PS3.20

DICOM PS3.20 ~~2014c~~2015a - Transformation of DICOM to and from HL7 Standards

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Foreword

This DICOM Standard was developed according to the procedures of the DICOM Standards Committee.

The DICOM Standard is structured as a multi-part document using the guidelines established in [ISO/IEC Directives, Part 3].

1 Scope and Field of Application

This part of the DICOM Standard specifies the transformation of DICOM data to and from HL7 standards.

2 Normative and Informative References

The following standards contain provisions that, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibilities of applying the most recent editions of the standards indicated below.

[ISO/IEC Directives, Part 3] ISO/IEC. 1989. *Drafting and presentation of International Standards*.

HL7 CDA R2 DIR IG, R1-2009 Health Level Seven Implementation Guide for CDA Release 2: Imaging Integration, Basic Imaging Reports in CDA and DICOM, Diagnostic Imaging Reports (DIR) Release 1.0, 2009.

ANSI/HL7 CDA, R2-2005 Health Level Seven Version 3 Standard: Clinical Document Architecture (CDA) Release 2, 2005.

ANSI/HL7 V3 CMET, R2-2009 Health Level Seven Version 3 Standard: Common Message Element Types, Release 2, 2009.

HL7 V3NE08 V3 Guide Health Level Seven Messaging Standard Version 3 Normative Edition 2008: Version 3 Guide.

LOINC® Logical Observation Identifier Names and Codes, Regenstrief Institute for Health Care, Indianapolis 2000.

RFC 3066 Tags for the Identification of Languages, Internet Engineering Task Force.

SNOMED CT® Systematized Nomenclature of Medicine - Clinical Terms, International Health Terminology Standards Development Organisation (IHTSDO).

UCUM Unified Code for Units of Measure, Regenstrief Institute for Health Care, Indianapolis 2000.

3 Definitions

For the purposes of this Standard the following definitions apply.

3.1 Codes and Controlled Terminology Definitions:

The following definitions are commonly used in this Part of the DICOM Standard:

Context Group A set of coded concepts defined by a Mapping Resource forming a set appropriate to use in a particular context.

Context ID (CID) Identifier of a Context Group.

Template A pattern that describes the Content Items, Value Types, Relationship Types and Value Sets that may be used in part of a Structured Report content tree, or in other Content Item constructs, such as Acquisition Context or Protocol Context. Analogous to a Module of an Information Object Definition.

Template ID (TID) Identifier of a Template.

Coding Schemes Dictionaries (lexicons) of concepts (terms) with assigned codes and well defined meanings.

4 Symbols and Abbreviations

The following symbols and abbreviations are used in this Part of the Standard.

ANSI American National Standards Institute

CDA Clinical Document Architecture (HL7)

DICOM Digital Imaging and Communications in Medicine

HL7 Health Level 7

HMD Hierarchical Message Description (HL7)

II Instance Identifier (HL7)

IOD Information Object Definition

ISO International Standards Organization

NEMA National Electrical Manufacturers Association

OID Object Identifier (ISO 8824)

SNOMED Systematized Nomenclature of Medicine

SR Structured Reporting

UCUM Unified Code for Units of Measure

UID Unique Identifier

XML Extensible Markup Language

5 Conventions

Terms listed in Section 3 Definitions are capitalized throughout the document.

A SR Diagnostic Imaging Report Transformation Guide

A.1 Scope and Field of Application

Constrained DICOM SR documents based on DICOM SR TID 2000 can be mapped to HL7 CDA Release 2 Diagnostic Imaging Reports. DICOM TID 2000 Basic Diagnostic Imaging Report specifies a basic DICOM SR report template for unencrypted completed general diagnostic imaging interpretation reports of single human identifiable patient subjects without digital signatures and without spatial and temporal coordinates. Only a single enterer and a single verifier are supported.

A.2 Use Cases

The basic use case for the mapping and transformation from DICOM SR to HL7 CDA is to facilitate the exchange of imaging based observations between imaging information systems and clinical information systems. The DICOM SR "Basic Diagnostic Imaging Report" will typically base its observations and conclusions on imaging data and related clinical information.

Scenarios:

a. Mapping of the complete constrained DICOM SR "Basic Diagnostic Imaging Report" to an HL7 CDA Release 2 Diagnostic Imaging Report. The receiver optionally selects relevant parts of the transformed document for inclusion into a clinical HL7 CDA document (e.g., a clinical progress note or a summary report that cites the results of a variety of sub-specialties involved in the treatment process of the patient)

b. Mapping of a subset of the original DICOM SR "Basic Diagnostic Imaging Report" that includes measurement data and the relevant context information (the minimal context that is required will be outlined in Section A.3.2.2). This subset comprises the relevant information provided by the responsible physician of the imaging institution to external parties (e.g., for ultrasound SR documents where only a subset of the measurement data will be communicated)

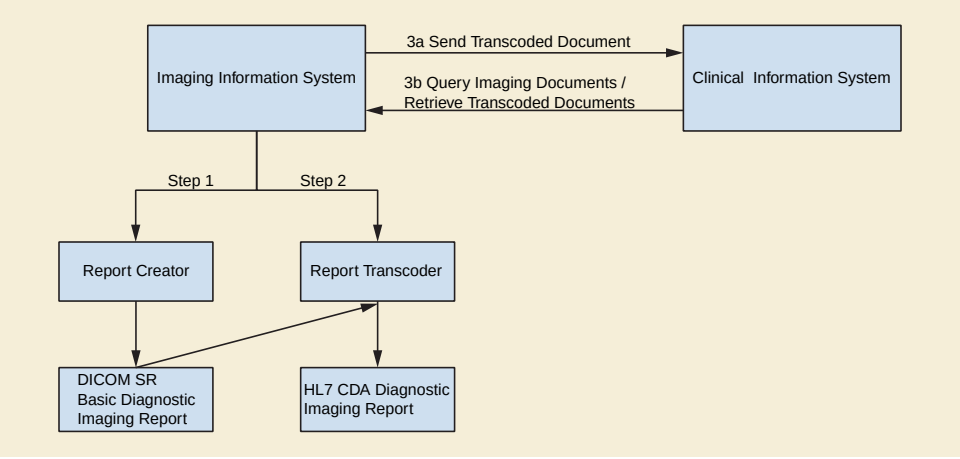

Figure A.2-1. Report Creation and Transformation

A.3 Structure of DICOM SR Documents

DICOM SR documents can be thought of as consisting of a document header and a document body. The header metadata attribute values are grouped into modules such as "Patient", "General Study" in PS3.3.

The SR Document Content Module contains the attributes for the root content item that includes the coded report title. The content tree (structured content) of the document body is contained in the nested Content Sequence Items of that module. "Container" content items are part of the Content Sequence. They are structural elements of the SR document body structure. Content items are DICOM SR document nodes within the content tree that are connected through "by-value" relationships (at least for Enhanced SR IODs).

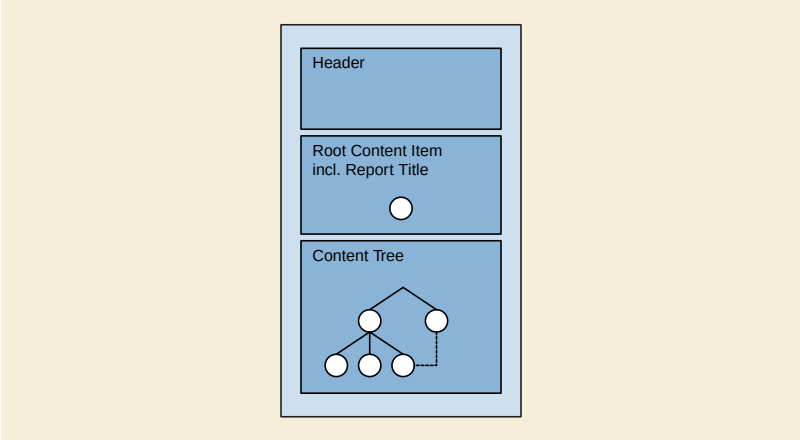

Figure A.3-1. SR Document Structure

A.3.1 Header

Enhanced SR Information Object Definition (IOD) header relevant for TID 2000 as specified in PS3.3. The contents of any module not covered by this transformation guideline will not be included in the generated CDA document.

Table A.3.1-1. DICOM Enhanced SR IOD Modules

IE	Module	Reference	Usage	Covered by this Transformation Guideline
Patient	Patient	C.7.1.1	M	Yes
	Clinical Trial Subject	C.7.1.3	U	No
Study	General Study	C.7.2.1	M	Yes
	Patient Study	C.7.2.2	U	No
	Clinical Trial Study	C.7.2.3	U	No
Series	SR Document Series	C.17.1	M	Yes
	Clinical Trial Series	C.7.3.2	U	No
Equipment	General Equipment	C.7.5.1	M	Yes
Document	SR Document General	C.17.2	M	Yes
	SR Document Content	C.17.3	M	Yes
	SOP Common	C.12.1	M	Yes

DICOM SR Header Modules:

Refer to Section A.6.1 for details.

Patient Module

The patient module specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

Clinical Trial Subject Module

The Clinical Trial Subject Module contains attributes that identify a Patient as a clinical trial Subject. This Annex does not provide mappings for this module since they are outside the scope of this transformation.

General Study Module

The General Study Module specifies the Attributes that describe and identify the Study performed upon the Patient.

Patient Study Module

The Patient Study Module defines the attributes that provide information about the Patient at the time the Study was performed. This Annex does not provide mappings for the module since they would need to be inserted in the content tree.

Clinical Trial Study Module

The Clinical Trial Study Module contains attributes that identify a Study in the context of a clinical trial. This Annex does not provide mappings for this module.

SR Document Series Module

The SR Document Series Module defines the Attributes of the SR Document Series. A Series of SR Documents may contain any number of SR Documents.

Clinical Trial Series Module

The Clinical Trial Series Module contains attributes that identify a Series in the context of a clinical trial. This Annex does not provide mappings for this module.

General Equipment Module

The General Equipment Module specifies the Attributes that identify and describe the piece of equipment that produced a Series of Composite Instances.

SR Document General Module

The SR Document General Module defines the general Attributes of an SR Document Instance. These Attributes identify the SR Document and provide context for the entire document.

SOP Common Module

The SOP Common Module defines the Attributes that are required for proper functioning and identification of the associated SOP Instances.

SR Document Content Module

The Attributes in this Module convey the content of an SR Document. It specifies the root content item and the content tree (refer to Figure A.3-1).

A.3.2 Document Body

A.3.2.1 DICOM SR "Basic Diagnostic Imaging Report" Template Structure

TID 2000 is the top-level template of DICOM SR Basic Diagnostic Imaging Reports (PS3.16). It includes sub-templates as shown in Figure A.3.2.1-1. The root content item (coded report title) and the Content Sequence details (structure and contents) are specified by those templates.

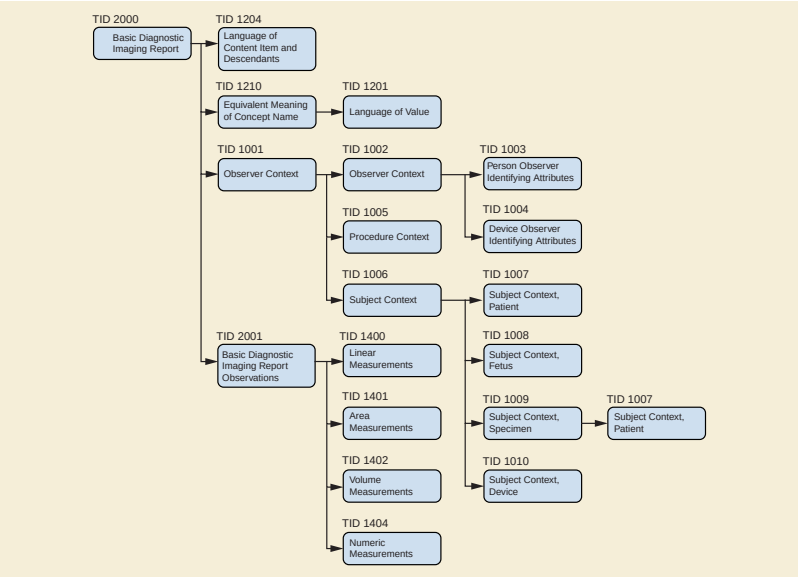

Figure A.3.2.1-1. Template Structure Summarized from PS 3.16

A.3.2.2 Mapping Requirements

The goal of this document is to specify a mapping between constrained TID 2000 Basic Diagnostic Imaging Report DICOM SR documents and HL7 CDA Diagnostic Imaging Reports (HL7 CDA R2 DIR IG, R1-2009). The following constraints apply to DICOM SR Basic Diagnostic Imaging Reports that are mapped to CDA Diagnostic Imaging Reports:

- TID 1007 Subject Context, Patient: The constrained DICOM SR Basic Diagnostic Imaging Report is restricted to cover exactly one patient subject.
- TID 1009 Subject Context, Specimen: The mapping of "Subject Context, Specimen" (TID 1009) is out of scope for this version of the implementation guide.
- TID 1010 Subject Context, Device and reports on animals are not addressed by this implementation guide.
- The mapping of DICOM SR clinical trial header data (Clinical Trial Subject Module, Clinical Trial Study Module, Clinical Trial Series Module) is out of scope for this version of the implementation guide.
- The transformation of de-identified SR documents (e.g., for clinical trials and educational purposes) is not addressed in this version of the implementation guide. CDA Release 2 does not address de-identification explicitly (e.g., by definition of flags). De-identified SR documents that have been transformed in accordance with this guide will not be able to have original patient information recovered.
- The transformation of DICOM Patient Study Module attributes in the document header is out of scope. Pertinent clinical information may be present in the SR content tree and will be mapped to the CDA document body.
- The transcoding of encrypted DICOM SR documents to CDA Release 2 is not addressed in this version of the implementation guide.
- Since the use of digital signatures for transcoded DICOM SR documents is not primarily a mapping question, this topic is not addressed in the implementation guide.
- SR Document General Module, Verifying Observer Sequence (0040,A073): The constrained DICOM SR Basic Diagnostic Imaging Report is restricted to cover exactly one Verifying Observer since CDA R2 only allows for a single Legal Authenticator.
- SR Document General Module, Participant Sequence (0040,A07A): The constrained DICOM SR Basic Diagnostic Imaging Report is restricted to cover exactly one Data Enterer since CDA R2 only allows for a single dataEnterer.
- For automated transformation of DICOM SR diagnostic imaging report it is recommended to transform only SR documents where the DICOM Completion Flag (0040,A491) value equals "COMPLETE" to make sure that only SR documents get exported that

contain all significant observations (the completeness of the content will be attested or verified by an authorized user). The value of the completion flag can be ignored, if an authorized user confirms that the SR document contains all significant observations. The Completion Flag (0040,A491) cannot be mapped since CDA Release 2 does not specify such flags.

- Spatial coordinates contained in the content tree of the original DICOM SR document are not mapped because this guideline assumes that Presentation States are used to convey such information.

The CDA Diagnostic Imaging Report Implementation Guide (HL7 CDA R2 DIR IG, R1-2009) defines constraints on CDA Header and Body elements used in a Diagnostic Imaging Report document. Performing the mapping and setting CDA specific values as specified in this transformation guide and adhering to the constraints of CDA Diagnostic Imaging Reports (DIR) results in CDA DIR conformant reports. Validation of the generated CDA DIR documents is based on the constraints specified for CDA Diagnostic Imaging Reports (HL7 CDA R2 DIR IG, R1-2009).

A.3.2.3 DICOM Composite Object References Context Requirements

The attributes of DICOM composite object references are specified in Section A.7 HL7 V3 DICOM CMETS (Common Message Element Types). These CDA mapping patterns shall be used to reference DICOM composite objects. Information on relevant DICOM objects referenced within the CDA target document's body and on the original DICOM SR document shall be included in the CDA DICOM object catalog section.

A.4 Structure of HL7 CDA Release 2 Documents

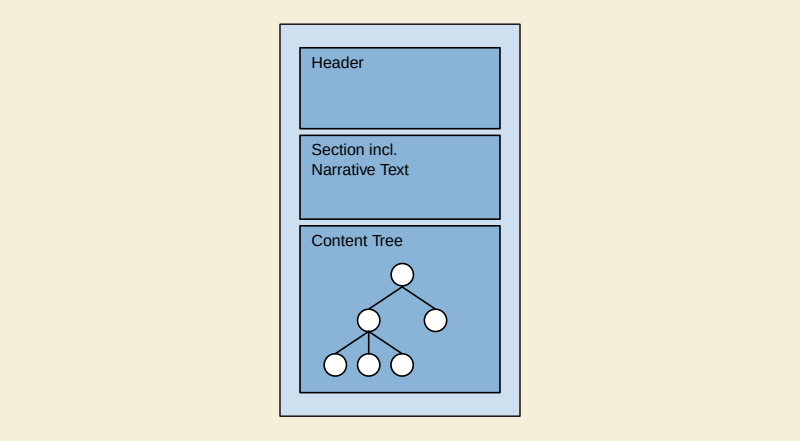

Figure A.4-1. CDA Release 2 Document Structure

The CDA Header contains the document metadata. The structured document body may comprise multiple sections with narrative text and clinical statement entries that form the content tree of the document.

A.5 HL7 CDA Release 2 Diagnostic Imaging Report Target Structure

The HL7 development framework (HDF) uses a model driven methodology and the derivation of specifications and interim work products from a common set of reference models (HL7 V3 Guide). The basis for Refined Message Information Models is the HL7 Reference Information Model (RIM). The CDA RMIM contains act classes, entities, roles and participations derived from the core RIM artifacts. The structured part of the CDA RMIM (Clinical Statement) specifies generic act entry classes such as act and observation. The code attribute of the entry classes is used to convey the semantic information while generic class names are used for the different act entries. Similarly the type code of the entry relationships denotes the semantics of the relationship between act entries.

The HL7 CDA XML representation builds on the HL7 V3 XML Implementation Technology Specification - Data Types and XML Implementable Technology Specification for V3 Structures. XML structures are derived from Hierarchical Message Descriptions (HMD).

The header of the transcoded diagnostic imaging report contains the participations and act relationships that are related to the central ClinicalDocument act class. The clinical document contains the structured body of the CDA document that consists of one or multiple sections. Each document section contains an optional section code and narrative text. Sections are associated with optional entry

act classes and their related participations. Entry act classes are connected by act relationships that denote the type of relationship between individual act entries.

DICOM UIDs are mapped to HL7 V3 Instance Identifier (II) data type root. Non UID DICOM identifiers and numbers are mapped to the HL7 V3 Instance Identifier (II) data type extension portion. In this case the root value of the assigning authority (custodian organization) shall be used.

A.5.1 Constrained HL7 CDA Release 2 Diagnostic Imaging Report RMIM

The constrained CDA RMIM for Diagnostic Imaging Reports transcoded from DICOM SR Basic Diagnostic Imaging Reports shows the relevant artifacts of the target CDA document (refer to CDA Diagnostic Imaging Report RMIM).

A.5.1.1 Header (Level 1)

General Remarks on the mapping of DICOM header module attributes:

SR Document General Module

- Custodian:The Type 3 DICOM Custodial Organization Sequence ((0040,A07C) attribute values of the original SR document are not necessarily the basis for mapping to the CDA Custodian Participation, related roles and entities, since the custodian values of the transformed CDA document shall be set according to institution policies.
- Mapping of the Participant Sequence (0040,A07A): Participations of type "SOURCE" (Equipment that contributed to the content) are not mapped to CDA Release 2. The DICOM TID 2000 (PS3.16) does not specify default values for the device observer that are based on the participant sequence.
- Attributes of the Predecessor Documents Sequence (0040,A360) and Identical Documents Sequence (0040,A525) are not mapped since they are relevant only in the context of the original DICOM SR document.
- Attributes of the Current Requested Procedure Evidence Sequence (0040,A375), Pertinent Other Evidence Sequence (0040,A385) and Equivalent Document Sequence (0040,A090) are not mapped since they are relevant only in the context of the original DICOM SR document.

SOP Common Module

- Timezone Offset From UTC (0008,0201) shall be considered for attributes of the original DICOM SR document that are based on the DA or TM data type (PS3.5).
- The Specific Character Set (0008,0005) is required (Type 1C), if the Basic Graphic Set is expanded or replaced. This is the basis for mapping DICOM character sets to CDA Unicode (<?xml version="1.0" encoding="UTF-8"?>)

  Note

  Ambiguities exist for mapping individual characters to Unicode (e.g., for Japanese characters). Resolution of those issues is beyond the scope of this document. Please refer to Section A.8 for further details on data types and character sets.

Header Mapping Tables

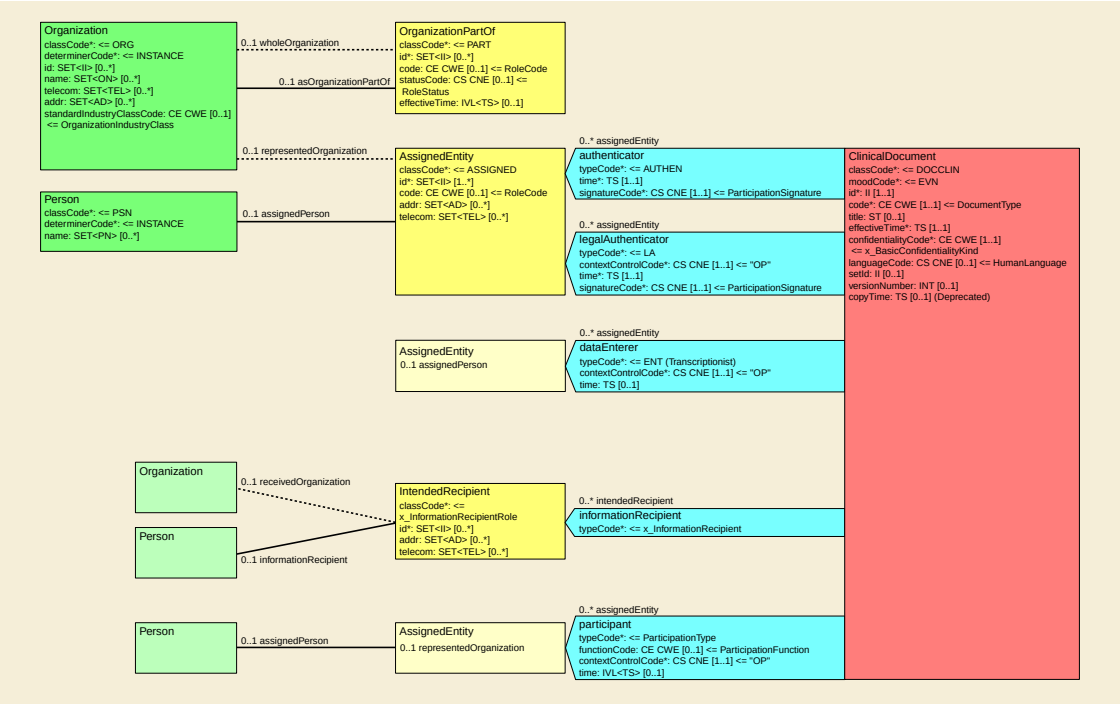

Figure A.5.1.1-1. Clinical Document Header Participations

Clinical Document

Table A.5.1.1-1. Clinical Document

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	DOCCLIN
moodCode	CS	1..1	EVN
id	II	1..1	A UID with a maximum length of 64 bytes shall be assigned to the root portion of the HL7 V3 Instance Identifier (II) data type. There shall be no extension to the root portion of the Instance Identifier.
code	CE	1..1	"18748-4" as code property, 2.16.840.1.113883.6.1 as codeSystem property, LOINC as codeSystemName property, "Diagnostic Imaging Report" as displayName property.
title	ST	1..1	*Code Meaning (0008,0104)* of "Equivalent Meaning of Concept Name" (TID 1210) if code is available. If code is not present: *Code Meaning (0008,0104) of* Concept name code sequence (0040,A043) of the root content item. .
effectiveTime	TS	1..1	Content Date (0008,0023), Content Time (0008,0033) of the SR Document General Module
confidentialityCode	CE	1..1	Defaults to "N" (Normal confidentiality rules). Other values may be used in accordance with local policies.
languageCode	CS	0..1	Code Sequence (0040,A043) of "Language of Content Item and Descendants" code content item (TID 1204): <code value as code property, coding scheme designator as codeSystemName property, code meaning as displayName property> (as defined by the IETF (Internet Engineering Task Force) RFC 3066)
setID	II	0..1	Shall not be sent.

Attribute	Data Type	Multiplicity	Value
versionNumber	INT	0..1	Shall not be sent.
copyTime	TS	0..1	Deprecated, shall not be sent.

For the mapping of parent document attributes (i.e., the transformed original DICOM SR document) refer to Table A.5.1.1-19.

Authenticator Participation

The attributes of the SR Document General Module Participant Sequence (0040,A07A), PS3.3 are mapped to the authenticator participation, associated role and entity as specified in Table A.5.1.1-2, Table A.5.1.1-3 and Table A.5.1.1-4, if the participation type value equals "ATTEST" (Attestor). One or more such items of the Participant Sequence can be mapped to the authenticator participation that has cardinality 0..*.

Table A.5.1.1-2. Authenticator Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	AUTHEN
time	TS	1..1	Participation Datetime (0040,A082) of Participant Sequence (0040,A07A)
signatureCode	CS	1..1	S (Signature has been affixed) if DICOM attestor attribute values are set in the original document.

Table A.5.1.1-3. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	1..*	Person Identification Code Sequence (0040,1101) within Participant Sequence (0040,A07A): code value as identifier
code	CE	0..1	Person Identification Code Sequence (0040,1101) within Participant Sequence (0040,A07A): <code value as code property, coding scheme UID as codeSystem property, coding scheme designator as codeSystemName property, code meaning as displayName property>
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table A.5.1.1-4. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Person Name (0040,A123) of Participant Sequence (0040,A07A)

Legal Authenticator Participation

The SR Document General Module attributes related to document verification (PS3.3) are mapped to the legal authenticator participation, associated role and entities as specified in Table A.5.1.1-5, Table A.5.1.1-6, Table A.5.1.1-7 and Table A.5.1.1-8.

SR Document General Module, Verifying Observer Sequence (0040,A073): The constrained DICOM SR Basic Diagnostic Imaging Report is restricted to cover exactly one Verifying Observer since CDA R2 only allows for a single Legal Authenticator. The Verification Flag (0040,A493) cannot be mapped since CDA Release 2 does not specify such flags. If however legalAuthenticator attribute values are set, that implies that the document is verified. If not, the document is unverified. Recommendation: Each transformed DICOM SR

document that is sent to information systems should be verified after it has been transcoded. Only verified documents should be exported.

Table A.5.1.1-5. Legal Authenticator Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	LA
contextControlCode	CS	1..1	OP
time	TS	1..1	Verification DateTime (0040,A030) within Verifying Observer Sequence.
signatureCode	CS	1..1	S (Signature has been affixed) if Verification Flag (0040,A493) Value equals "VERIFIED".

Table A.5.1.1-6. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	1..*	Verifying Observer Identification Code Sequence (0040,A088): code value as identifier
code	CE	0..1	Verifying Observer Identification Code Sequence (0040,A088): <code value as code property, coding scheme UID as codeSystem property, coding scheme designator as codeSystemName property, code meaning as displayName property>
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table A.5.1.1-7. Organization

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ORG
determinerCode	CS	1..1	INSTANCE
id	SET<II>	0..*	Shall not be sent.
name	SET<ON>	0..*	Verifying Organization (0040,A027) within Verifying Observer Sequence
telecom	SET<TEL>	0..*	Shall not be sent.
addr	SET<AD>	0..*	Shall not be sent.
standardIndustryClassCode	CE	0..1	Shall not be sent.

Table A.5.1.1-8. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Verifying Observer Name (0040,A075) within Verifying Observer Sequence

Information Recipient Participation

The referring physician is considered the primary information recipient for both, inpatient as well as outpatient delivery of imaging services by default.

Information on the attending physician may be encoded by using the encompassing encounter | encounter participation (refer to Table A.5.1.1-25, Table A.5.1.1-26 and Table A.5.1.1-27). This participation may also be used for encoding information of the referrer if the primary information recipient is different from the referring physician.

The PRCP (Primary Information Recipient) code shall be used as a fixed value for type code as specified in Table A.5.1.1-9.

Table A.5.1.1-9. Information Recipient Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	PRCP

Attribute values of the original SR document General Study Module, Referring Physician Identification Sequence (0008,0096) are mapped as specified in Table A.5.1.1-10, Table A.5.1.1-11 and Table A.5.1.1-12. Only a single item is permitted in this sequence.

Table A.5.1.1-10. Assigned Entity Role

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	0..*	Person Identification Code Sequence (0040,1101) of Referring Physician Identification Sequence (0008,0096): code value as identifier
addr	SET<AD>	0..*	Person's Address (0040,1102) of Referring Physician Identification Sequence (0008,0096): DICOM ST (Short Text) String Data Type
telecom	SET<TEL>	0..*	Person's Telephone Numbers (0040,1103) of Referring Physician Identification Sequence (0008,0096): DICOM LO (Long String) String Data Type

Table A.5.1.1-11. Organization

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ORG
determinerCode	CS	1..1	INSTANCE
id	SET<II>	0..*	Institution Code Sequence (0008,0082) of Referring Physician Identification Sequence (0008,0096): code value as identifier (will not be used if Institution Name is present)
name	SET<ON>	0..*	Institution Name (0008,0080) of Referring Physician Identification Sequence (0008,0096) (will not be used if Institution Code Sequence is present and code value is mapped to id).
telecom	SET<TEL>	0..*	Shall not be sent.
addr	SET<AD>	0..*	Institution Address (0008,0081) of Referring Physician Identification Sequence (0008,0096)
standardIndustryClassCode	CE	0..1	Shall not be sent.

Table A.5.1.1-12. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Referring Physician's Name (0008,0090)

Data Enterer Participation

The attributes of the SR Document General Module Participant Sequence (0040,A07A), PS3.3 are mapped to the dataEnterer participation, associated role and entity as specified in Table A.5.1.1-13, Table A.5.1.1-14 and Table A.5.1.1-15 if the participation type value equals "ENT" (Data Enterer). The constrained DICOM SR Basic Diagnostic Imaging Report is restricted to cover exactly one Data Enterer since CDA R2 only allows for a single dataEnterer (dataEnterer participation has cardinality 0..1).

Table A.5.1.1-13. Data Enterer Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	ENT
contextControlCode	CS	1..1	OP
time	TS	0..1	Participation Datetime (0040,A082) of Participant Sequence (0040,A07A) if Participation Type (0040,A080) equals "ENT" (Data Enterer).

Table A.5.1.1-14. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	1..*	Person Identification Code Sequence (0040,1101) within Participant Sequence (0040,A07A): code value as identifier
code	CE	0..1	Person Identification Code Sequence (0040,1101) within Participant Sequence (0040,A07A): <code value as code property, coding scheme UID as codeSystem property, coding scheme designator as codeSystemName property, code meaning as displayName property>
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table A.5.1.1-15. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Person Name (0040,A123) of Participant Sequence (0040,A07A) if Participation Type (0040,A080) equals "ENT" (Data Enterer).

Participant (Referrer) Participation

Attribute values of the original SR document General Study Module, Referring Physician Identification Sequence (0008,0096) are mapped as specified in Table A.5.1.1-16, Table A.5.1.1-17 and Table A.5.1.1-18. Only a single item is permitted in this sequence.

Table A.5.1.1-16. Referring Physician Encounter Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	REF
time	IVL<TS>	0..1	Shall not be sent.

Table A.5.1.1-17. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED

Attribute	Data Type	Multiplicity	Value
id	SET<II>	1..*	Referring Physician Identification Sequence (0008,0096): code value as identifier
code	CE	0..1	Referring Physician Identification Sequence (0008,0096): <code value as code property, coding scheme UID as codeSystem property, coding scheme designator as codeSystemName property, code meaning as displayName property>
addr	SET<AD>	0..*	Person's Address (0040,1102) of Referring Physician Identification Sequence (008,0096): DICOM ST (Short Text) String Data Type
telecom	SET<TEL>	0..*	Person's Telephone Numbers (0040,1103) of Referring Physician Identification Sequence (008,0096): DICOM LO (Long String) String Data Type

Table A.5.1.1-18. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Referring Physician's Name (0008,0090)

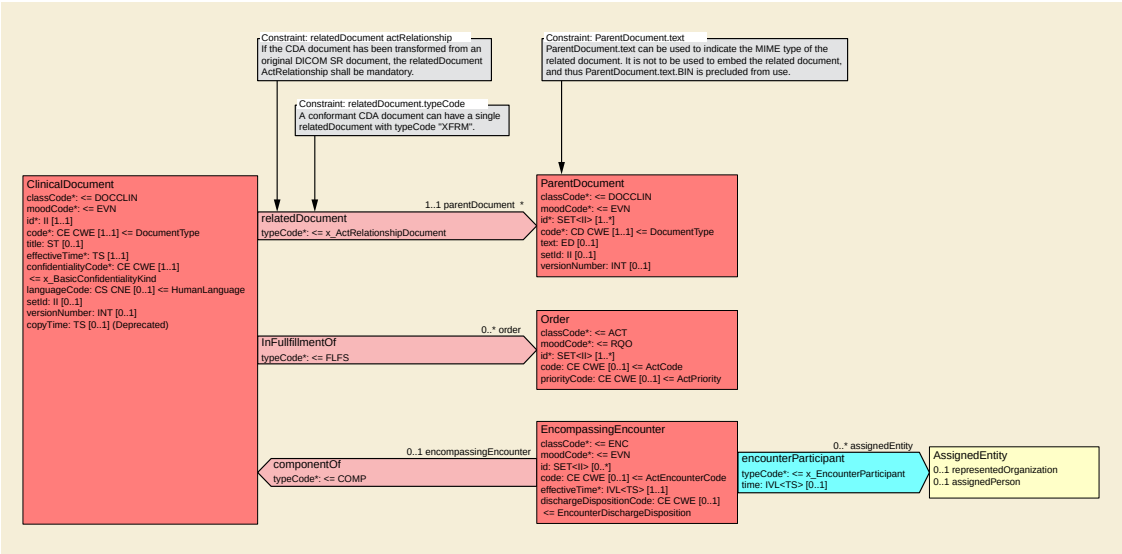

Figure A.5.1.1-2. Clinical Document Header Act Relationships

Parent Document

RelatedDocument act relationship: Set typeCode to fixed value "XFRM" (for transformed parent DICOM SR document). The multiplicity of the act relationship is constrained to cardinality 1..1 (for a single original DICOM SR document that has been transformed to CDA).

Related Parent Document

The SOP Instance UID (0008,0016) attribute value of the SOP Common Module is mapped to the required CDA attribute ParentDocument.id.

Table A.5.1.1-19. Parent Document

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	DOCCLIN
moodCode	CS	1..1	EVN
id	SET<II>	1..*	SOP Instance UID of original DICOM SR Composite Object.
code	CD	1..1	DICOM SR Report Title: Concept Name Code Sequence (0040,A043) of Root Content Item.
text	ED	0..1	Shall not be sent.
setID	II	0..1	Shall not be sent.
versionNumber	INT	0..1	Shall not be sent.

Order Fulfillment

If available from the source SR document, at least one of the following numbers of DICOM TID 1005 "Procedure Context" should be mapped to the CDA Order.id set of instance identifiers: Placer Number, Filler Number or Accession Number. Each of the numbers should be combined with "Issuer of Identifier" (TID 1005) if available. Multiple procedure codes and the associated placer/filler/accession number(s) can be mapped to order acts as specified in Table A.5.1.1-20 (the CDA act relationship "infulfillmentOf" has cardinality 0..*).

Table A.5.1.1-20. Order

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT
moodCode	CS	1..1	RQO
id	SET<II>	1..*	Placer Number (TID 1005) and/or Filler Number (TID 1005) and/or Accession Number (TID 1005), each of them combined with its associated Issuer of Identifier (TID 1005) if available. Accession Number (TID 1005) defaults to Accession Number (0008,0050) of the General Study Module.
code	CE	0..1	Requested Procedure Code Sequence (0032,1064) within the Referenced Request Sequence (0040,A370) of the SR Document General Module
priorityCode	CE	0..1	Shall not be sent.

Service Event

For the diagram related to the serviceEvent mapping refer to Section A.5.1.4.2 Procedure Context.

DICOM General Study Attributes Mapping:

- Physician(s) Reading Study attributes are mapped to the service event act class performer participation, associated roles and entities (refer to Table A.5.1.1-21, Table A.5.1.1-22 and Table A.5.1.1-23).
- Physician(s) of Record attributes are mapped to the encompassing encounter act | encounter participation (typeCode = "ATND" for Attender), associated roles and entities (refer to Table A.5.1.1-25, Table A.5.1.1-26 and Table A.5.1.1-27 and the information recipient section for the relationship to the primary information recipient).

Service Event Performer Participation

Attribute values of original SR document General Study Module, Physician(s) Reading Study (0008,1060) and Physician(s) Reading Study Identification Sequence (0008,1062) are mapped as specified in Table A.5.1.1-21, Table A.5.1.1-22 and Table A.5.1.1-23. Information on multiple physicians can be mapped to multiple AssignedEntity roles and Person entities since the encounterParticipant participation has cardinality 0..*.

Table A.5.1.1-21. Physician(s) Reading Study Performer Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	PRF
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.1" (identifies the template that defines constraints on "Physician Reading Study Performer" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
functionCode	CE	0..1	Shall not be sent.
time	IVL<TS>	0..1	Shall not be sent.

Table A.5.1.1-22. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	1..*	Person Identification Code Sequence (0040,1101) within Physician(s) Reading Study Identification Sequence (0008,1062): code value as identifier
code	CE	0..1	Person Identification Code Sequence (0040,1101) within Physician(s) Reading Study Identification Sequence (0008,1062): <code value as code property, coding scheme UID as codeSystem property, coding scheme designator as codeSystemName property, code meaning as displayName property>
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table A.5.1.1-23. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Name of Physician(s) Reading Study (0008,1060)

Encompassing Encounter

EncompassingEncounter shall be sent if there is information on either the admission or the attender participation and not otherwise. EncompassingEncounter.effectiveTime is a required attribute. There is no DICOM SR attribute specified that can be mapped, i.e., Visit Date and Time are not available. If the value cannot be obtained from some other source, the null flavor "NI" (No Information) is assigned as the default Encompassing Encounter effectiveTime value. A complete list of null flavor values is available in CDA R2 DIR IG.

Table A.5.1.1-24. Encompassing Encounter

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ENC
moodCode	CS	1..1	EVN
id	SET<II>	0..*	Admission Id (0038,0010) and Issuer of Admission ID Sequence (0038;0014) of the Patient Study Module
code	CE	0..1	Shall not be sent

Attribute	Data Type	Multiplicity	Value
effectiveTime	IVL<TS>	1..1	Use null flavor value "NI" (No Information) if the value cannot be obtained from some other source.
dischargeDispositionCode	CE	0..1	Shall not be sent

Attender Participation

Attribute values of Physician(s) of Record (0008,1048) and the Physician(s) of Record Identification Sequence (0008,1049) within the General Study module (PS3.3) are mapped to the encompassing encounter act | encounter participation (typeCode = "ATND" for Attender), associated roles and entities. Information on multiple physicians can be mapped to multiple AssignedEntity roles and Person entities since the encounterParticipant participation has cardinality 0..*.

Table A.5.1.1-25. Physician(s) of Record Attender Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	ATND
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.2" (identifies the template that defines constraints on "Physician of Record Participant" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
time	IVL<TS>	0..1	Shall not be sent.

Table A.5.1.1-26. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	1..*	Person Identification Code Sequence (0040,1101) within Physician(s) of Record Identification Sequence (0008,1049): code value as identifier
code	CE	0..1	Person Identification Code Sequence (0040,1101) within Physician(s) of Record Identification Sequence (0008,1049): <code value as code property, coding scheme UID as codeSystem property, coding scheme designator as codeSystemName property, code meaning as displayName property>
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table A.5.1.1-27. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Physician(s) of Record (0008,1048)

A.5.1.2 Section (Level 2)

General Mapping of Document Sections

DICOM SR Section Container Content Items are mapped to CDA Clinical Document Sections. CDA section elements shall have a code element that shall contain a LOINC code if available, or DICOM codes for sections that have no LOINC equivalent. The mapping of section codes is specified in CDA R2 DIR IG.

Table A.5.1.2-1. CDA Section

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	DOCSECT
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	Set root portion of II to: • "2.16.840.1.113883.10.20.6.1.1" for DICOM Object Catalog sections • "2.16.840.1.113883.10.20.6.1.2" for Findings sections (values identify the templates that define constraints on section content of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
id	II	0..1	Generate Section Identifier
code	CE	1..1	If no equivalent LOINC section code is available, DICOM section codes contained in Concept Name Code Sequence (0040,A043) of the DICOM SR Container Content Item are used: <code value as code property,"1.2.840.10008.2.16.4"as codeSystem property,"DCM"as codeSystemName property, code meaning as displayName property>. If an equivalent LOINC section code is available, DICOM section codes are mapped to LOINC as specified by CDA R2 DIR IG: <mapped code value as code property,"2.16.840.1.113883.6.1"as codeSystem property,"LOINC"as codeSystemName property, mapped code meaning as displayName property>
title	ST	0..1	If section title is intended to be rendered: Code meaning of Concept Name Code Sequence (0040,A043) of the DICOM SR Container Content Item.
text	ED	0..1	If section text is intended to be rendered: Narrative text
confidentialityCode	CE	0..1	If used the value defaults to "N" (Normal confidentiality rules). Other values may be used in accordance with local policies.
languageCode	CS	0..1	Shall not be sent.

CDA Section Text

Section.text contains the narrative text (attested content) of the document. Section.text is populated from DICOM SR content items of the original document in a way that the full meaning can be conveyed in an unambiguous manner by applications that render the document.

Structured CDA entries may be referenced within the narrative section text of the CDA document (refer to the CDA Release 2 Standard, Section 4.3.5.1 on <content>). Parts of the structured body of the CDA document that are part of the attested content of the document shall be included in the narrative section text. To that end corresponding CDA entries are extended by originalText elements and reference values that can be derived from the entry act class code displayName.

Example A.5.1.2-1. CDA Sample Document Excerpt 1: CODE OBSERVATION REFERENCE

```
<observation classCode="OBS" moodCode="EVN">
 <templateId root="2.16.840.1.113883.10.20.6.2.9"/>
 <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
 <value xsi:type="CD" code="121112" codeSystem="1.2.840.10008.2.16.4"
       codeSystemName="DCM" displayName="Source of Measurement">
 <originalText>
  <reference value="#SrceOfMeas2"/>
 </originalText>
 </value>
</observation>
```

Example A.5.1.2-2. CDA Sample Document Excerpt 2: TEXT OBSERVATION REFERENCE

```
<observation classCode="OBS" moodCode="EVN">
 <templateId root="2.16.840.1.113883.10.20.6.2.12"/>
 <code code="121073" codeSystem="1.2.840.10008.2.16.4"
       codeSystemName="DCM" displayName="Impression"/>
 <value xsi:type="ED">
  <reference value="#Fndng3"/>
 </value>
</observation>
```

Within section text a new paragraph may be used for CDA entries that are inserted as part of the attested content. The caption value may be derived from the code displayName value. The attribute value of the reference value shall be used for the content ID attribute.

Example A.5.1.2-3. CDA Sample Document Excerpt 3: SECTION TEXT PARAGRAPH

```
<paragraph>
  <caption>Source of Measurement</caption>
  <content ID=" SrceOfMeas2"/>
…
</paragraph>
…
<paragraph>
<caption>Impression</caption>
<content ID="Fndng3">No acute cardiopulmonary process. Round density in left superior hilus,
further evaluation with CT is recommended as underlying malignancy is not excluded.</content>
…
</paragraph>
```

For CDA entries (structured part) WADO references are included in observation text as reference value.

Example A.5.1.2-4. CDA Sample Document Excerpt 4: OBSERVATION TEXT WADO REFERENCE

```
<observation classCode="DGIMG" moodCode="EVN">
…
  <text  mediaType="application/DICOM">
    <!--reference to CR DICOM image (PA view) -->
    <reference value="http://www.example.org/wado?requestType=WADO
       &amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
       &amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823223142485051
       &amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
       &amp;contentType=application/DICOM"
    />
  </text>
…
</observation>
```

Within section text the same WADO reference may be included as the linkHtml href attribute value and the element value can be derived from the DICOM Study Description attribute value.

Example A.5.1.2-5. CDA Sample Document Excerpt 5: SECTION TEXT WADO REFERENCE

```
<linkHtml href="http://www.example.org/wado?requestType=WADO
  &amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
  &amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823223142485051
  &amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
  &amp;contentType=application/DICOM">Chest_PA
</linkHtml>
```

Section.title and Section.text values shall be populated as shown in Table A.5.1.2-1 above if the section is intended to be rendered. Sections that are not intended to be rendered such as the DICOM Objects Catalog shall not contain title and/or text values.

Structured Body and Sections

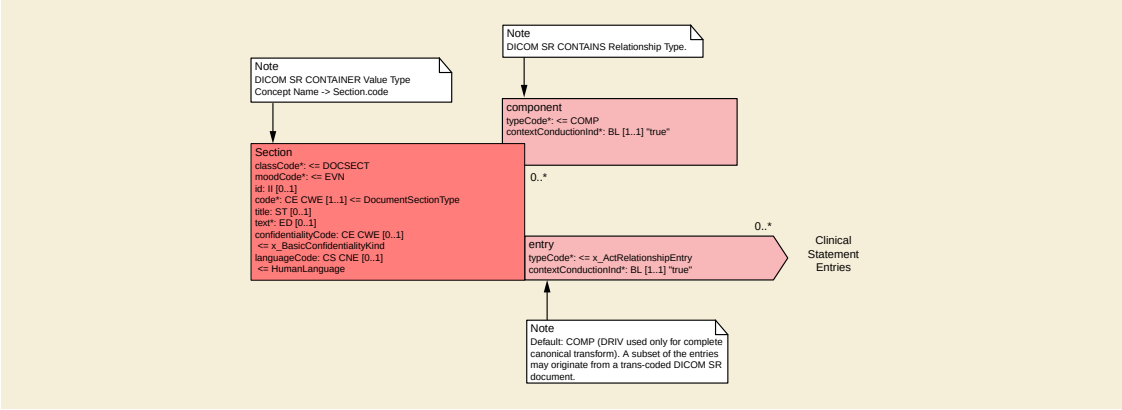

Figure A.5.1.2-1. Nested Sections

DICOM SR Basic Diagnostic Imaging Reports include nested container content items. The root content item (value type "CONTAINER") includes document sections (content items of value type "CONTAINER") by applying relationships between those content items (relationship type "CONTAINS").

The ClinicalDocument act class is associated with the StructuredBody act class by an act relationship (typeCode "COMP"). The structured body of the CDA contains sections that may be nested (recursive act relationship, typeCode = "COMP"). Nested DICOM SR sections within the document body are not used for SR Basic Diagnostic Imaging Reports (TID 2000). For other SR document types nested sections are mapped as shown in Figure A.5.1.2-1.

DICOM Object Catalog Section

The DICOM Object Catalog Section provides a single location for the identifying information of the study/series/instance hierarchical context of DICOM composite objects that are referenced for a specific purpose (Refer to Section A.7.1 A_DicomSequence minimal (COCT_RM830110UV) for details. In the context of the CDA, entry act class and actRelationships names shall be used as specified for the CDA mapping).

A.5.1.3 Structured Body (Level 3)

Coded Observations

DICOM TID 2000 specifies that Imaging Report Elements of Value Type Code are contained in sections (row 6 and 8). The Imaging Report Elements are inferred from Basic Diagnostic Imaging Report Observations (Row 9) that consist of image references and measurements (linear, area, volume and numeric). Coded DICOM Imaging Report Elements in this context are mapped to CDA coded observations that are section components and are related to the SopInstance or QuantityMeasurement act classes by the SPRT (Support) act relationship (Figure A.5.1.3-1).

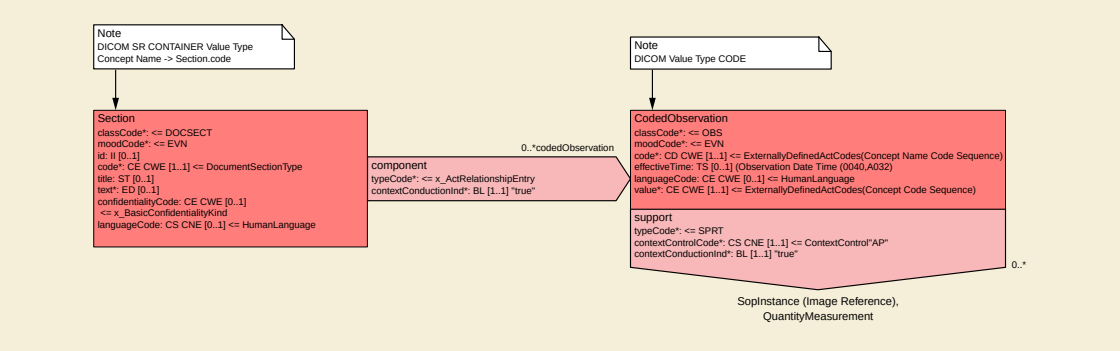

Figure A.5.1.3-1. Coded Observation Within Section

Table A.5.1.3-1 shows the mapping of attribute values for DICOM Imaging Report Elements to CDA coded observation. The component act relationship between Section and CodedObservation is encoded as a section entry in CDA; CodedObservation as an observation CDA entry and the support act relationship as entryRelationship.

Table A.5.1.3-1. Coded Observation (DICOM Imaging Report Element, Value Type Code)

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.13" (identifies the template that defines constraints on "Code Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
code	CE	1..1	Concept Name Code Sequence (0040,A043) of CODE Content Item:):<code value as code property, coding scheme designator as codeSystemName property, code meaning as displayName property>
effectiveTime	TS	0..1	Observation DateTime (0040,A032)
languageCode	CE	0..1	Not used at entry level.
value	CE	1..1	Concept Code Sequence (0040,A168) of CODE Content Item:<code value as code property, coding scheme designator as codeSystemName property, code meaning as displayName property>

Text Observations

DICOM TID 2000 specifies that Imaging Report Elements of Value Type Text are contained in sections (Rows 6 and 10). The Imaging Report Elements are inferred from Basic Diagnostic Imaging Report Observations (Row 11) that consist of image references and measurements (linear, area, volume and numeric). Coded DICOM Imaging Report Elements in this context are mapped to CDA text observations that are section components and are related to the SopInstance or QuantityMeasurement act classes by the SPRT (Support) act relationship (Figure A.5.1.3-2).

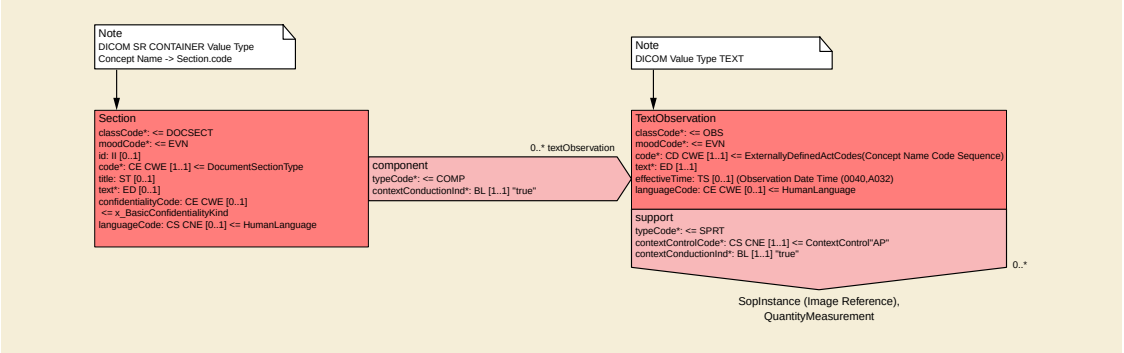

Figure A.5.1.3-2. Text Observation Within Section

Table A.5.1.3-2 shows the mapping of attribute values for DICOM Imaging Report Elements to CDA text observation. The component act relationship between Section and TextObservation is encoded as a section entry in CDA; TextObservation as an observation CDA entry and the support act relationship as entryRelationship.

Table A.5.1.3-2. Text Observation

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.12" (identifies the template that defines constraints on "Text Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
code	CE	1..1	Concept Name Code Sequence (0040,A043) of TEXT Content Item:):<code value as code property, coding scheme designator as codeSystemName property, code meaning as displayName property>
effectiveTime	TS	0..1	Observation DateTime (0040,A032)
languageCode	CE	0..1	Not used at entry level.
value	ED	1..1	Text Value (0040,A160) of TEXT Content Item

Image References and Measurements within Section

Image references and measurements (linear, area, volume and numeric) may also be inserted directly within sections (TID 2000, Rows 6 and 12). In this case CDA sections are related to SopInstance and/or QuantityMeasurement act classes via component (COMP) act relationships.

Quantity Measurement + DICOM Composite Object References

For the modeling of DICOM Composite Object References refer to Section A.7.2 Updated Pattern Based on A_DicomCompositeObjectReference Minimal (COCT_RM830120UV). In the context of the CDA, entry act class and actRelationships names shall be used as specified for the CDA mapping.

The mapping of observations (i.e., quantity measurements based on image data) is specified below (structured contents of linear, area, volume and numeric measurements). The updated pattern based on CMET COCT_RM830120 "ReferencedDicomComposite Object" (refer to Section A.7.2) is reused for the mapping. Instead of starting directly with the SopInstance Act Class, the COCT_RM830120 pattern is applied in the context of Quantity Measurements (refer to Figure A.5.1.3-3 for details).

Quantity Measurement Act Class (Observation)

Table A.5.1.3-3. Quantity Measurement

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.14" (identifies the template that defines constraints on "Quantity Measurement Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
code	CE	1..1	If a DICOM code is used in Concept Name Code Sequence (0040,A043) of Numeric Measurement (NUM) Content Item: <code value as code property,"1.2.840.10008.2.16.4"as codeSystem property,"DCM"as codeSystemName property, code meaning as displayName property>. If a SNOMED code is used in Concept Name Code Sequence (0040,A043) of Numeric Measurement (NUM) Content Item: <mapped code value as code property,"2.16.840.1.113883.6.96"as codeSystem property,"SRT"as codeSystemName property, mapped code meaning as displayName property>. Please refer to table 33 for the mapping of linear measurement codes, table 34 for the mapping of area measurement codes and table 35 for the mapping of volume measurement codes.
effectiveTime	TS	0..1	Observation DateTime (0040,A032)
languageCode	CE	0..1	Not used at entry level.
value	PQ	1..1	The Numeric Value (0040,A30A) DICOM decimal string (DS data type) is mapped to the value component of the PQ data type (real number). The contents of the Measurement Units Code Sequence (0040,08EA) macro are mapped to the unit component of the PQ data type (UCUM codes are used for the CS data type): unit of measure code value as code property

Table A.5.1.3-4, Table A.5.1.3-5 and Table A.5.1.3-6 list the code value and code meaning of SNOMED codes contained in DICOM CID 7470, CID 7471 and CID 7472 and corresponding attribute values of SNOMED observable entity codes for DICOM SR TID 2000 based diagnostic imaging reports. For the latter codes SNOMED Concept IDs are used as code values.

Table A.5.1.3-4. TID 2000 Linear Measurement SNOMED CODE Mapping for DICOM CID 7470

Coding Scheme Designator(0008,0102)	Code Value(0008,0100)	Code Meaning(0008,0104)	Code Value of Equivalent Observable Entity Code (Concept ID)	Code Meaning of Equivalent Observable Entity Code
SRT	G-A22A	Length	439932008	Length of structure
SRT	G-A220	Width	440357003	Width of structure
SRT	G-D785	Depth	439934009	Depth of structure
SRT	M-02550	Diameter	439984002	Diameter of structure
SRT	G-A185	Long Axis	439933003	Long axis length of structure
SRT	G-A186	Short Axis	439428006	Short axis length of structure
SRT	G-A193	Major Axis	439982003	Major axis length of structure
SRT	G-A194	Minor Axis	439983008	Minor axis length of structure
SRT	G-A195	Perpendicular Axis	440356007	Perpendicular axis length of structure
SRT	G-A196	Radius	439429003	Radius of structure
SRT	G-A197	Perimeter	440433004	Perimeter of non-circular structure

Coding Scheme Designator(0008,0102)	Code Value(0008,0100)	Code Meaning(0008,0104)	Code Value of Equivalent Observable Entity Code (Concept ID)	Code Meaning of Equivalent Observable Entity Code
SRT	M-02560	Circumference	439747008	Circumference of circular structure
SRT	G-A198	Diameter of circumscribed circle	439748003	Diameter of circular structure

Table A.5.1.3-5. TID 2000 Area Measurement SNOMED Code Mapping for DICOM CID 7471

Coding Scheme Designator(0008,0102)	Code Value(0008,0100)	Code Meaning(0008,0104)	Code Value of Equivalent Observable Entity Code (Concept ID)	Code Meaning of Equivalent Observable Entity Code
SRT	G-A166	Area	439746004	Area of structure
SRT	G-A16A	Area of defined region	439985001	Area of body region

Table A.5.1.3-6. TID 2000 Volume Measurement SNOMED Code Mapping for DICOM CID 7472

Coding Scheme Designator(0008,0102)	Code Value(0008,0100)	Code Meaning(0008,0104)	Code Value of Equivalent Observable Entity Code (Concept ID)	Code Meaning of Equivalent Observable Entity Code
SRT	G-D705	Volume	439749006	Volume of structure

Subject Act Relationship (QuantityMeasurement to SopInstance)

Equivalent DICOM relationship types of the CDA SUBJ actRelationship in this context are: INFERRED FROM and R-INFERRED. CDA Release 2 does not specify reference relationships. However act class clones that carry a unique identifier only and omit other attribute values of the original act class may be used to that purpose.

The relation of quantity measurements to procedures and acts is specified in Section A.5.1.4.2 Procedure Context.

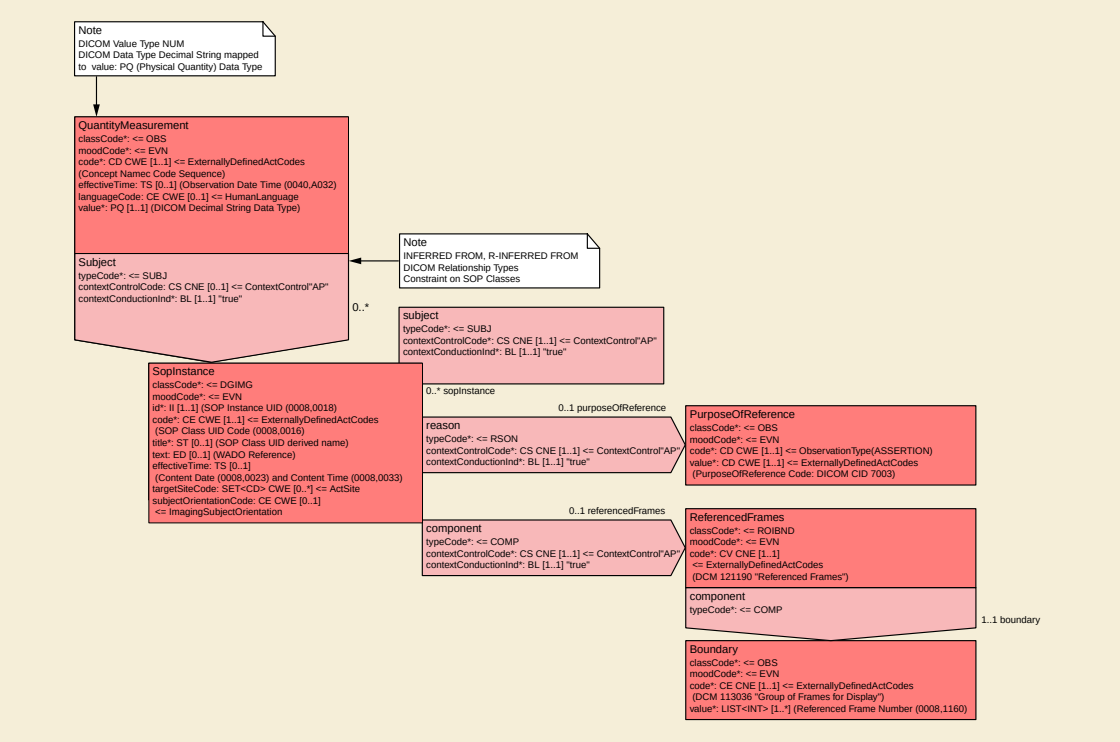

Figure A.5.1.3-3. Quantity Measurement and DICOM Composite Object Reference

The act relationships shown in Figure A.5.1.3-3 are encoded as entryRelationships in CDA; the act classes are represented as observations.

DICOM SR numeric measurements (value type NUM) are mapped to the QuantityMeasurement act class.

The QuantityMeasurement act class is associated with one or more SopInstance act classes. SopInstance is associated with zero or one PurposeOfReference act class through the reason entry relationship.

Multi-frame Image References

The DICOM Image Reference Macro (used for SR content items of value type IMAGE) allows for referencing individual frames of a multi-frame image if the reference does not apply to all frames. The individual referenced frames (DICOM attribute "Referenced Frame Number" (0008,1160)) are mapped to the value attribute (list of integers) of the boundary act class. For mapping quantity measurements (applies to SR template 1400, 1401, 1402 and 1404) that are related to frames of a multi-frame image, one ReferencedFrames act class is associated with SopInstance through an entryRelationship of type code component (Figure A.5.1.3-3). The DICOM code 121190 "ReferencedFrames" is assigned to the ReferencedFrames.code attribute. The ReferencedFrames act class is related to one Boundary act class through an entryRelationship of type code component. In the context of mapping DICOM TID 2000 the Boundary.value attribute contains the referenced frame number of the frame that is the basis for measurements or coded purpose of reference terms.

A.5.1.4 DICOM SR Observation Context

The observation context comprises the observer context data (the human observer or device that made the observation), the procedure context data (related to data acquisition and interpretation) and the subject context data (for patient, specimen and fetus being subject to the reported procedure). Section A.5.1.4.1, Section A.5.1.4.2 and Section A.5.1.4.3 specify the mapping.

A.5.1.4.1 Subject Context

Subject Context, Patient

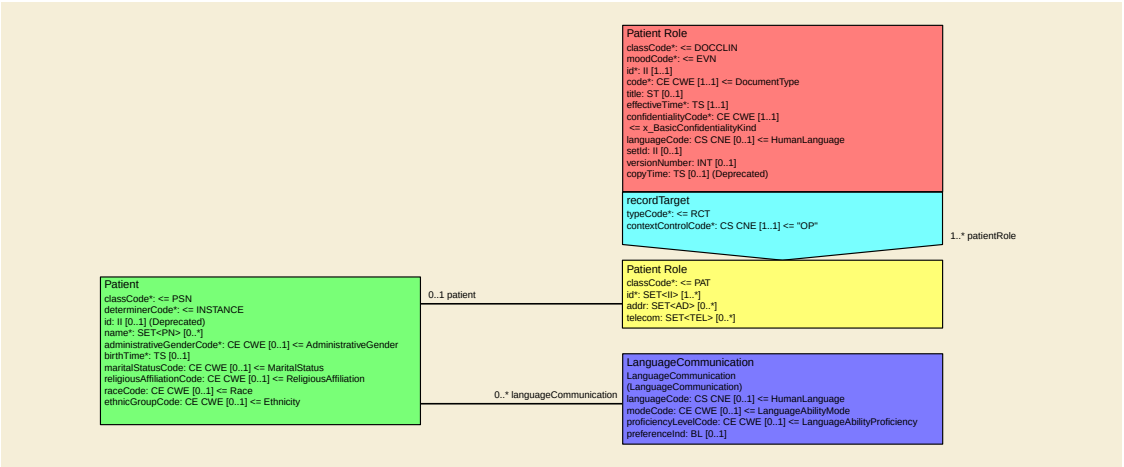

Figure A.5.1.3-4. Patient Context

DICOM TID 2000 constrains the multiplicity of the patient subject to one per document. Attributes of the Patient Module (PS3.3) and the Patient Subject Context (TID 1007) are mapped to the recordTarget participation, associated roles and entities, if the Subject Class Code (TID 1006) equals "Patient".

Table A.5.1.3-7. Patient Role

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PAT
id	SET<II>	1..*	"Subject ID": Defaults to value of Patient ID(0010,0020) in Patient Module. Other Patient IDs (0010,1000): may be mapped if appropriate infrastructure (master person index) and policies for domain identifier assignment are in place. The SET <II> data type does not provide use codes to distinguish multiple patient identifiers.
addr	SET<AD>	0..*	Patient's Address (0010,1040) in Patient Demographic Module.
telecom	SET<TEL>	0..*	Patient's Telephone Numbers (0010,2154)) in Patient Demographic Module.

Note

If information on Issuer of Patient ID is available from the DICOM SR document (Patient Module), Universal Entity ID (0040,0032) of the Issuer of Patient ID Qualifiers Sequence (0010,0024) are mapped to PatientRole.id II root and Patient ID (0010,0020) to PatientRole.id II extension. Otherwise a globally unique identifier (ISO Object Identifier) may be generated for the PatientRole.id II root portion. If available Issuer of Patient ID (0010,0021) shall be mapped to PatientRole.id assigningAuthorityName.

Table A.5.1.3-8. Patient Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	"Subject Name": Defaults to value of Patient's Name (0010,0010) in Patient Module. Other Patient Names (0010,1001) may be mapped, appropriate infrastructure (master person index) and policies for domain identifier assignment are in place. No specific use codes are provided by DICOM.

<table>
<tr><th>Attribute</th><th>Data Type</th><th>Multiplicity</th><th>Value</th></tr>
<tr><td>administrativeGenderCode</td><td>CE</td><td>0..1</td><td>"Subject Sex": Defaults to value equivalent to Patient's Sex (0010,0040) in Patient Module. The DICOM coded string (CS) values maps to HL7 V3 administrativeGenderCode values (codeSystem="2.16.840.1.113883.5.1") as follows:
<table>
<tr><th colspan="2">DICOM</th><th colspan="2">HL7 V3</th></tr>
<tr><th>CS</th><th>Meaning</th><th>Concept Code</th><th>Print Name</th></tr>
<tr><td>F</td><td>Female</td><td>F</td><td>Female</td></tr>
<tr><td>M</td><td>Male</td><td>M</td><td>Male</td></tr>
<tr><td>O</td><td>Undetermined sex</td><td colspan="2">Use "UNK" (unknown) null flavor value</td></tr>
<tr><td colspan="2">"Subject Sex" value not available</td><td colspan="2">Use appropriate null flavor value</td></tr>
</table></td></tr>
<tr><td>birthTime</td><td>TS</td><td>0..1</td><td>"Subject Birth Date": Defaults to value of Patient's Birth Date (0010,0030) in Patient Module.</td></tr>
<tr><td>maritalStatusCode</td><td>CE</td><td>0..1</td><td>Shall not be sent.</td></tr>
<tr><td>religiousAffiliationCode</td><td>CE</td><td>0..1</td><td>Shall not be sent.</td></tr>
<tr><td>raceCode</td><td>CE</td><td>0..1</td><td>Shall not be sent.</td></tr>
<tr><td>ethnicGroupCode</td><td>CE</td><td>0..1</td><td>Ethnic Group (0010,2160) of Patient Module if present. (DICOM short string: SH shall be converted to the appropriate ethnicGroupCode attribute code)</td></tr>
</table>

Subject Context, Fetus

Document Level

The header attributes shall contain values for mother as specified in Table A.5.1.3-7 and Table A.5.1.3-8. Refer to Figure A.5.1.3-4 for an overview on the recordTarget participation. The mother of the fetus is considered the patient and is therefore the recordTarget. Patient.name (Patient Entity, Table A.5.1.3-8) or "Subject Name": Defaults to value of Patient's Name (0010,0010) in Patient Module, which shall be identical to TID 1008 PNAME ("Mother of fetus").

Section Level

The fetus subject is specified at section level.

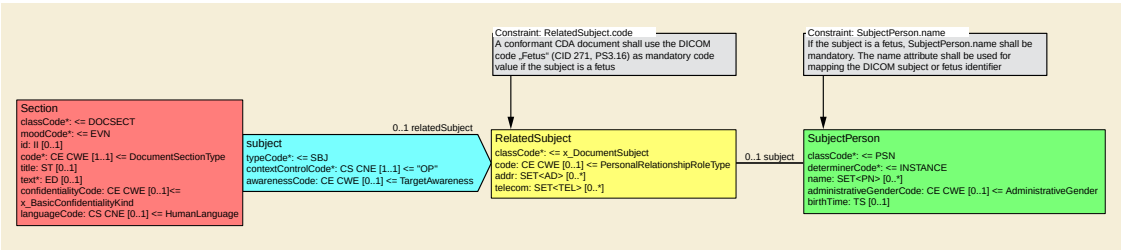

Figure A.5.1.3-5. Subject Context, Fetus

Table A.5.1.3-9. Related Subject, Fetus

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PRS (Personal Relationship)

Attribute	Data Type	Multiplicity	Value
code	CE	1..1	"Fetus" code (CID 271) extends value domain PersonalRelationshipRoleType <121026> as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, "Fetus" as displayName property>
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.3" (identifies the template that defines constraints on "Fetus Subject Context" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
administrativeGenderCode	CE	0..1	Shall not be sent.
birthTime	TS	0..0	Shall not be sent.

Table A.5.1.3-10. Subject Person, Fetus

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	1..1	Subject ID or Fetus ID (TID 1008)
telecom	SET<TEL>	0..*	Shall not be sent.

CDA Release 2 does not specify a subject ID for mapping of Fetus Subject UID. Also the DICOM SR NUM content item that conveys the number of fetuses cannot be mapped because CDA Release 2 does not specify such an attribute. The fetus subject is always mapped in combination with the mother record target artifacts.

A.5.1.4.2 Procedure Context

CDA Header

Service Event Attribute Values default to DICOM SR "General Study" Module Header Attribute Values.

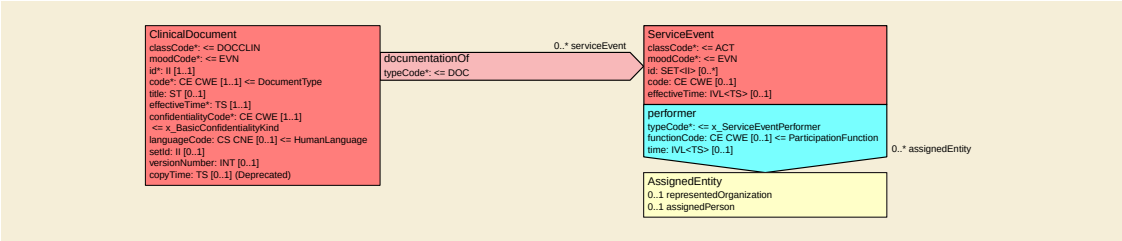

Figure A.5.1.3-6. CDA Header Procedure Context (Service Event)

Table A.5.1.3-11. Service Event

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT
moodCode	CS	1..1	EVN
id	SET<II>	0..*	Study Instance UID (0020,000D) of the General Study Module
code	CE	0..1	Procedure Code Sequence (0008,1032) of the General Study Module or Procedure Code (TID 1005)
effectiveTime	IVL<TS>	0..1	Set low value of interval using: Study Date (0008,0020) and Study Time (0008,0030) of the General Study Module

For the mapping of Physician(s) reading study to the performer participation refer to Service Event Performer Participation (Table A.5.1.1-21, Table A.5.1.1-22 and Table A.5.1.1-23).

CDA Entries (Clinical Statement, Structured Body)

If individual sections are used to report on one or multiple procedures, the procedure code values of the Procedure Context (TID 1005) associated with the DICOM section container content item are mapped to the CDA clinical statement entry class attribute Act.code or Procedure.code. The selection of the "Procedure" or "Act" entry from the clinical statement choice box depends on the nature of the imaging service that has been performed. The "Procedure" entry shall be used for image-guided interventions and minimal invasive imaging services, whereas the "Act" entry shall be used for diagnostic imaging services (based on Procedure Code Sequence (0008,1032) or Procedure Code (TID 1005) values). The set of attributes is identical for the "Procedure" and "Act" Context.

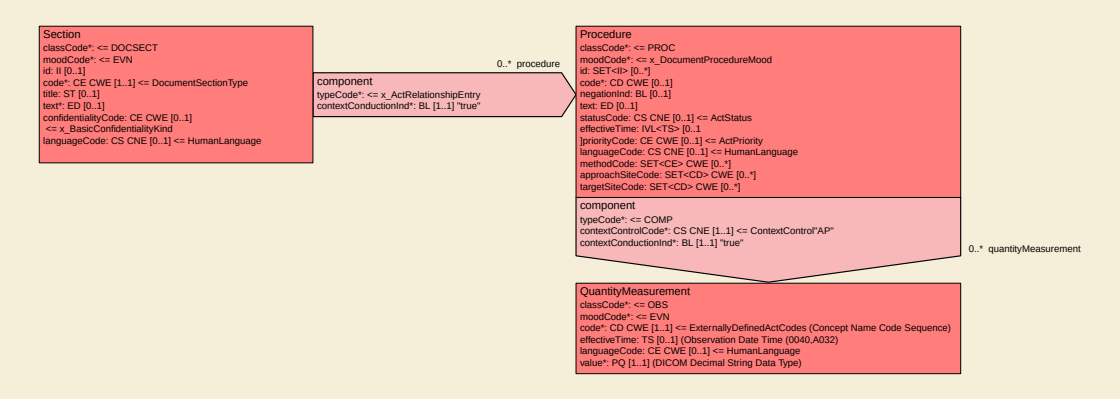

Figure A.5.1.3-7. Procedure Context for Image-Guided Interventions

Figure A.5.1.3-7 and Figure A.5.1.3-8 show the procedure context for image-guided interventions and diagnostic imaging services and its relationship to CDA document sections plus quantity measurements. The component act relationship between Section and Procedure/Act is encoded as a section entry in CDA; QuantityMeasurement as an observation CDA entry and the component act relationship between Procedure/Act and QuantityMeasurement as entryRelationship.

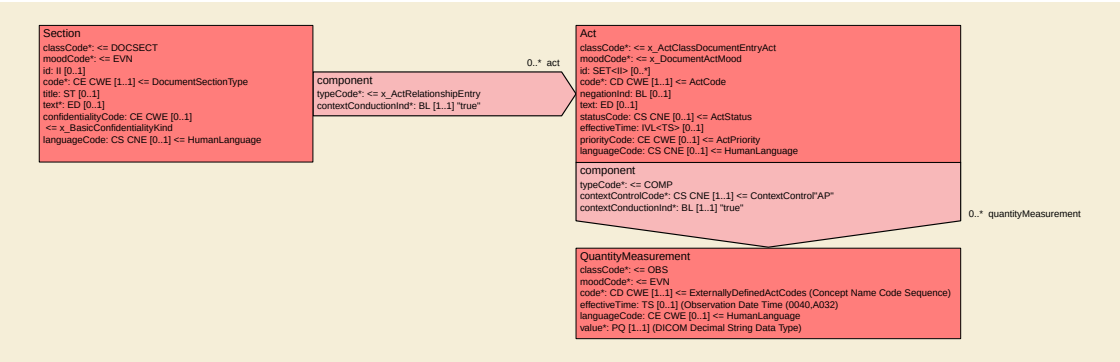

Figure A.5.1.3-8. Procedure Context for Diagnostic Imaging Services

Table A.5.1.3-12. Common Set of Attributes for Procedure and Act Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT
moodCode	CS	1..1	EVN

Attribute	Data Type	Multiplicity	Value
templateId	LIST<II>	1..*	Set root portion of II to "2.16.840.1.113883.10.20.6.2.5" (identifies the template that defines constraints on "Procedure Context" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
id	SET<II>	0..*	Shall not be sent, refer to Study Instance UID (0020,000D) of General Study Module mapped to ServiceEvent.id that is applied via context conduction
code	CE	1..1	Procedure Code (Section procedure context associated with DICOM section container content item:TID 1005)
text	ED	0..1	Study Description (0008,1030) of the General Study Module
effectiveTime	IVL<TS>	0..1	Set low value of interval using: Study Date (0008,0020) and Study Time (0008,0030) of the General Study Module

A.5.1.4.3 Observer Context

The Observer Context (TID 1002) maps to the author participation and associated roles and entities at document or section level. DICOM specifies a Person Observer (TID 1003) and a Device Observer (TID 1004). Depending on the DICOM SR Observer Type, attribute values are mapped to the Person or AuthoringDevice Entity in the AuthorChoice Box.

The Person and Device Observer Context used at document level (Figure A.5.1.3-9) may be overridden at section level (Figure A.5.1.3-10).

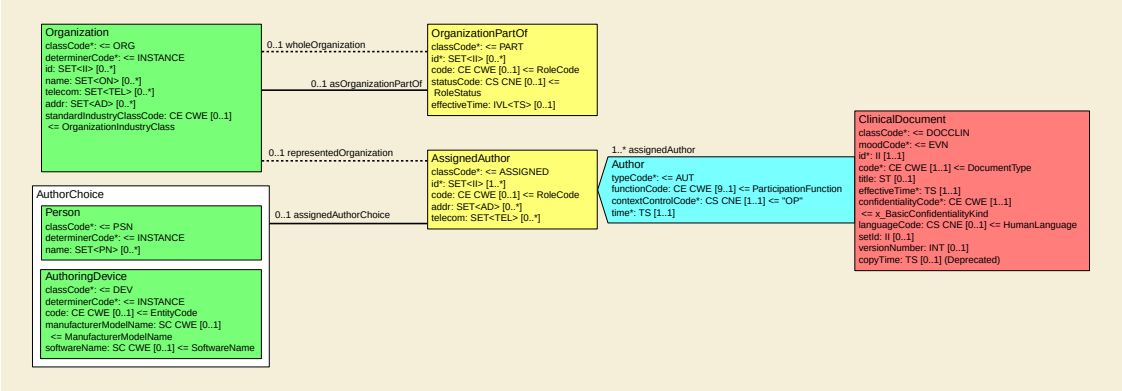

Figure A.5.1.3-9. Document Observer Context

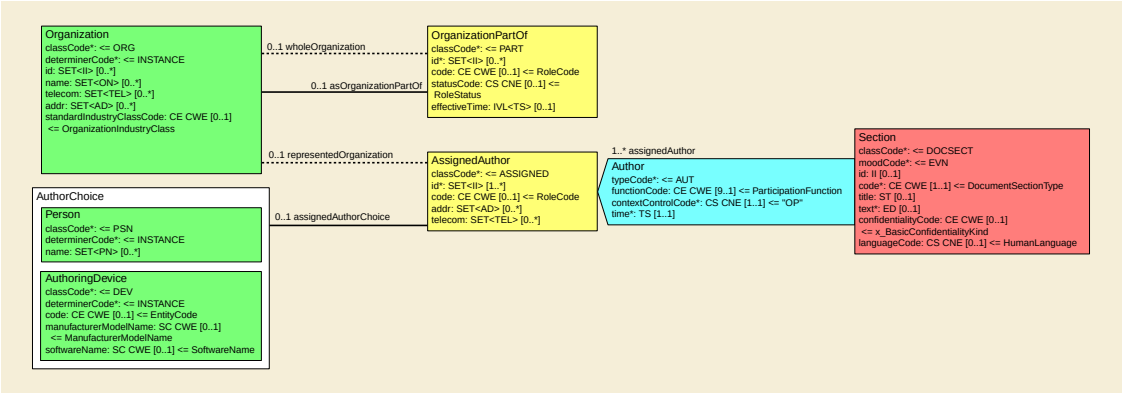

Figure A.5.1.3-10. Section Observer Context

Table A.5.1.3-13. Author Participation (for both Person and Device Observer)

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	AUT
functionCode	CE	0..1	Shall not be sent
contextControlCode	CS	1..1	"OP"
time	TS	1..1	Content Date (0008,0023), Content Time (0008,0033) of the SR Document General Module and Timezone Offset from UTC (0008,0201) from SOP Common Module

A.5.1.4.3.1 Person Observer

Attribute values of TID 1003 Person Observer Identifying Attributes and the SR Document General Module are mapped to the CDA author participation, associated role and entities as specified in Table A.5.1.3-13, Table A.5.1.3-14, Table A.5.1.3-15 and Table A.5.1.3-16. The DICOM attribute values of Person Observer's Role in this procedure and Person Observer's Role in the Organization cannot be mapped to CDA Release 2 since it does not specify equivalent attributes.

Table A.5.1.3-14. Assigned Author, Person Observer Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
templateId	LIST<II>	1..*	At section level set root portion of II to "2.16.840.1.113883.10.20.6.2.4" (identifies the template that defines constraints on "Observer Context" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
id	SET<II>	1..*	Person Identification Code Sequence (0040,1101) of Author Observer Sequence (0040,A078) in SR Document General Module.
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table A.5.1.3-15. Organization, Person Observer Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ORG
determinerCode	CS	1..1	INSTANCE
id	SET<II>	0..*	Institution Code Sequence (0008,0082) of Author Observer Sequence (0040,A078) in SR Document General Module
name	SET<ON>	0..*	Defaults to Institution Name (0008,0080) of the General Equipment Module; otherwise Person Observer's Organization Name as specified in TID 1003 is used.
telecom	SET<TEL>	0..*	Shall not be sent.
addr	SET<AD>	0..*	Shall not be sent.
standardIndustryClassCode	CE	0..1	Shall not be sent.

Table A.5.1.3-16. Person, Person Observer Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN

Attribute	Data Type	Multiplicity	Value
determinerCode	CS	1..1	INSTANCE
name	SET<PN>	0..*	Defaults to Person Name (0040,A123) of Author Observer Sequence (0040,A078) in SR Document General Module; otherwise Person Observer Name as specified in TID 1003 is used.

A.5.1.4.3.2 Device Observer

Attribute values of TID 1004 Device Observer Identifying Attributes and the SR Document General Module are mapped to the CDA author participation, associated role and entities as specified in Table A.5.1.3-13 and Table A.5.1.3-17, Table A.5.1.3-18 and Table A.5.1.3-19. DICOM does not specify attributes that could be mapped to MaintainedEntity role and associated Person entity.

Table A.5.1.3-17. Assigned Author, Device Observer Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
templateId	LIST<II>	1..*	At section level set root portion of II to "2.16.840.1.113883.10.20.6.2.4" (identifies the template that defines constraints on "Observer Context" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).
id	SET<II>	1..*	Device Observer UID as specified in TID 1004
addr	SET<AD>	0..*	Device Observer Physical Location During Observation as specified by TID 1004 is used.
telecom	SET<TEL>	0..*	Shall not be sent.

The DICOM attribute Device Observer Serial Number specified in TID 1004 cannot be mapped to CDA Release 2 because there is no equivalent attribute specified.

Table A.5.1.3-18. Authoring Device, Device Observer Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	DEV
determinerCode	CS	1..1	INSTANCE
code	CE	0..1	Defaults to Station Name (0008,1010) of Author Observer Sequence (0040,A078) in SR Document General Module.
manufacturerModelName	SC	0..1	Defaults to Manufacturer's Model Name (0008,1090) of Author Observer Sequence (0040,A078) in SR Document General Module; otherwise to Device Observer Model Name as specified by TID 1004 is used.
softwareName	SC	0..1	Shall not be sent.

Table A.5.1.3-19. Organization, Device Observer Context

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ORG
determinerCode	CS	1..1	INSTANCE
id	SET<II>	0..*	Shall not be sent.
name	SET<ON>	0..*	Manufacturer (0008,0070) of Author Observer Sequence (0040,A078) in SR Document General Module

Attribute	Data Type	Multiplicity	Value
telecom	SET<TEL>	0..*	Shall not be sent.
addr	SET<AD>	0..*	Shall not be sent.
standardIndustryClassCode	CE	0..1	Shall not be sent.

A.6 Sample Documents

The SR sample document encoding includes information on the SR document body tree depth (column 1: SR Tree Depth), nesting level for nested artifacts such as sequences and sequence items (column 2: Nesting), DICOM attribute names (column 3: Attribute), DICOM tag (column 4: Tag), the DICOM attribute value representation (Column 5: VR as specified in PS3.5), the hexadecimal value of value length (column 6: VL (hex)) and the sample document attribute values (column 7: Value).

A.6.1 DICOM SR "Basic Diagnostic Imaging Report" (TID 2000)

Table A.6-1 contains a sample document encoding. Refer to Section A.5.1 for description.

Table A.6-1. Sample document encoding

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
		Instance Creation Date	(0008,0012)	DA	0008	20060827
		Instance Creation Time	(0008,0013)	TM	0006	224157
		Instance Creator UID	(0008,0014)	UI	001c	1.2.276.0.7230010.3.0.3.5.4
		SOP Class UID	(0008,0016)	UI	001e	1.2.840.10008.5.1.4.1.1.88.22
		SOP Instance UID	(0008,0018)	UI	003c	1.2.840.113619.2.62.994044785528.20060823.200608232232322.9
		Study Date	(0008,0020)	DA	0008	20060823
		Content Date	(0008,0023)	DA	0008	20060823
		Study Time	(0008,0030)	TM	0006	222400
		Content Time	(0008,0033)	TM	0006	224352
		Accession Number	(0008,0050)	SH	0008	10523475
		Modality	(0008,0060)	CS	0002	SR
		Manufacturer	(0008,0070)	LO	000a	DicomWg20
		Referring Physician's Name	(0008,0090)	PN	0010	Smith^John^^^MD
		Procedure Code Sequence	(0008,1032)	SQ	ffffffff	
	%item					
	>	Code Value	(0008,0100)	SH	0006	11123
	>	Coding Scheme Designator	(0008,0102)	SH	0008	99WUHID
	>	Code Meaning	(0008,0104)	LO	000c	X-Ray Study
	%enditem					
	%endseq					

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
		Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	ffffffff	
	%endseq					
		Patient's Name	(0010,0010)	PN	0008	Doe^John
		Patient ID	(0010,0020)	LO	000a	0000680029
		Patient's Birth Date	(0010,0030)	DA	0008	19641128
		Patient's Sex	(0010,0040)	CS	0002	M
		Study Instance UID	(0020,000d)	UI	002e	1.2.840.113619.2.62.994044785528.114289542805
		Series Instance UID	(0020,000e)	UI	0036	1.2.840.113619.2.62.994044785528.20060823223142485052
		Study ID	(0020,0010)	SH	0008	10523475
		Series Number	(0020,0011)	IS	0004	560
		Instance Number	(0020,0013)	IS	0006	07851
1		Value Type	(0040,a040)	CS	000a	CONTAINER
1		Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1	%item					
1	>	Code Value	(0008,0100)	SH	0008	18782-3
1	>	Coding Scheme Designator	(0008,0102)	SH	0002	LN
1	>	Code Meaning	(0008,0104)	LO	000c	X-Ray Report
1	%enditem					
1	%endseq					
1		Continuity Of Content	(0040,a050)	CS	0008	SEPARATE
		Verifying Observer Sequence	(0040,a073)	SQ	ffffffff	
	%item					
	>	Verifying Organization	(0040,a027)	LO	001a	World University Hospital
	>	Verification DateTime	(0040,a030)	DT	000e	20060827141500
	>	Verifying Observer Name	(0040,a075)	PN	0012	Blitz^Richard^^^MD
	>	Verifying Observer Identification Code Sequence	(0040,a088)	SQ	ffffffff	
	%item					
	>>	Code Value	(0008,0100)	SH	0008	08150000

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
	>>	Coding Scheme Designator	(0008,0102)	SH	0008	99WUHID
	>>	Code Meaning	(0008,0104)	LO	0016	Verifying Observer ID
	%enditem					
	%endseq					
	%enditem					
	%endseq					
		Referenced Request Sequence	(0040,a370)	SQ	ffffffff	
	%item					
	>	Accession Number	(0008,0050)	SH	0008	10523475
	>	Referenced Study Sequence	(0008,1110)	SQ	ffffffff	
	%item					
	>>	Referenced SOP Class UID	(0008,1150)	UI	001a	1.2.840.10008.5.1.4.1.1.1
	>>	Referenced SOP Instance UID	(0008,1155)	UI	003c	1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
	%enditem					
	%endseq					
	>	Study Instance UID	(0020,000d)	UI	002e	1.2.840.113619.2.62.994044785528.114289542805
	>	Requested Procedure Description	(0032,1060)	LO	0020	CHEST TWO VIEWS, PA AND LATERAL
	>	Requested Procedure Code Sequence	(0032,1064)	SQ	ffffffff	
	%item					
	>>	Code Value	(0008,0100)	SH	0006	11123
	>>	Coding Scheme Designator	(0008,0102)	SH	0008	99WUHID
	>>	Code Meaning	(0008,0104)	LO	000c	X-Ray Study
	%enditem					
	%endseq					
	>	Requested Procedure ID	(0040,1001)	SH	0006	123453
	>	Reason for the Requested Procedure	(0040,1002)	LO	0014	Suspected lung tumor
	>	Placer Order Number/Imaging Service Request	(0040,2016)	LO	0006	123451

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
	>	Filler Order Number/Imaging Service Request	(0040,2017)	LO	0006	123452
	%enditem					
	%endseq					
		Performed Procedure Code Sequence	(0040,a372)	SQ	ffffffff	
	%item					
	>	Code Value	(0008,0100)	SH	0006	11123
	>	Coding Scheme Designator	(0008,0102)	SH	0008	99WUHID
	>	Code Meaning	(0008,0104)	LO	000c	X-Ray Study
	%enditem					
	%endseq					
		Current Requested Procedure Evidence Sequence	(0040,a375)	SQ	ffffffff	
	%item					
	>	Referenced Series Sequence	(0008,1115)	SQ	ffffffff	
	%item					
	>>	Referenced SOP Sequence	(0008,1199)	SQ	ffffffff	
	%item					
	>>>	Referenced SOP Class UID	(0008,1150)	UI	001a	1.2.840.10008.5.1.4.1.1.1
	>>>	Referenced SOP Instance UID	(0008,1155)	UI	003c	1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
	%enditem					
	%item					
	>>>	Referenced SOP Class UID	(0008,1150)	UI	001a	1.2.840.10008.5.1.4.1.1.1
	>>>	Referenced SOP Instance UID	(0008,1155)	UI	003c	1.2.840.113619.2.62.994044785528.20060823.200608232231422.3
	%enditem					
	%endseq					
	>>	Series Instance UID	(0020,000e)	UI	0036	1.2.840.113619.2.62.994044785528.20060823223142485051
	%enditem					
	%endseq					
	>	Study Instance UID	(0020,000d)	UI	002e	1.2.840.113619.2.62.994044785528.114289542805
	%enditem					

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
	%endseq					
		Completion Flag	(0040,a491)	CS	0008	COMPLETE
		Verification Flag	(0040,a493)	CS	0008	VERIFIED
1		Content Sequence	(0040,a730)	SQ	ffffffff	
1.1	%item					
1.1	>	Relationship Type	(0040,a010)	CS	0010	HAS CONCEPT MOD
1.1	>	Value Type	(0040,a040)	CS	0004	CODE
1.1	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.1	%item					
1.1	>>	Code Value	(0008,0100)	SH	0006	121049
1.1	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.1	>>	Code Meaning	(0008,0104)	LO	0028	Language of Content Item and Descendants
1.1	%enditem					
1.1	%endseq					
1.1	>	Concept Code Sequence	(0040,a168)	SQ	ffffffff	
1.1	%item					
1.1	>>	Code Value	(0008,0100)	SH	0006	en-US
1.1	>>	Coding Scheme Designator	(0008,0102)	SH	0008	ISO639_1
1.1	>>	Code Meaning	(0008,0104)	LO	000e	English (U.S.)
1.1	%enditem					
1.1	%endseq					
1.1	%enditem					
1.2	%item					
1.2	>	Relationship Type	(0040,a010)	CS	0010	HAS CONCEPT MOD
1.2	>	Value Type	(0040,a040)	CS	0004	TEXT
1.2	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.2	%item					
1.2	>>	Code Value	(0008,0100)	SH	0006	121050
1.2	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.2	>>	Code Meaning	(0008,0104)	LO	0022	Equivalent Meaning of Concept Name
1.2	%enditem					
1.2	%endseq					
1.2	>	Text Value	(0040,a160)	UT	001c	Chest X-Ray, PA and LAT View
1.2	%enditem					

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
1.3	%item					
1.3	>	Relationship Type	(0040,a010)	CS	0010	HAS OBS CONTEXT
1.3	>	Value Type	(0040,a040)	CS	0004	CODE
1.3	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.3	%item					
1.3	>>	Code Value	(0008,0100)	SH	0006	121005
1.3	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.3	>>	Code Meaning	(0008,0104)	LO	000e	Observer Type
1.3	%enditem					
1.3	%endseq					
1.3	>	Concept Code Sequence	(0040,a168)	SQ	ffffffff	
1.3	%item					
1.3	>>	Code Value	(0008,0100)	SH	0006	121006
1.3	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.3	>>	Code Meaning	(0008,0104)	LO	0006	Person
1.3	%enditem					
1.3	%endseq					
1.3	%enditem					
1.4	%item					
1.4	>	Relationship Type	(0040,a010)	CS	0010	HAS OBS CONTEXT
1.4	>	Value Type	(0040,a040)	CS	0006	PNAME
1.4	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.4	%item					
1.4	>>	Code Value	(0008,0100)	SH	0006	121008
1.4	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.4	>>	Code Meaning	(0008,0104)	LO	0014	Person Observer Name
1.4	%enditem					
1.4	%endseq					
1.4	>	Person Name	(0040,a123)	PN	0012	Blitz^Richard^^^MD
1.4	%enditem					
1.5	%item					
1.5	>	Relationship Type	(0040,a010)	CS	0008	CONTAINS
1.5	>	Value Type	(0040,a040)	CS	000a	CONTAINER
1.5	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
1.5	%item					
1.5	>>	Code Value	(0008,0100)	SH	0006	121060
1.5	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.5	>>	Code Meaning	(0008,0104)	LO	0008	History
1.5	%enditem					
1.5	%endseq					
1.5	>	Continuity Of Content	(0040,a050)	CS	0008	SEPARATE
1.5	>	Content Sequence	(0040,a730)	SQ	ffffffff	
1.5.1	%item					
1.5.1	>>	Relationship Type	(0040,a010)	CS	0008	CONTAINS
1.5.1	>>	Value Type	(0040,a040)	CS	0004	TEXT
1.5.1	>>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.5.1	%item					
1.5.1	>>>	Code Value	(0008,0100)	SH	0006	121060
1.5.1	>>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.5.1	>>>	Code Meaning	(0008,0104)	LO	0008	History
1.5.1	%enditem					
1.5.1	%endseq					
1.5.1	>>	Text Value	(0040,a160)	UT	000c	Sore throat.
1.5.1	%enditem					
1.5	%endseq					
1.5	%enditem					
1.6	%item					
1.6	>	Relationship Type	(0040,a010)	CS	0008	CONTAINS
1.6	>	Value Type	(0040,a040)	CS	000a	CONTAINER
1.6	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.6	%item					
1.6	>>	Code Value	(0008,0100)	SH	0006	121070
1.6	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.6	>>	Code Meaning	(0008,0104)	LO	0008	Findings
1.6	%enditem					
1.6	%endseq					
1.6	>	Continuity Of Content	(0040,a050)	CS	0008	SEPARATE

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
1.6	>	Content Sequence	(0040,a730)	SQ	ffffffff	
1.6.1	%item					
1.6.1	>>	Relationship Type	(0040,a010)	CS	0008	CONTAINS
1.6.1	>>	Value Type	(0040,a040)	CS	0004	TEXT
1.6.1	>>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.6.1	%item					
1.6.1	>>>	Code Value	(0008,0100)	SH	0006	121071
1.6.1	>>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.6.1	>>>	Code Meaning	(0008,0104)	LO	0008	Finding
1.6.1	%enditem					
1.6.1	%endseq					
1.6.1	>>	Text Value	(0040,a160)	UT	01ae	The cardiomediastinum is within normal limits. The trachea is midline. The previously described opacity at the medial right lung base has cleared. There are no new infiltrates. There is a new round density at the left hilus, superiorly (diameter about 45mm). A CT scan is recommended for further evaluation. The pleural spaces are clear. The visualized musculoskeletal structures and the upper abdomen are stable and unremarkable.
1.6.1	>>	Content Sequence	(0040,a730)	SQ	ffffffff	
1.6.1.1	%item					
1.6.1.1	>>>	Relationship Type	(0040,a010)	CS	000e	INFERRED FROM
1.6.1.1	>>>	Observation DateTime	(0040,a032)	DT	000e	20060823223912
1.6.1.1	>>>	Value Type	(0040,a040)	CS	0004	NUM
1.6.1.1	>>>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.6.1.1	%item					
1.6.1.1	>>>>	Code Value	(0008,0100)	SH	0008	M-02550
1.6.1.1	>>>>	Coding Scheme Designator	(0008,0102)	SH	0004	SRT
1.6.1.1	>>>>	Code Meaning	(0008,0104)	LO	0008	Diameter
1.6.1.1	%enditem					
1.6.1.1	%endseq					
1.6.1.1	>>>	Measured Value Sequence	(0040,a300)	SQ	ffffffff	
1.6.1.1	%item					
1.6.1.1	>>>>	Measurement Units Code Sequence	(0040,08ea)	SQ	ffffffff	
1.6.1.1	%item					

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
1.6.1.1	>>>>>	Code Value	(0008,0100)	SH	0002	mm
1.6.1.1	>>>>>	Coding Scheme Designator	(0008,0102)	SH	0004	UCUM
1.6.1.1	>>>>>	Code Meaning	(0008,0104)	LO	0002	mm
1.6.1.1	%enditem					
1.6.1.1	%endseq					
1.6.1.1	>>>>	Numeric Value	(0040,a30a)	DS	0002	45
1.6.1.1	%enditem					
1.6.1.1	%endseq					
1.6.1.1	>>>	Content Sequence	(0040,a730)	SQ	ffffffff	
1.6.1.1.1	%item					
1.6.1.1.1	>>>>	Referenced SOP Sequence	(0008,1199)	SQ	ffffffff	
1.6.1.1.1	%item					
1.6.1.1.1	>>>>>	Referenced SOP Class UID	(0008,1150)	UI	001a	1.2.840.10008.5.1.4.1.1.1
1.6.1.1.1	>>>>>	Referenced SOP Instance UID	(0008,1155)	UI	003c	1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
1.6.1.1.1	%enditem					
1.6.1.1.1	%endseq					
1.6.1.1.1	>>>>	Relationship Type	(0040,a010)	CS	000e	INFERRED FROM
1.6.1.1.1	>>>>	Value Type	(0040,a040)	CS	0006	IMAGE
1.6.1.1.1	>>>>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.6.1.1.1	%item					
1.6.1.1.1	>>>>>	Code Value	(0008,0100)	SH	0006	121112
1.6.1.1.1	>>>>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.6.1.1.1	>>>>>	Code Meaning	(0008,0104)	LO	0016	Source of Measurement
1.6.1.1.1	%enditem					
1.6.1.1.1	%endseq					
1.6.1.1.1	%enditem					
1.6.1.1	%endseq					
1.6.1.1	%enditem					
1.6.1	%endseq					
1.6.1	%enditem					
1.6	%endseq					
1.6	%enditem					
1.7	%item					
1.7	>	Relationship Type	(0040,a010)	CS	0008	CONTAINS

SR Tree Depth	Nesting	Attribute	Tag	VR	VL (hex)	Value
1.7	>	Value Type	(0040,a040)	CS	000a	CONTAINER
1.7	>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.7	%item					
1.7	>>	Code Value	(0008,0100)	SH	0006	121072
1.7	>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.7	>>	Code Meaning	(0008,0104)	LO	000c	Impressions
1.7	%enditem					
1.7	%endseq					
1.7	>	Continuity Of Content	(0040,a050)	CS	0008	SEPARATE
1.7	>	Content Sequence	(0040,a730)	SQ	ffffffff	
1.7.1	%item					
1.7.1	>>	Relationship Type	(0040,a010)	CS	0008	CONTAINS
1.7.1	>>	Value Type	(0040,a040)	CS	0004	TEXT
1.7.1	>>	Concept Name Code Sequence	(0040,a043)	SQ	ffffffff	
1.7.1	%item					
1.7.1	>>>	Code Value	(0008,0100)	SH	0006	121073
1.7.1	>>>	Coding Scheme Designator	(0008,0102)	SH	0004	DCM
1.7.1	>>>	Code Meaning	(0008,0104)	LO	000a	Impression
1.7.1	%enditem					
1.7.1	%endseq					
1.7.1	>>	Text Value	(0040,a160)	UT	009c	No acute cardiopulmonary process. Round density in left superior hilus, further evaluation with CT is recommended as underlying malignancy is not excluded.
1.7.1	%enditem					
1.7	%endseq					
1.7	%enditem					
1	%endseq					

A.6.2 Transcoded HL7 CDA Release 2 "Diagnostic Imaging Report"

```
<?xml version="1.0" encoding="utf-8"?>
<?xml-stylesheet type="text/xsl" href="CDA-DIR.xsl"?>
<ClinicalDocument xmlns="urn:hl7-org:v3" xmlns:voc="urn:hl7-org:v3/voc"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:hl7-org:v3 CDA.xsd">
  <realmCode code="UV" />
  <typeId root="2.16.840.1.113883.1.3" extension="POCD_HD000040" />
  <templateId root="2.16.840.1.113883.10.20.6" />
  <id root="1.2.840.113619.2.62.994044785528.12"
  extension="20060828170821659" />
```

```
<code code="18748-4" codeSystem="2.16.840.1.113883.6.1"
codeSystemName="LOINC" displayName="Diagnostic Imaging Report" />
<!-- from DICOM TID 1210 "Equivalent Meaning(s) of Concept Name"
    (Concept Modifier to DICOM SR document report title) -->
<title>Chest X-Ray, PA and LAT View</title>
<!-- /from TID 1210  -->
<effectiveTime value="20060828170821" />
<!-- CDA DIR effective time usually will be different from SR study date
    and SR content date and time-->
<confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25" />
<languageCode code="en-US" />
<recordTarget>
 <patientRole>
  <id root="1.2.840.113619.2.62.994044785528.10" extension="0000680029" />
  <!-- Unique identifier for root: {root}.10 = patient ID list added based on
       organizational policy (not present in SR sample document because root is
       not specified by DICOM. DICOM Patient ID (0010,0020) value inserted into
       extension -->
  <addr nullFlavor="NI" />
  <telecom nullFlavor="NI" />
  <patient>
   <name>
    <given>John</given>
    <family>Doe</family>
   </name>
   <administrativeGenderCode codeSystem="2.16.840.1.113883.5.1"
   code="M" />
   <birthTime value="19641128" />
  </patient>
 </patientRole>
</recordTarget>
<author>
 <time value="20060823224352" />
 <assignedAuthor>
  <id extension="121008" root="2.16.840.1.113883.19.5" />
  <addr nullFlavor="NI" />
  <telecom nullFlavor="NI" />
  <assignedPerson>
   <name>
    <given>Richard</given>
    <family>Blitz</family>
    <suffix>MD</suffix>
   </name>
  </assignedPerson>
 </assignedAuthor>
</author>
<custodian>
 <!-- custodian values have been added based on organizational policy (in
      this case they are not mapped from the SR sample document)-->
 <assignedCustodian>
  <representedCustodianOrganization>
   <id root="2.16.840.1.113883.19.5" />
   <name>World University Hospital</name>
   <telecom nullFlavor="NI" />
   <addr nullFlavor="NI" />
  </representedCustodianOrganization>
 </assignedCustodian>
</custodian>
<!-- legal authenticator present in sample, document is VERIFIED -->
<legalAuthenticator>
```

```
  <time value="20060827141500" />
  <!-- verification date time (0040,A030)-->
  <signatureCode code="S" />
  <assignedEntity>
   <id extension="08150000" root="1.2.840.113619.2.62.994044785528.33" />
   <addr nullFlavor="NI" />
   <telecom nullFlavor="NI" />
   <assignedPerson>
    <name>
     <given>Richard</given>
     <family>Blitz</family>
     <suffix>MD</suffix>
    </name>
   </assignedPerson>
  </assignedEntity>
</legalAuthenticator>
<!-- Mapped from Referring physicians name (0008,0090) SR sample document -->
<participant typeCode="REF">
  <associatedEntity classCode="PROV">
   <id nullFlavor="NI" />
   <addr nullFlavor="NI" />
   <telecom nullFlavor="NI" />
   <associatedPerson>
    <name>
     <given>John</given>
     <family>Smith</family>
     <suffix>MD</suffix>
    </name>
   </associatedPerson>
  </associatedEntity>
</participant>
<inFulfillmentOf>
  <order>
   <id extension="10523475" root="1.2.840.113619.2.62.994044785528.27" />
   <!-- {root}.27 of accession number added based on organizational policy (not
        present in SR sample document because root is not specified by DICOM).
        Accession number value used in extension -->
   <id extension="123452" root="1.2.840.113619.2.62.994044785528.28" />
   <!-- {root}.28 of filler order number added based on organizational policy (not
        present in SR sample document because root is not specified by DICOM).
        Filler number value used in extension -->
   <id extension="123451" root="1.2.840.113619.2.62.994044785528.29" />
   <!-- {root}.29 of placer order number added based on organizational policy (not
        present in SR sample document because root is not specified by DICOM).
        Placer number value used in extension  -->
  </order>
</inFulfillmentOf>
<documentationOf>
  <serviceEvent classCode="ACT">
   <id root="1.2.840.113619.2.62.994044785528.114289542805" />
   <!-- study instance UID -->
   <code nullFlavor="NI" />
   <effectiveTime value="20060823222400" />
  </serviceEvent>
</documentationOf>
<!-- transformation of a DICOM SR -->
<relatedDocument typeCode="XFRM">
  <parentDocument>
   <id root="1.2.840.113619.2.62.994044785528.20060823.200608232232322.9" />
   <!-- SOP Instance UID (0008,0018) of SR sample document-->
```

```
   </parentDocument>
  </relatedDocument>
  <component>
   <structuredBody>
    <component>
     <!--
**********************************************************************
                DICOM Object Catalog Section
**********************************************************************
     -->
     <section classCode="DOCSECT" moodCode="EVN">
      <templateId root="2.16.840.1.113883.10.20.6.1.1" />
      <code code="121181" codeSystem="1.2.840.10008.2.16.4"
      codeSystemName="DCM" displayName="DICOM Object Catalog" />
      <entry>
       <!--
**********************************************************************
                    Study
**********************************************************************
     -->
       <act classCode="ACT" moodCode="EVN">
        <templateId root="2.16.840.1.113883.10.20.6.2.6" />
        <id root="1.2.840.113619.2.62.994044785528.114289542805" />
        <code code="113014" codeSystem="1.2.840.10008.2.16.4"
        codeSystemName="DCM" displayName="Study" />
        <!--
*****************************************************************
          Series (Parent SR Document)
*****************************************************************
     -->
        <entryRelationship typeCode="COMP">
         <act classCode="ACT" moodCode="EVN">
          <id root="1.2.840.113619.2.62.994044785528.20060823222132232023" />
          <code code="113015" codeSystem="1.2.840.10008.2.16.4"
          codeSystemName="DCM" displayName="Series">
           <qualifier>
            <name code="121139" codeSystem="1.2.840.10008.2.16.4"
            codeSystemName="DCM" displayName="Modality"></name>
            <value code="CR" codeSystem="1.2.840.10008.2.16.4"
            codeSystemName="DCM" displayName="SR Document"></value>
           </qualifier>
          </code>
          <!--
*****************************************************************
             SopInstance UID
*****************************************************************
     -->
           <!--   Reference to SR Document -->
           <entryRelationship typeCode="COMP">
            <observation classCode="DGIMG" moodCode="EVN">
             <templateId root="2.16.840.1.113883.10.20.6.2.8" />
             <id root="1.2.840.113619.2.62.994044785528.20060823.200608242334312.3" />
             <code code="1.2.840.10008.5.1.4.1.1.88.22"
             codeSystem="1.2.840.10008.2.6.1" codeSystemName="DCMUID"
             displayName="Enhanced SR"></code>
             <text mediaType="application/dicom">
              <reference value="http://www.example.org/wado?requestType=WADO
                &amp;amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
                &amp;amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823222132232023
                &amp;amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232232322.9
```

```
                    &amp;amp;contentType=application/dicom" />
                  <!--reference to image 1 (PA) -->
                 </text>
                 <effectiveTime value="20060823223232" />
                </observation>
               </entryRelationship>
              </act>
             </entryRelationship>
             <!--
*********************************************************************
                 Series (CR Images)
*********************************************************************
      -->
          <entryRelationship typeCode="COMP">
           <act classCode="ACT" moodCode="EVN">
            <id root="1.2.840.113619.2.62.994044785528.20060823223142485051" />
            <code code="113015" codeSystem="1.2.840.10008.2.16.4"
            codeSystemName="DCM" displayName="Series">
             <qualifier>
              <name code="121139" codeSystem="1.2.840.10008.2.16.4"
              codeSystemName="DCM" displayName="Modality"></name>
              <value code="CR" codeSystem="1.2.840.10008.2.16.4"
              codeSystemName="DCM" displayName="Computed Radiography">
              </value>
             </qualifier>
            </code>
            <!--
*********************************************************************
                  SopInstance UID
*********************************************************************
      -->
             <!--   2 References (chest PA and LAT) -->
             <entryRelationship typeCode="COMP">
              <observation classCode="DGIMG" moodCode="EVN">
               <templateId root="2.16.840.1.113883.10.20.6.2.8" />
               <id root="1.2.840.113619.2.62.994044785528.20060823.200608232232322.3" />
               <code code="1.2.840.10008.5.1.4.1.1.1"
               codeSystem="1.2.840.10008.2.6.1" codeSystemName="DCMUID"
               displayName="Computed Radiography Image Storage"></code>
               <text mediaType="application/dicom">
                <reference value="http://www.example.org/wado?requestType=WADO
                   &amp;amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
                   &amp;amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823223142485051
                   &amp;amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
                   &amp;amp;contentType=application/dicom" />
                <!--reference to image 1 (PA) -->
               </text>
               <effectiveTime value="20060823223232" />
              </observation>
             </entryRelationship>
             <entryRelationship typeCode="COMP">
              <observation classCode="DGIMG" moodCode="EVN">
               <templateId root="2.16.840.1.113883.10.20.6.2.8" />
               <id root="1.2.840.113619.2.62.994044785528.20060823.200608232231422.3" />
               <code code="1.2.840.10008.5.1.4.1.1.1"
               codeSystem="1.2.840.10008.2.6.1" codeSystemName="DCMUID"
               displayName="Computed Radiography Image Storage"></code>
               <text mediaType="application/dicom">
                <reference value="http://www.example.org/wado?requestType=WADO
                   &amp;amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
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                    &amp;amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823223142485051
                    &amp;amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232231422.3
                    &amp;amp;contentType=application/dicom" />
                  <!--reference to image 2 (LAT) -->
                 </text>
                 <effectiveTime value="20060823223142" />
                </observation>
               </entryRelationship>
              </act>
             </entryRelationship>
            </act>
           </entry>
          </section>
          <!--
*************************************************************************
        End of DICOM Object Catalog Section
*************************************************************************
          -->
         </component>
         <component>
          <!--
*************************************************************************
               Reason for study Section
*************************************************************************
The original DICOM SR document that is mapped does not contain a
"Indications for Procedure" section. The attribute value "Reason
for the Requested Procedure"  (0040,1002) within the Referenced
Request Sequence (0040,A370) of the SR header has been mapped under
the assumption that the header attribute value has been displayed to
and included by the legal authenticator.
          -->
          <section>
           <code code="121109" codeSystem="1.2.840.10008.2.16.4"
           codeSystemName="DCM" displayName="Indications for Procedure" />
           <title>Indications for Procedure</title>
           <text>Suspected lung tumor</text>
          </section>
          <!--
*************************************************************************
                Reason for study Section
*************************************************************************
          -->
         </component>
         <component>
          <!--
*************************************************************************
               History Section
*************************************************************************
          -->
          <section>
           <code code="121060" codeSystem="1.2.840.10008.2.16.4"
           codeSystemName="DCM" displayName="History" />
           <title>History</title>
           <text>
            <paragraph>
             <caption>History</caption>
             <content ID="Fndng1">Sore throat.</content>
            </paragraph>
           </text>
           <entry>
```

```
        <!-- History report element (TEXT) -->
        <observation classCode="OBS" moodCode="EVN">
          <templateId root="2.16.840.1.113883.10.20.6.2.12" />
          <code code="121060" codeSystem="1.2.840.10008.2.16.4"
          codeSystemName="DCM" displayName="History" />
          <value xsi:type="ED">
            <reference value="#Fndng1" />
          </value>
        </observation>
      </entry>
    </section>
    <!--
*************************************************************************
              End of History Section
*************************************************************************
    -->
   </component>
   <component>
    <!--
*************************************************************************
               Findings Section
*************************************************************************
    -->
    <section>
      <templateId root="2.16.840.1.113883.10.20.6.1.2" />
      <code code="121070" codeSystem="1.2.840.10008.2.16.4"
      codeSystemName="DCM" displayName="Findings" />
      <title>Findings</title>
      <text>
        <paragraph>
          <caption>Finding</caption>
          <content ID="Fndng2">The cardiomediastinum is within normal
          limits. The trachea is midline. The previously described opacity
          at the medial right lung base has cleared. There are no new
          infiltrates. There is a new round density at the left hilus,
          superiorly (diameter about 45mm). A CT scan is recommended for
          further evaluation. The pleural spaces are clear. The visualized
          musculoskeletal structures and the upper abdomen are stable and
          unremarkable.</content>
        </paragraph>
        <paragraph>
          <caption>Diameter</caption>
          <content ID="Diam2">45mm</content>
        </paragraph>
        <paragraph>
          <caption>Source of Measurement</caption>
          <content ID="SrceOfMeas2">
            <linkHtml href="http://www.example.org/wado?requestType=WADO
              &amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
              &amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823223142485051
              &amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
              &amp;contentType=application/dicom">
            Chest_PA</linkHtml>
          </content>
        </paragraph>
      </text>
      <entry>
        <observation classCode="OBS" moodCode="EVN">
          <!-- Text Observation -->
          <templateId root="2.16.840.1.113883.10.20.6.2.12" />
```

```
    <code code="121071" codeSystem="1.2.840.10008.2.16.4"
    codeSystemName="DCM" displayName="Finding" />
    <value xsi:type="ED">
      <reference value="#Fndng2" />
    </value>
    <!-- inferred from measurement -->
    <entryRelationship typeCode="SPRT">
      <observation classCode="OBS" moodCode="EVN">
        <templateId root="2.16.840.1.113883.10.20.6.2.14" />
        <code code="246120007" codeSystem="2.16.840.1.113883.6.96"
        codeSystemName="SNOMED" displayName="Nodule size">
          <originalText>
            <reference value="#Diam2" />
          </originalText>
        </code>
        <!-- no DICOM attribute  <statusCode code="completed"/> -->
        <effectiveTime value="20060823223912" />
        <value xsi:type="PQ" value="45" unit="mm" />
        <!-- inferred from image -->
        <entryRelationship typeCode="SUBJ">
          <observation classCode="DGIMG" moodCode="EVN">
            <templateId root="2.16.840.1.113883.10.20.6.2.8" />
            <!-- (0008,1155) Referenced SOP Instance UID-->
            <id root="1.2.840.113619.2.62.994044785528.20060823.200608232232322.3" />
            <!-- (0008,1150) Referenced SOP Class UID -->
            <code code="1.2.840.10008.5.1.4.1.1.1"
            codeSystem="1.2.840.10008.2.6.1" codeSystemName="DCMUID"
            displayName="Computed Radiography Image Storage"></code>
            <text mediaType="application/dicom">
              <!--reference to CR DICOM image (PA view) -->
              <reference value="http://www.example.org/wado?requestType=WADO
                 &amp;studyUID=1.2.840.113619.2.62.994044785528.114289542805
                 &amp;seriesUID=1.2.840.113619.2.62.994044785528.20060823223142485051
                 &amp;objectUID=1.2.840.113619.2.62.994044785528.20060823.200608232232322.3
                 &amp;contentType=application/dicom" />
            </text>
            <effectiveTime value="20060823223232" />
            <!-- Purpose of Reference -->
            <entryRelationship typeCode="RSON">
              <observation classCode="OBS" moodCode="EVN">
                <templateId root="2.16.840.1.113883.10.20.6.2.9" />
                <code code="ASSERTION"
                codeSystem="2.16.840.1.113883.5.4" />
                <value xsi:type="CD" code="121112"
                codeSystem="1.2.840.10008.2.16.4"
                codeSystemName="DCM"
                displayName="Source of Measurement">
                  <originalText>
                    <reference value="#SrceOfMeas2" />
                  </originalText>
                </value>
              </observation>
            </entryRelationship>
          </observation>
        </entryRelationship>
      </observation>
    </entryRelationship>
  </observation>
 </entry>
</section>
```

```
      <!--
**************************************************************************
                End of Findings Section
**************************************************************************
      -->
     </component>
     <component>
      <!--
**************************************************************************
                Impressions Section
**************************************************************************
      -->
      <section>
       <code code="121072" codeSystem="1.2.840.10008.2.16.4"
       codeSystemName="DCM" displayName="Impressions" />
       <title>Impressions</title>
       <text>
        <paragraph>
         <caption>Impression</caption>
         <content ID="Fndng3">No acute cardiopulmonary process. Round
         density in left superior hilus, further evaluation with CT is
         recommended as underlying malignancy is not excluded.</content>
        </paragraph>
       </text>
       <entry>
        <!-- Impression report element (TEXT) -->
        <observation classCode="OBS" moodCode="EVN">
         <!-- Text Observation -->
         <templateId root="2.16.840.1.113883.10.20.6.2.12" />
         <code code="121073" codeSystem="1.2.840.10008.2.16.4"
         codeSystemName="DCM" displayName="Impression" />
         <value xsi:type="ED">
          <reference value="#Fndng3" />
         </value>
        </observation>
       </entry>
      </section>
      <!--
**************************************************************************
                End of Impressions Section
**************************************************************************
      -->
     </component>
    </structuredBody>
   </component>
</ClinicalDocument>
```

A.7 HL7 V3 DICOM CMETS

A.7.1 A_DicomSequence minimal (COCT_RM830110UV)

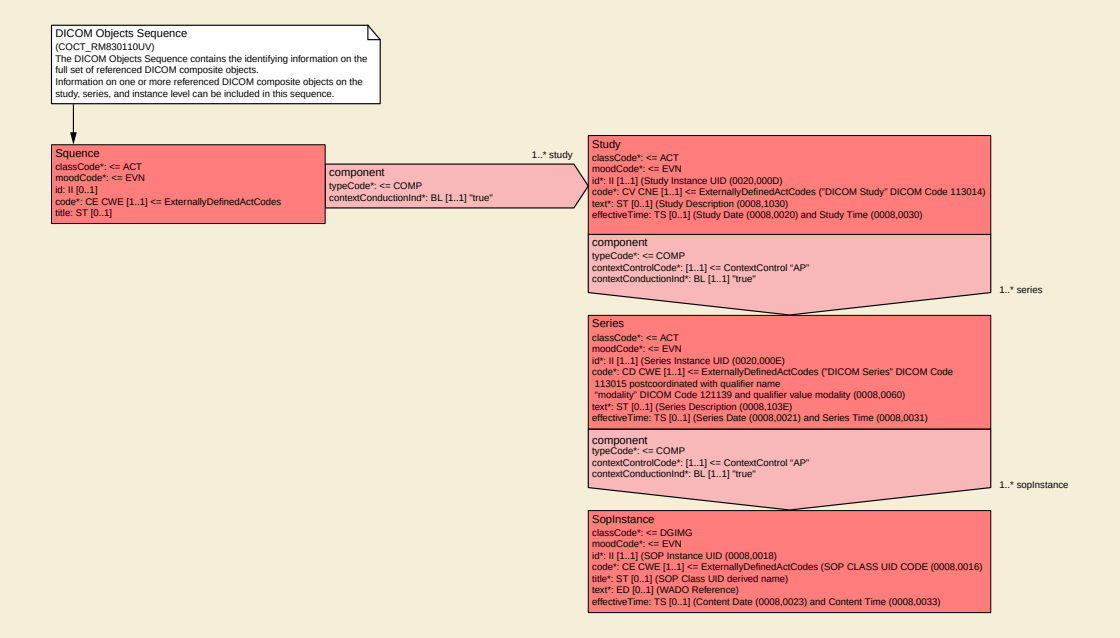

Figure A.7-1. A_DicomSequence minimal CMET

The A_DicomSequence minimal CMET is used to reference DICOM composite objects within HL7 Version 3 messages. It provides a single location for the identifying information of the study/series/instance hierarchical context of DICOM composite objects that are referenced for a specific purpose. Additional information on this context (e.g., Study Description) may optionally be added. Mappings from DICOM object attributes to the various Act attributes are provided. The CMETs for the HL7 V3 message sequence and the CDA Release 2 section are structurally identical. For the CDA section pattern different clone names are used according to the specified entry names of CDA Release 2.

Note

The A_DicomSequence minimal CMET may be used in combination with COCT_RM830120 to provide additional structured information on individual references to DICOM composite objects. COCT_RM830120 is used to put the references into the context of other acts and observations (e.g., relate referenced DICOM images to lab observations).

The following description of the act classes and act relationships contains the attribute mappings of HL7 V3 attributes to DICOM (Digital Imaging and Communications in Medicine) tags. The group and element number of the mapped DICOM tags are listed in parenthesis. The CDA mappings specify the use of the CMET act classes and act relationships for a CDA Release 2 document section that contains section entries.

A.7.1.1 Sequence

The DICOM Objects Sequence contains the identifying information on DICOM composite objects referenced in a HL7 V3 message for a specific purpose. The sequence can be used for any HL7 V3 message that includes references to composite DICOM objects, such as images and structured reports. Information on one or more referenced DICOM composite objects on the study, series and instance level can be included in a sequence.

Table A.7.1-1. Sequence Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT

Attribute	Data Type	Multiplicity	Value
moodCode	CS	1..1	EVN
id	II	0..1	*Sequence Identifier*
code	CE	1..1	Externally defined DICOM codes, e.g., <121181 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, e.g., "DICOM Object Catalog" as displayName property>
title	ST	0..1	<e.g., "DICOM Object Catalog">

A.7.1.1.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

Section (replaces Sequence)

The CDA DICOM Objects Section contains the identifying information on DICOM composite objects referenced in a CDA Release 2 document for a specific purpose. The CDA DICOM Objects Section can be used within any CDA Release 2 document that includes references to composite DICOM objects in the structured part of the CDA document, such as images and structured reports. Information on one or more referenced DICOM composite objects on the study, series and instance level can be included in this section.

Table A.7.1-2. Section Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT
moodCode	CS	1..1	EVN
id	II	0..1	*Section Identifier*
code	CE	1..1	Externally defined DICOM codes, e.g., <121181 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, e.g., "DICOM Object Catalog" as displayName property>
title	ST	0..1	<e.g., "DICOM Object Catalog">

Section X.3.5 Structured Entries in PS3.17 specifies the semantics of the section e.g., "DICOM Object Catalog" (DICOM Code Value: 121181) that contains information on the full set of DICOM composite objects referenced in the CDA document:

“It is recommended that this list be transcoded to CDA Entries in a Section with Section.Title "DICOM Object Catalog" and a Section.Code of 121181 from the DICOM Controlled Terminology (refer to PS3.16).”

A.7.1.2 ActRelationship COMPONENT (Sequence to Study)

This actRelationship "COMPONENT" is used to link Sequence with one or more associated study acts.

A.7.1.2.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entry (replaces COMPONENT)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = COMP)
- ContextConductionInd: "true"

A.7.1.3 Study

The Study act class contains the DICOM study information that defines the characteristics of a referenced medical study performed on a patient. A study is a collection of one or more series of medical images, presentation states, SR documents, overlays and/or curves that are logically related for the purpose of diagnosing a patient. Each study is associated with exactly one patient. A study may include composite instances that are created by a single modality, multiple modalities or by multiple devices of the same modality. The study information is modality independent.

Table A.7.1-3. DICOM Study Reference in an HL7 V3 Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	
id	II	1..1	<Study Instance UID (0020,000D) as root property with no extension property>: Unique identifier for the Study
code	CV	1..1	<113014 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, "DICOM Study" as displayName property>
text	ST	0..1	<Study Description (0008,1030) > Institution-generated description or classification of the Study (component) performed.
effectiveTime	TS	0..1	<Study Date (0008,0020): Date the Study started; and Study Time (0008,0030): Time the Study started.>

A.7.1.3.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

- Act clone name of the CDA entry is "Act" instead of "Study". The attributes and attribute values of this CDA entry "Act" are identical to those listed in table 3.
- templateId value (Table A.7.1-3): Set root portion of II to "2.16.840.1.113883.10.20.6.2.6"

  (identifies the template that defines constraints on "Study Act" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).

A.7.1.4 ActRelationship COMPONENT (Study to Series)

This actRelationship "COMPONENT" is used to link one study act with one or more associated series acts.

A.7.1.4.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entryRelationship (replaces COMPONENT)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = COMP)
- ActRelationship.contextControlCode: "AP" (Additive Propagating)
- ContextConductionInd: "true"

A.7.1.5 Series

The Series act class contains the DICOM series information for referenced DICOM composite objects. The series information defines the attributes that are used to group composite instances into distinct logical sets. Each series is associated with exactly one study.

Table A.7.1-4. DICOM Series Reference in an HL7 V3 Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ACT
moodCode	CS	1..1	EVN
id	II	1..1	< *Series Instance UID (0020,000E)* as root property with no extension property>: Unique identifier of the Series.
code	CD	0..1	<113015 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, "DICOM Series" as displayName property, Modality as qualifier property (see text and Table A.7.1-5) >

Attribute	Data Type	Multiplicity	Value
text	ST	0..1	< *Series Description (0008,103E)*> User provided description of the Series
effectiveTime	TS	0..1	< *Series Date (0008,0021)*: Date the Series started. and *Series Time (0008,0031)*: Time the Series started.>

The code for the Act representing a Series uses a qualifier property to indicate the modality. The qualifier property is a list of coded name/value pairs. For this use, only a single list entry is used, as described in Table A.7.1-5.

Table A.7.1-5. Modality Qualifier for the Series Act.code

Property	Data Type	Value
name	CV	<121139 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, "Modality" as displayName property>
value	CD	< *Modality (0008,0060)* as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, *Modality code meaning* (PS3.16) as displayName property>

A.7.1.5.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

- Act Clone Name: Act
- Act clone name of the CDA entry is "Act" instead of "Series". The attributes and attribute values of this CDA entry "Act" are identical to those listed in Table A.7.1-4 and Table A.7.1-5.

A.7.1.6 ActRelationship COMPONENT (Series to SopInstance)

This actRelationship "COMPONENT" is used to link one series act with one or more associated SopInstance acts.

A.7.1.6.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entryRelationship (replaces COMPONENT)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = COMP)
- ActRelationship.contextControlCode: "AP" (Additive Propagating)
- ContextConductionInd: "true"

A.7.1.7 SopInstance

Please refer to COCT_RM830120UV for the description of the SopInstance act class.

A.7.2 Updated Pattern Based on A_DicomCompositeObjectReference Minimal (COCT_RM830120UV)

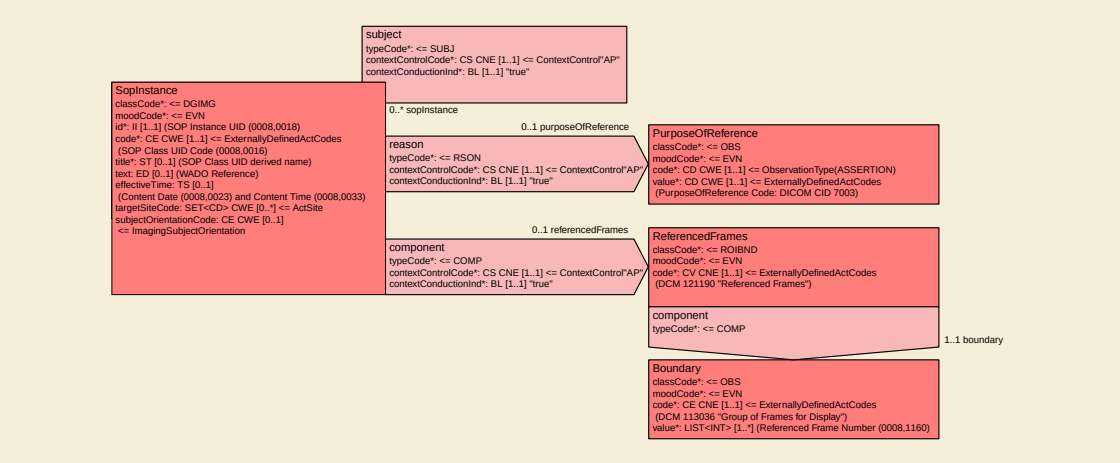

Figure A.7-2. A_DicomCompositeObjectReference Minimal

The A_DicomCompositeObjectReference minimal pattern has been updated for harmonization with the HL7 V3 assertion pattern. It is used to reference DICOM composite objects within HL7 Version 3 messages in the context of acts and observations. It provides detailed information on the referenced DICOM composite object such as images, presentation states and DICOM structured documents. Mappings from DICOM object attributes to the various Act attributes are provided. The CMETs for the HL7 V3 message DICOM composite object references and the corresponding CDA Release 2 section entries are structurally identical. For the CDA section entries different clone names are used according to the specified entry names in the CDA Release 2.

Note

The A_DicomCompositeObjectReference minimal CMET COCT_RM830120 may be used in combination with COCT_RM830110 that provides a single location for lookup of referenced DICOM composite objects of an HL7 V3 message (identifying information on the DICOM study/series/instance hierarchy can be found there).

The following description of the act classes and act relationships contains the attribute mappings of HL7 V3 attributes to DICOM (Digital Imaging and Communications in Medicine) tags. The group and element number of the mapped DICOM tags are listed in parenthesis. The CDA mappings specify the use of the CMET act classes and act relationships as CDA Release 2 document section entries.

A.7.2.1 SopInstance

The SopInstance act class contains the DICOM Service Object Pair (SOP) Instance information for referenced DICOM composite objects. The SopInstance act class is used to reference both, image and non-image DICOM instances. The text attribute contains the DICOM WADO (PS 3.18 Web Access to DICOM Objects) reference.

Table A.7.2-1. DICOM Composite Object Reference in an HL7 V3 Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	DGIMG
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	
id	II	1..1	< *SOP Instance UID (0008,0018)* as root property with no extension property> Uniquely identifies the SOP Instance.
code	CE	1..1	< *SOP Class UID (0008,0016)* as code property, 1.2.840.10008.2.6.1 as codeSystem property, DCMUID as codeSystemName property, *SOP Class UID Name* (from PS3.6) as displayName property>: Unique Identifier for the SOP Class as Code Property

Attribute	Data Type	Multiplicity	Value
title	ST	0..1	SOP Class UID derived name
text	ED	0..1	<"application/DICOM" as mediaType property, *WADO reference* (see Table A.7.2-2) as reference property>
effectiveTime	TS	0..1	< *Content Date (0008,0023): The date the content creation (e.g., image pixel data, document) started;* and *Content Time (0008,0033): The time the content creation (e.g., image pixel data, document) started.* >

The DGIMG classCode is used to reference all DICOM Composite Instances, not just diagnostic images.

WADO is a service that enables the Web Client System to retrieve DICOM Persistent Objects managed by a Web Enabled DICOM Server, through the HTTP/HTTPs protocol. The WADO reference uses an URI with query parameters (Table A.7.2-2). Access to the content of a data object is enabled by specifying a "link" pointing to a specific DICOM Persistent Object by means of its URL/URI and specifying its DICOM object Instance UID and the transfer syntax to be employed.

Table A.7.2-2. WADO Reference in HL7 DGIMG Observation.text

WADO Component	Source
<scheme>://<authority>/<path>	Configuration setting, used by the conversion process, identifying the WADO server
?requestType=WADO	Fixed
&studyUID=<uid>	Study Instance UID for referenced instance
&seriesUID=<uid>	Series Instance UID for referenced instance
&objectUID=<uid>	SOP Instance UID for referenced instance
&contentType=application/DICOM	Fixed

A.7.2.1.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

- Act clone name of the CDA entry is "Observation" instead of "SopInstance". The attributes and attribute values of this CDA entry "Observation" are identical to those listed in table 1 and 2, except for the optional title attribute (Value: SOP Class UID derived name) that is not mapped because it is not supported by CDA Act Entries.
- templateId value (Table A.7.1-1): Set root portion of II to "2.16.840.1.113883.10.20.6.2.8" (identifies the template that defines constraints on "SopInstance Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).

A.7.2.2 ActRelationship SUBJECT (SopInstance recursive actRelationship)

This optional recursive "SUBJECT" actRelationship is used to link a referenced DICOM Presentation State to one or more associated referenced DICOM images (SopInstance act class is used in both cases) it is applied to.

A.7.2.2.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entryRelationship (replaces SUBJECT)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = SUBJ)
- ActRelationship.contextControlCode: "AP" (Additive Propagating)
- ContextConductionInd: "true"

A.7.2.3 ActRelationship REASON (SopInstance to PurposeOfReference)

This optional "REASON" actRelationship is used to relate a referenced DICOM composite object (SopInstance ActClass) with the PurposeOfReference ActClass that includes the coded purpose(s) of reference.

A.7.2.3.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entryRelationship (replaces REASON)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = RSON)
- ActRelationship.contextControlCode: "AP" (Additive Propagating)
- ContextConductionInd: "true"

A.7.2.4 PurposeOfReference

Describes the purpose the DICOM composite object reference is made for. Appropriate codes such as externally defined DICOM codes may be used to specify the semantics of the purpose of reference. When absent, implies that the reason for the reference is unknown.

Codes specified in PS3.16 shall be used to designate the coded purpose of reference by using the value attribute. Candidate codes are contained in the DICOM Context Group 7003. The attribute mapping for the code attributes are listed in table 3.

Table A.7.2-3. DICOM Coded Purpose of Reference in an HL7 V3 Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	
code	CD	1..1	<"ASSERTION" as code property, 2.16.840.1.113883.5.4 as codeSystem property> (HL7 observation type code specified for assertions)
value	CD	1..1	< *Code Value (0008,0100)* as code property, 1.2.840.10008.2.16.4 as codeSystem property, *Coding Scheme Designator (0008,0102)* as codeSystemName property, *Code Meaning (0008,0104)* as displayName property>

A.7.2.4.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

- Act Clone Name: Observation
- Act clone name of the CDA entry is "Observation" instead of "PurposeOfReference"
- The attributes and attribute values of this "Observation" CDA entry are identical to those listed in table 3
- templateId value (Table A.7.1-3): Set root portion of II to "2.16.840.1.113883.10.20.6.2.9" (identifies the template that defines constraints on "Purpose of Reference Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).

A.7.2.5 ActRelationship COMPONENT (SopInstance to ReferencedFrames)

This optional "COMPONENT" actRelationship is used to link a referenced DICOM composite object to one or more frames of a DICOM multi-frame image SOP instance.

A.7.2.5.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entryRelationship (replaces COMPONENT)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = COMP)
- ActRelationship.contextControlCode: "AP" (Additive Propagating)
- ContextConductionInd: "true"

A.7.2.6 ReferencedFrames

This act class shall be used if the referenced DICOM SOP instance is a multi-frame image and the reference does not apply to all frames. The list of integer values for the referenced frames of a DICOM multi-frame image SOP instance is contained in the Boundary ActClass.

Table A.7.2-4. DICOM Referenced Frames in an HL7 V3 Act

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ROIBND
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	
code	CV	1..1	< *Code Value (0008,0100)*: 121190 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, *Code Meaning (0008,0104*): "Referenced Frames" as displayName property>

A.7.2.6.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

- Act Clone Name: Observation
- Act clone name of the CDA entry is "Observation" instead of "ReferencedFrames"
- templateId value (Table A.7.1-4): Set root portion of II to "2.16.840.1.113883.10.20.6.2.10" (identifies the template that defines constraints on "Referenced Frames Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).

A.7.2.7 ActRelationship Component (ReferencedFrames to Boundary)

This "COMPONENT" actRelationship is used to link the ReferencedFrames ActClass to the Boundary ActClass that contains the list of integer values for the referenced frames of a DICOM multi-frame image SOP instance.

A.7.2.7.1 CDA Mapping (ActRelationship Name and Attributes used for CDA Documents)

- ActRelationship Clone name: entryRelationship (replaces COMPONENT)
- ActRelationship.typeCode: x_ActRelationshipEntry (Constraint: Fixed value = COMP)

A.7.2.8 Boundary

The act class contains a list of integer values for the referenced frames of a DICOM multi-frame image SOP instance. It identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. This act class shall be used if the referenced DICOM SOP instance is a multi-frame image and the reference does not apply to all frames.

Table A.7.2-5. Boundary Act Class

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	
code	CE	1..1	< *Code Value (0008,0100)*: 113036 as code property, 1.2.840.10008.2.16.4 as codeSystem property, DCM as codeSystemName property, *Code Meaning (0008,0104*): "Group of Frames for Display" as displayName property >

Attribute	Data Type	Multiplicity	Value
value	LIST<INT>	1..*	< *Referenced Frame Number (0008,1160)*> Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Values shall be provided if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames.

A.7.2.8.1 CDA Mapping (Class Name and Attributes used for CDA Documents)

- Act Clone Name: ObservationAct clone name of the CDA entry is "Observation" instead of "Boundary".
- templateId value (Table A.7.1-5): Set root portion of II to "2.16.840.1.113883.10.20.6.2.11" (identifies the template that defines constraints on "Boundary Observation" of CDA Diagnostic Imaging Reports as specified by CDA R2 DIR IG).

A.8 Overview on Data Types

DICOM data types are specified in Part 5 of the standard (PS3.5), CDA R2 is based on HL7 V3 Data Types Release 1 (refer to XML Implementation Technology Specification and Abstract Data Types Specification). While a complete comparison of DICOM and HL7 V3 data types, cardinality and optionality is beyond the scope of this implementation guide, some hints are given on topics that are relevant for transforming DICOM SR Diagnostic Imaging Reports to CDA R2.

a. Optionality

If the original DICOM SR document does not include values for optional attributes that are required or mandatory in CDA R2, the null flavor value "NI" (No Information) can be used as the default for those attributes unless specific reasons for missing values are known.

b. Character Sets

DICOM provides information on the interpretation of text data types by specifying a default character set (ISO-IR 6) and "Specific Character Set" (0008,0005) values that are used if the Basic Graphic Set is expanded or replaced. For CDA R2 the XML declaration attribute "encoding" (overall document) and the attribute "charset" (for ED and ST data type values) may be used to provide information on character sets.

c. Character strings

Text Value (0040,A160) of value type TEXT (data type: Unlimited Text (UT)) shall be mapped to HL7 V3 data type ED (text (TXT) representation; media type = "text/plain") to populate CDA R2 text observation entries and section text. The ED text representation is identical to HL7 V3 data type ST (Character String). Character strings that are used for DICOM attributes such as Study Description (Long String, LO) are mapped to ST. Maximum length is not specified for HL7 V3 data types ED and ST.

DICOM character strings such as Long String (LO, e.g., Manufacturer's Model Name (0008,1090)) and Unlimited Text (UT, e.g., Observer's Model Name within TID 1004) can be mapped to the character string part of HL7 V3 data type SC (Character String with Code). SC code components are optional.

d. Identifiers

DICOM UI (data type: Unique Identifier, UID) is limited to 64 bytes. UIDs shall be mapped to the root portion of HL7 V3 Instance Identifiers (II).

DICOM Placer Number, Filler Number, Accession Number (Unlimited Text, UT) and Patient ID (Long String, LO) are usually non-globally unique identifiers. However, a globally unique root is mandatory for the HL7 V3 Instance Identifier (II) data type. Order number, placer number, accession number and patient id may be used as an extension to the II root representing the ID assigning authority.

If information on Issuer of Patient ID is available from the DICOM SR document (Patient Module), Universal Entity ID (0040,0032) of the Issuer of Patient ID Qualifiers Sequence (0010,0024) shall be mapped to PatientRole.id II root and Patient ID (0010,0020) to PatientRole.id II extension. Otherwise a globally unique identifier (ISO Object Identifier) may be generated for the PatientRole.id II root portion. If available Issuer of Patient ID (0010,0021) shall be mapped to PatientRole.id assigningAuthorityName.).

e. Codes

Basic code attributes are mapped as specified in Table A.8-1 below for HL7 V3 code data types (CV, CS, CE and CD).

Table A.8-1. Basic Code Attributes Mapping to HL7 V3 Code Data Types (CV, CS, CE and CD)

DICOM PS3.3, PS3.5 and PS3.16		HL7 V3 Data Types R1	
Code Value (0008,0100)	SH	code	ST
Coding Scheme UID (PS3.16)	UID	codeSystem	UID
Coding Scheme Designator (0008,0102)	SH	codeSystemName	ST
Coding Scheme Version (0008,0103)	SH	codeSystemVersion	ST
Code Meaning (0008,0104)	LO	displayName	ST

Note

The actual encoding for CV, CE and CD will be the same. The difference are optional fields that are not present in the DICOM report.

- For document titles the Code Meaning value may be mapped to the CDA title string (ST).
- For coded DICOM SR person identifiers the Code Value shall be mapped to the root portion of the HL7 V3 instance identifier (II).
- Patient's Sex (DICOM coded string: CS) shall be mapped to the appropriate administrativeGenderCode attribute code (HL7 V3: CE).
- Ethnic Group (DICOM short string: SH) shall be mapped to the appropriate ethnicGroupCode attribute code (HL7 V3: CE).
- If this report was generated automatically, Station Name (DICOM short string: SH) shall be mapped to AuthoringDevice.code (CE) original text. Basic code values of the AuthoringDevice.code shall be set to null flavor value "OTH" (other) because no specific codes are available.
- Units of measurement in observations shall be transcoded to UCUM.

f. Date and Time

- DICOM data types DateTime (DT), Date (DA) and Time (TM) shall be mapped to HL7 V3 data type Point in Time (TS).
- DICOM DT matches TS except for the number of decimal places of fractional seconds (6 versus 4 for TS).
- DICOM DA matches the TS part YYYYMMDD (Y=Year, M=Month, D=Day).
- DICOM DT matches the TS part HHMMSS.UUUUUU (H=Hour, M=Minute, S=Second, U=Fractional Second) except for the number of decimal places of fractional seconds (6 versus 4 for TS).
- If available, DICOM Timezone Offset From UTC (0008,0201) values shall be used for DA or TM data types to populate time zone offset values of HL7 V3 data type TS.

g. Person and Organization Names

- DICOM Person Name (PN) shall be mapped to HL7 V3 data type Person Name (PN) as described in Table A.8-2.

Table A.8-2. DICOM Person Name (PN) Mapping to HL7 V3 Data Type Person Name (PN)

DICOM Person Name (PN)	HL7 V3 Data Types R1: Person Name (PN)
<family_name_complex>	Family Part type
<given_name_complex>	Given Part type
<middle_name>	Given Part type - order of parts matters
<name_suffix>	Suffix Part type
<name_prefix>	Prefix Part type

- HL7 V3 PN may contain multiple given names. DICOM PN Middle Name shall be mapped to HL7 V3 PN Given Name Part type.

Example A.8-1. Person Name Example

John Robert Morrison, Ph.D. "Morrison^John Robert^^^Ph.D." [One family name; two given names; no middle name; no prefix; one suffix] can be represented as a HL7 V3 Person Name (PN) in the following way:

```
<name>
    <given>John</given>
    <given>Robert</given>
 <family>Morrison</family>
  <suffix>Ph.D.</suffix>
</name>
```

- The following HL7V3 PN use codes may be used to represent multi-part DICOM person names: ABC (Alphabetic), IDE (Ideographic), SYL (Phonetic).

Example A.8-2. HL7 V3 Multi-Part Person Name Example

```
<name use="ABC">
    <family>KIMURA</family>
    <given>MICHIO</given>
</name>
<name use='IDE'>
    <family>木村</family>
    <given>道男</given>
</name>
<name use="SYL">
    <family>きむら</family>
    <given>みちお</given>
</name>
```

- DICOM character strings representing organization names shall be mapped to HL7 V3 data type Organization Name (ON). ON may be populated with free text.

h. Addresses

DICOM address character strings (e.g., Short Text (ST)) shall be mapped to HL7 V3 data type Postal Address (AD). AD may be populated with free text.

i. Numeric Measurements

DICOM Numeric Measurement value types shall be mapped to HL7 V3 Physical Quantity data types as specified in Table A.8-3.

Table A.8-3. DICOM Numeric Measurement Value Types Mapped to HL7 V3 Physical Quantity Data Types

DICOM PS3.3, PS3.5 and PS3.16: Numeric Measurement (NUM) Value Type		HL7 V3 Data Types R1: Physical Quantity (PQ)	
Numeric Value (0040,A30A)	DS	value	REAL

DICOM PS3.3, PS3.5 and PS3.16: Numeric Measurement (NUM) Value Type		HL7 V3 Data Types R1: Physical Quantity (PQ)	
Code Value (0008,0100) of Measurement Units Code Sequence (0040,08EA)	SH	unit	CS
Measure Units Code Sequence (0040,08EA)	Refer to note below	translation	CD
> Numeric Value Qualifier Code Sequence (0040,A301)	Refer to note below	qualifier (of translation)	CR

Note

Details on the mapping of basic code attributes are provided in section "e. Codes" of this annex.

If the Numeric Value Qualifier Code Sequence is used to convey the reason for absence of the measured value sequence item, an appropriate null flavor value shall be used to populate the physical quantity value.

B Imaging Report with Conditional Radiation Exposure and Protection Information Transformation Guide

B.1 Scope and Field of Application

DICOM SR documents based on DICOM SR TID 2006 Imaging Report With Conditional Radiation Exposure and Protection Information can be mapped to HL7 CDA Release 2 Diagnostic Imaging Reports. TID 2006 specifies a DICOM SR report template based on the report structure and contents of TID 2000 Basic Diagnostic Imaging Report.

The approach taken, unlike in the existing TID 2000 Basic Diagnostic Imaging Report, which refers to a table of potential section headings defined as a context group, is to follow the same structure but mandate the presence of specific section headings.

B.2 Mapping Requirements

This document specifies a mapping between unencrypted completed DICOM SR TID 2006 and HL7 CDA Diagnostic Imaging Reports (HL7 CDA R2 DIR IG, R1-2009). Only TID 2006 based reports of single human identifiable patient subjects, single enterer, single verifier, without digital signatures and without spatial and temporal coordinates are supported. The constraints in Section A.3.2.2 Mapping Requirements also apply to DICOM SR "Imaging Reports With Conditional Radiation Exposure and Protection Information" that are mapped to CDA Diagnostic Imaging Reports.

B.3 HL7 CDA Release 2 Diagnostic Imaging Report Target Structure

The structure of DICOM SR Template TID 2006 is similar to DICOM SR TID 2000 Basic Diagnostic Imaging Report. References to the SR Diagnostic Imaging Report Transformation Guide (PS 3.20, Annex A) are used where the transformation of TID 2006 based reports is identical to that of basic diagnostic imaging reports. Details are outlined where new specific mapping requirements exist.

"Imaging Reports With Conditional Radiation Exposure and Protection Information"transformations that are identical to the "Diagnostic Imaging Report Transformation Guide" specification (PS 3.20, Annex A):

- Transformation of DICOM header module attributes as specified in Section A.5.1.1 Header (Level 1) of PS 3.20, Annex A.
- General transformation of DICOM sections as specified in Section A.5.1.2 Section (Level 2) of PS 3.20, Annex A.
- Transformation of "Structured Body (Level 3) " artifacts as specified in Section A.5.1.3 of PS 3.20) for: "Coded Observations", "Text Observations", "Image References and Measurements within Section", "Quantity Measurement + DICOM Composite Object References" (Use the linear measurement SNOMED code mapping as specified in Table A.5.1.3-4. Information on relevant DICOM objects referenced within the CDA target document's body and on the original DICOM SR document shall be included in the CDA DICOM object catalog section.).
- Transformation of "DICOM SR Observation Context" as specified in Section A.5.1.4 of PS 3.20 and the following subsections of this document: "Subject Context" (Section A.5.1.4.1), "Procedure Context" (Section A.5.1.4.2) and "Observer Context" (Section A.5.1.4.3).

PS 3.20, Annex A also contains information on HL7 data types mapping in Section A.8.

B.4 TID 2006 "Imaging Report with Conditional Radiation Exposure and Protection Information" Specific Mapping Requirements

In addition to the transformations listed in Section B.3, TID 2006-specific contents shall be mapped as outlined below.

Study Date and Study Time in TID 2007 Imaging Procedure Description:

The study date and time observation is modeled as a CDA section component and shall be encoded as a section entry.

Table B.4-1. Study Date and Time Observation

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
code	CE	1..1	<"113014" as code property,"1.2.840.10008.2.16.4"as codeSystem property,"DCM"as codeSystemName property, "Study" as displayName property>
effectiveTime	TS	1..1	"Study Date" value (DATE Value Type) and if present "Study Time" value (TIME Value Type)
languageCode	CE	0..1	Not used at entry level.
value	ANY	0..1	Not used.

The syntax of Point in Time (TS) is "YYYYMMDDHHMMSS.UUUU[+|-ZZzz]" where digits can be omitted from the right side to express less precision. If only "Study Date" is available from TID 2007, the form "YYYYMMDD" can be used.

Reference to Composite Objects in TID 2007 Imaging Procedure Description:

References to Composite Objects are used for DICOM objects that are not DICOM Images or Waveforms, for instance to SR Documents or to HL7 Structured Documents. Composite object reference observations are modeled as CDA section components and shall be encoded as section entries. The mapping of SopInstance references for composite objects is identical to image SopInstance references (please refer to PS 3.20 Annex A *SR Diagnostic Imaging Report Transformation Guide* for detailed information).

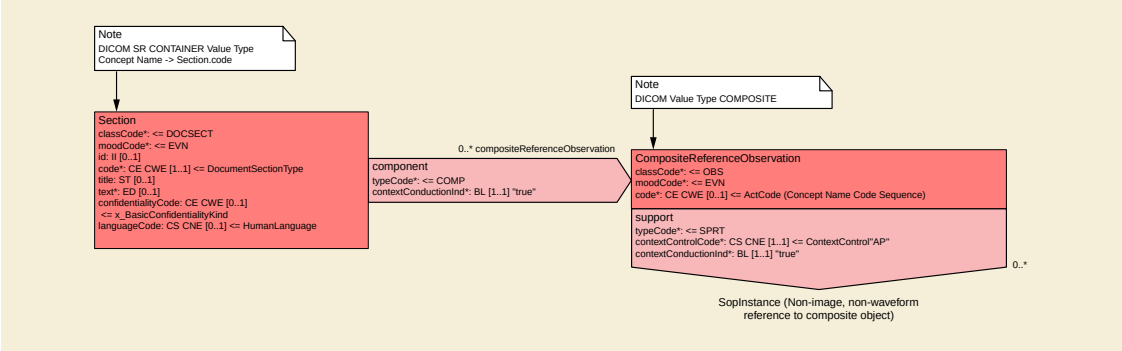

Figure B.4-1. Composite Object References

Table B.4-2. Composite Object Reference Observation

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	OBS
moodCode	CS	1..1	EVN
templateId	LIST<II>	1..*	
code	CE	0..1	Concept Name Code Sequence (0040,A043) of COMPOSITE Content Item (required if the Purpose of Reference is conveyed in the Concept Name): <code value as code property, coding scheme designator as codeSystemName property, code meaning as displayName property>
effectiveTime	TS	0..1	Not used.
languageCode	CE	0..1	Not used at entry level.
value	ANY	0..1	Not used.

The following Observation.code values shall be used for TID 2007 references to DICOM SR X-Ray Radiation Dose Reports: <"113701" as code property,"1.2.840.10008.2.16.4"as codeSystem property,"DCM"as codeSystemName property, "X-Ray Radiation Dose Report" as displayName property>.

"Irradiation Authorizing" (Value Type PNAME) in TID 2008 Radiation Exposure and Protection Information

The attributes of the "Irradiation Authorizing" PNAME content item are mapped to the ServiceEvent performer participation associated role and entities as specified in Table B.4-3, Table B.4-2 and Table B.4-5.

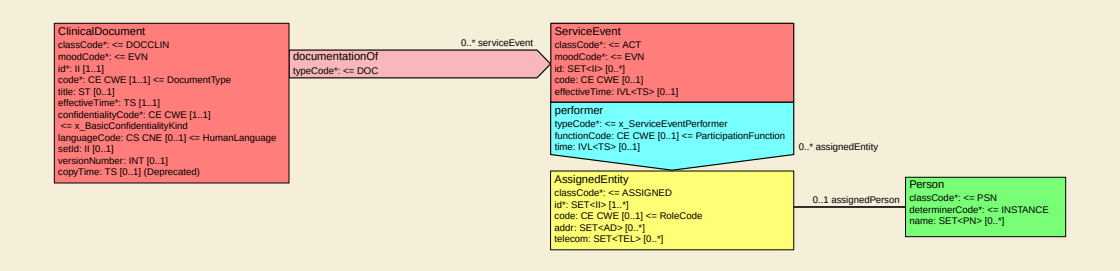

Figure B.4-2. Irradiation Authorizing Service Event Participation

Table B.4-3. Performer Participation

Attribute	Data Type	Multiplicity	Value
typeCode	CS	1..1	PRF
functionCode	CE	0..1	Shall not be sent.
time	IVL<TS>	0..1	Shall not be sent.

Table B.4-4. Assigned Entity

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	ASSIGNED
id	SET<II>	1..*	Use null flavor value "NI" (No Information) if the value cannot be obtained from some other source.
code	CE	1..1	Concept Name Code Sequence (0040,A043) of PNAME Content Item: <"113850" as code property, "1.2.840.10008.2.16.4" as codeSystem property, "DCM" as codeSystemName property, "Irradiation Authorizing" as displayName property>.
addr	SET<AD>	0..*	Shall not be sent.
telecom	SET<TEL>	0..*	Shall not be sent.

Table B.4-5. Person

Attribute	Data Type	Multiplicity	Value
classCode	CS	1..1	PSN
determinerCode	CS	1..1	INSTANCE
name	PN	1..1	Person Name (0040,A123)