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Digital Imaging and Communications in Medicine (DICOM)

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Supplement 185: Content Assessment Results IOD

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30   **Table of Contents**

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Foreword

72 This Supplement specifies a new IOD to encode the results of an assessment by a person or device of the content of a DICOM SOP Instance. An assessment might be performed when the content of the SOP

74 Instance could cause serious delays in clinical workflow, or outright harm to a patient, if the values are not consistent and safe. DICOM itself does not define the criteria for such assessments or the clinical

76 workflow implications.

This document is an extension to the following parts of the published DICOM Standard:

78 PS 3.2   Conformance

PS 3.3   Information Object Definitions

80 PS 3.4   Service Class Specifications

PS 3.6   Data Dictionary

82 PS 3.16   Content Mapping Resource

PS 3.17   Explanatory Information

84

Scope and Field of Application

86 This Supplement specifies the IOD representing content assessment by a person or device. It stems from the development of the Quality Assurance with Plan Veto profile in IHE-RO. While the profile originated

88 from use cases to assess RT Plan, the IOD is generalized to allow for reporting of assessment results of any DICOM SOP Instance.

90 **Part 2 Addendum**

92 **Add new SOP Classes to PS3.2 Table A.1-2 UID Values:**

UID Value	UID Name	Category
1.2.840.10008.5.1.4.1.1.90.1	Content Assessment Results Storage SOP Class	Transfer

94

96   **Part 3 Addendum**

In PS3.3, Section 10.17:

98   **- Add text to 10.17**
- Add Proceeding Text and Table 10-20b

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100   **10.17 SELECTOR ATTRIBUTE MACROS**

Table 10-20 specifies the Attributes that identify the context for a Data Element Tag that is used as a
102   Selector Attribute (0072,0026). The attribute may be an attribute nested within one or more Sequences,
and/or a Private Attribute.

104   **Table 10-20a extends the Selector Attribute Macro with additional attribute descriptors.**

Table 10-20. Selector Attribute Macro Attributes
106   … (Table Body 10-20a) …

Table 10-20a. Extended Selector Attribute Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Selector Attribute Name	**(0082,0018)**	**1**	**Name of the Selector Attribute (0072,0026).** **For standard data elements, this shall be the value in the Name column of PS3.6 Table 6-1.**
Selector Attribute Keyword	**(0082,0019)**	**3**	**Keyword of the Selector Attribute (0072,0026).** **For standard data elements, this shall be the value in the Keyword column of PS3.6 Table 6-1.**
Selector Attribute VR	**(0072,0050)**	**1**	**Value Representation of the Selector Attribute (0072,0026).** **For standard data elements, this shall be the value in the VR column of PS3.6 Table 6-1.**
Include Table 10-20 'Selector Attribute Macro Attributes'			

108

In PS3.3, add new section 10.25

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110   **10.25 ATTRIBUTE VALUE CONSTRAINT MACRO**

Table 10.25-1 allows an Attribute to be identified and to have constraints placed on acceptable values for
112   that Attribute. An Attribute being constrained is refered to in the macro as a Selector Attribute.

Notes: 1. This Macro does not handle mutual constraints between multiple Attributes. For example constraining
114   the ratio between two Attributes to a specific value is not possible unless there is a third Attribute that
           encodes that ratio so the third Attribute could then be constrained.
116   2. The SOP Instance containing this macro defines the purpose of the constraints which may include
           constraining attribute values in other SOP Instances.

118

Table 10.25-1

ATTRIBUTE VALUE CONSTRAINT MACRO ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Include Table 10-20a 'Extended Selector Attribute Macro Attributes'			

Constraint Type	(0082,0032)	1	Describes how the value(s) specified in the Constraint Value Sequence (0082,0034) shall be used to determine the acceptability of a given value for the Attribute identified by Selector Attribute (0072,0026)
			
			 See 10.25.1.
			
			 Enumerated Values:
			   RANGE_INCL
			   RANGE_EXCL
			   GREATER_OR_EQUAL
			   LESS_OR_EQUAL
			   GREATER_THAN
			   LESS_THAN
			   EQUAL
			   MEMBER_OF
			   NOT_MEMBER_OF
			   MEMBER_OF_CID
			   UNCONSTRAINED

Constraint Violation Significance	(0082,0036)	3	Level of significance of a Selector Attribute value exceeding this constraint.
			
			 See Section 10.25.2.
			
			 Enumerated Values:
			   FAILURE
			   WARNING
			   INFORMATIVE

Constraint Violation Condition	(0082,0037)	1C	Conditionality of the constraint violation significance. If the condition is not met, the violation has no significance. The condition may be expressed as a mathematical expression, a human readable text or other form. Required if Constraint Violation Significance (0082,0036) is only significant under certain conditions.
Constraint Value Sequence	(0082,0034)	1C	Value(s) used to constrain the contents of the attribute referenced by the Selector Attribute (0072,0026). Required if Constraint Type (0082,0032) is not UNCONSTRAINED.

Attribute Name	Tag	Type	Attribute Description
			If the Constraint Type (0082,0032) is GREATER_OR_EQUAL, LESS_OR_EQUAL, GREATER_THAN, LESS_THAN, EQUAL or MEMBER_OF_CID only a single Item shall be included in this Sequence.
			If the Constraint Type (0082,0032) is RANGE_INCL or RANGE_EXCL, exactly two Items shall be included in this Sequence, the first of which is less than or equal to the second.
			If the Constraint Type (0082,0032) is MEMBER_OF or NOT_MEMBER_OF, one or more Items shall be included in this Sequence.
>Include Table 10.26-1 "Attribute Value Macro Attributes"			*Any sub-sequences in the Constraint Value Sequence (0082,0034) shall only contain one item.*
			Any Attribute in the Sequence Item(s) shall contain a single value.
			If Constraint Type (0082,0032) is MEMBER_OF_CID, this shall be a Selector UI Value (0072,007F), despite the Selector Attribute VR (0072,0050) being SQ.
			See Section 10.25.1.1
Recommended Default Value Sequence	(0082,0035)	3	Contains a default value for the contents of the Selector Attribute (0072,0026).
			Only a single Item is permitted in this Sequence.
>Include Table 10.26-1 "Attribute Value Macro Attributes"			
Measurement Units Code Sequence	(0040,08EA)	3	Units of measurement for the values in the Item(s) in the Constraint Value Sequence (0082,0034) and the Recommended Default Value Sequence (0082,0035).
			Only a single Item is permitted in this Sequence.
>Include Table 8.8-1 'Code Sequence Macro Attributes'			*Baseline CID 82 "Units of Measurement".*
Specification Selection Guidance	(0082,0033)	3	Brief guidance that a human operator may consider when selecting an appropriate value for the Selector Attribute (0072,0026) within the constraints defined.

120

10.25.1   Constraint Type

122 The use of the specified value(s) in the Constraint Value Sequence (0082,0034) to constrain the value of
the Attribute referenced by the Selector Attribute (0072,0026) shall depend on the value of Constraint
124 Type (0082,0032) as follows:

       RANGE_INCL   the value is constrained to lie between the specified values, or be
126   equal to one of the specified values

128	RANGE_EXCL	the value is constrained to lie outside (i.e. not between) the specified values
130	GREATER_OR_EQUAL	the value is constrained to be greater than or equal to the specified value
	LESS_OR_EQUAL	the value is constrained to be less than or equal to the specified value
132	GREATER_THAN	the value is constrained to be greater than the specified value
	LESS_THAN	the value is constrained to be less than the specified value
134	EQUAL	the value is constrained to be equal to the specified value
	MEMBER_OF	the value is constrained to be equal to one of the specified values
136	NOT_MEMBER_OF	the value is constrained to be not equal to any of the specified values
	MEMBER_OF_CID	the value is constrained to be equal to a member of the specified CID
138	UNCONSTRAINED	the value of the Selector Attribute (0072,0026) is not constrained

140   For MEMBER_OF_CID, Constraint Value Sequence (0082,0034) shall contain a single Selector UI Value (0072,007F), containing a Context Group UID (see PS 3.6, Table A-3. Context Group UID Values).

142   RANGE_INCL, RANGE_EXCL, GREATER_OR_EQUAL, LESS_OR_EQUAL, GREATER_THAN or LESS_THAN shall only be specified if the Selector Attribute (0072,0026) is AS, DA, DS, DT, FD, FL, IS,
144   SL, SS, TM, UL or US.

See PS 3.4, C.2.2.2 for further guidance on value comparison.

146   Note: MEMBER_OF with a single item in the Constraint Value Sequence (0082,0034) is valid and is equivalent to EQUAL.

148   **10.25.1.1   Multi-valued Attribute Constraints**

If the Attribute referenced by the Selector Attribute (0072,0026) has a value multiplicity of greater than 1
150   and the value of Selector Value Number (0072,0028) is 0, all values in the selected attribute shall be compared to the single specified value. The constraint is violated if any of the multiple values do not
152   satisfy the comparison.

10.25.2   Constraint Violation Significance

154   The violation of some constraints may be more significant than others. Constraint Violation Significance (0082,0036) differentiates three levels of signficance.

156   Specific behaviors associated with each level may be defined by the SOP Class or may be left to implementations. For example, violation of a constraint with a significance of FAILURE might require
158   operator intervention, special auditing or rejection of the target instance being evaluated; violation of a constraint with a significance of WARNING might require the operator be notified or a warning message
160   be logged; violation of a constraint with a significance of INFORMATIVE might require an informational message be logged, or nothing at all if the constraint represents a preference not a signficant concern.

162   Note: Violation of a constraint does not imply that the Selector Attribute value is non-conformant to the Standard or is not clinically appropriate.

164

In PS3.3, add new section 10.26

166 **10.26 ATTRIBUTE VALUE MACRO**

Table 10.26-1 includes an Attribute to store a value of a specified VR.

168   **Table 10.26-1**

ATTRIBUTE VALUE MACRO ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Selector AE Value	(0072,005E)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is AE.
Selector AS Value	(0072,005F)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is AS.
Selector AT Value	(0072,0060)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is AT.
Selector CS Value	(0072,0062)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is CS.
Selector DA Value	(0072,0061)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is DA. See Note 2.
Selector DS Value	(0072,0072)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is DS. See Note 1 and Note 2.
Selector DT Value	(0072,0063)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is DT. See Note 1 and Note 2.
Selector FD Value	(0072,0074)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). Required if Selector Attribute VR (0072,0050) is present and the value is FD. See Note 2.
Selector FL Value	(0072,0076)	1C	The value(s) of the attribute identified by Selector

Attribute Name	Tag	Type	Attribute Description
			Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is FL.
			See Note 2.
Selector IS Value	(0072,0064)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is IS.
Selector LO Value	(0072,0066)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is LO.
Selector LT Value	(0072,0068)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is LT.
Selector OB Value	(0072,0065)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is OB.
Selector OD Value	(0072,0073)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is OD.
Selector OF Value	(0072,0067)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is OF.
Selector OL Value	(0072,0075)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is OL.
Selector OW Value	(0072,0069)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is OW.
Selector PN Value	(0072,006A)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is PN.
Selector SH Value	(0072,006C)	1C	The value(s) of the attribute identified by Selector

Attribute Name	Tag	Type	Attribute Description
			Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is SH.
Selector SL Value	(0072,007C)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is SL.
Selector SS Value	(0072,007E)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is SS.
Selector ST Value	(0072,006E)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is ST.
Selector TM Value	(0072,006B)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is TM.
			See Note 1 and Note 2.
Selector UC Value	(0072,006F)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is UC.
Selector UI Value	(0072,007F)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is UI.
Selector UL Value	(0072,0078)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is UL.
Selector UN Value	(0072,006D)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is UN.
Selector UR Value	(0072,0071)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is UR.
Selector US Value	(0072,007A)	1C	The value(s) of the attribute identified by Selector

Attribute Name	Tag	Type	Attribute Description
			Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is US.
Selector UT Value	(0072,0070)	1C	The value of the attribute identified by Selector Attribute (0072,0026).
			Required if Selector Attribute VR (0072,0050) is present and the value is UT.
Selector Code Sequence Value	(0072,0080)	1C	The value(s) of the attribute identified by Selector Attribute (0072,0026). One or more Items shall be included in this sequence. See Section C.23.1.1.3.2.
			Required if Selector Attribute VR (0072,0050) is present and the value is SQ and the Attribute referenced by the Selector Attribute (0072,0026) is a Code Sequence.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			No Baseline CID is defined.

170

Note 1:   For string Value Representations, the meaning of the Value in the standard shall be used, not the literal
172   string. E.g. "1.0E+3" equals "1000" and "1000.0".

Note 2:   Some leniency will be required by the application in precision when matching this selector value to an
174   attribute value.

Add the following column in PS3.3 Section A.1.4, Table A.1-3. Composite Information Object Modules Overview - More Non-Images

178

IODs Modules	Content Assessment Results
Patient	**M**
Clinical Trial Subject	**U**
General Study	**M**
Patient Study	**U**
Clinical Trial Study	**U**
General Series	**M**
Clinical Trial Series	**U**
General Equipment	**M**
Enhanced General Equipment	**M**
Common Instance Reference	**M**

Content Assessment Results	**M**
SOP Common	**M**

180

In PS3.3, Section A.1.2, add Content Assessment Result IE to Figure A.1-1

182

In PS3.3, Section A.1.2, include Section A.1.2.22

184

A.1 ELEMENTS OF AN INFORMATION OBJECT DEFINITION

186   …

A.1.2 IOD Entity-Relationship Model

188

…

190   **A.1.2.22 Content Assessment Result IE**

The Content Assessment Result IE contains the results of an assessment of the content of a SOP
192   instance.

An assessment is part of a process within a clinical workflow, conducted by users or devices, which have
194   the role of assessing the validity and suitability of the content in question, based on subjective or objective
criteria. The specific nature of such a process is outside of the scope of this standard.

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196   **In PS3.3 add the following IOD to Annex A:**

A.81   CONTENT ASSESSMENT RESULTS IOD

198   **A.81.1   Content Assessment Results IOD Description**

This IOD represents the results of an assessment of the content of one or more SOP Instance(s). The
200   assessment may be performed automatically without human intervention. There is no provision for
encoding verification or approval by a human, although a human may be involved in determining whether
202   the contents meet certain criteria. This IOD is not intended to communicate approval to proceed with the
clinical workflow.

204   The Content Assessment Results SOP Instance is not required to be part of the same study as the
assessed SOP Instances.

206   **A.81.2   Content Assessment Results IOD Entity-Relationship Model**

The Content Assessment Results IOD uses the E-R Model in Section A.1.2, with only the Content
208   Assessment Results IE below the Series IE. The Frame of Reference IE is not a component of this IOD.

A.81.3   Content Assessment Results IOD Module Table

210   **Table A.81.3-1. Content Assessment Results IOD Modules**

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
	Clinical Trial Subject	C.7.1.3	U
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
	Clinical Trial Study	C.7.2.3	U
Series	General Series	C.7.3.1	M
	Clinical Trial Series	C.7.3.2	U
Equipment	General Equipment	C.7.5.1	M
	Enhanced General Equipment	C.7.5.2	M
Content Assessment Results	Content Assessment Results	C.33.1	M
	SOP Common	C.12.1	M
	Common Instance Reference	C.12.2	M

212   **A.81.4   Content Assessment Results IOD Content Constraints**

A.81.4.1   Modality

214   The value of Modality (0008,0060) shall be ASMT.

216   **In PS3.3 add the following modality to Annex C, section C.7.3.1.1.1 Modality:**

C.7.3.1.1 General Series Attribute Descriptions

218   **C.7.3.1.1.1 Modality**

Defined Terms:

220   …

ASMT

222

Content Assessment Results

224   …

In PS3.3 add the following Module:

226   **C.33 CONTENT ASSESSMENT MODULES**

        C.33.1   Content Assessment Results Module

228   This Module describes the results of the assessment of a SOP Instance.

        The type of observations that are included in the results is up to the implementation. Although all
230   observations with the Observation Significance (0082,0008) with value MAJOR are included, inclusion of
        other observation is on the discretion of the implementation.

232

Table C.33.1-1 Content Assessment Results Module Attributes

Attribute Name	Tag	Type	Attribute Description
Assessment Label	(0082,0023)	1	A label that is used to identify this Assessment.
Assessment Type Code Sequence	(0082,0021)	1	Type of Assessment that was performed. Only a single item shall be included in this Sequence.
>Include Table 8.8-1 'Code Sequence Macro Attributes'			Baseline CID 701
Assessment Set ID	(0082,0016)	3	Identifies the set of assessments to which this assessment result belongs.
Assessment Requester Sequence	(0082,0017)	2	The person or device that made the assessment request. Only a single item shall be included in this Sequence.
>Include Table C.17-3b 'Identified Person or Device Macro Attributes'			
Assessed SOP Instance Sequence	(0082,0004)	1	The SOP Instances that were assessed. One or more Items shall be included in this Sequence.
>Include Table 10-11. 'SOP Instance Reference Macro Attributes'			
>Referenced Comparison SOP Instance Sequence	(0082,0005)	1C	SOP Instance(s) used by the assessor to compare to the assessed SOP Instances. Required if the assessor used comparison SOP Instances. One or more Items shall be included in this Sequence.
>>Include Table 10-11. 'SOP Instance Reference Macro Attributes'			
Assessment Summary	(0082,0001)	1	Summary of the assessment result. The relationship between the values of Observation Type (0082,0008) found and the Assessment Summary value is

Attribute Name	Tag	Type	Attribute Description

			implementation dependent.
			Enumerated Values:
			  PASSED
			    The assessment has passed. E.g. no observation of major or moderate concern was made.
			  INCONCLUSIVE
			    The object(s) have not definitively passed or failed. E.g. observations of moderate concern were made.
			  FAILED
			    The object(s) have failed the assessment. E.g. observations of major concern were made.

Assessment Summary Description	(0082,0003)	3	Human-readable summary description of the assessment result.
Pertinent Resources Sequence	(0038,0101)	3	List of Resources that contain information considered pertinent for the assessment. Note: This may include specifications for the assessment process and criteria for determining the Observation Type (0082,0008). One or more items may be present in this Sequence.
>Retrieve URI	(0040,E010)	1	Retrieval access path to resource. Includes fully specified scheme, authority, path, and query in accordance with [RFC 3986].
>Resource Description	(0038,0102)	3	Description or title of the resource
Number of Assessment Observations	(0082,0006)	1	Number of Observations made during the assessment.
Assessment Observations Sequence	(0082,0007)	1C	Observations made during the assessment. Required if Number of Assessment Observations (0082,0006) is not zero. The number of Items included in the Sequence shall equal the value of Number of Assessment Observations (0082,0006).
>Observation Significance	(0082,0008)	1	The significance of this observation regarding the quality or effectiveness of the assessed SOP Instance of this observation.

Attribute Name	Tag	Type	Attribute Description

			Enumerated Values:
			
			MAJOR
			    The observation represents a major concern. Further use of the assessed object(s) is not advised.
			
			MODERATE
			    The observation represents a moderate concern. Intervention by an authorized person is advised prior to any use of the assessed object(s).
			
			MINOR
			    The observation represents a minor concern, that does not inhibit further use of the assessed object(s).
			
			CONSISTENT
			    The observation was consistent with the assessment criteria.

>Observation Basis Code Sequence	(0082,0022)	1	Basis on which the Observation was performed. Only a single item shall be included in this Sequence.
>>*Include Table 8.8-1 'Code Sequence Macro Attributes'*			*Baseline CID 703*
>Observation Description	(0082,000A)	1	Human-readable description of the Observation.
>Structured Constraint Observation Sequence	(0082,000C)	2	Structured Constraint(s) that were used to make this observation and description of conformance or violation. Zero or more Items shall be included in this Sequence.
>>*Include Table 10.25-1 'Attribute Value Constraint Macro Attributes'*			
>>Assessed Attribute Value Sequence	(0082,0010)	1	The value of the attribute in the assessed SOP Instance. One or more Items shall be included in this Sequence.
>>>*Include Table 10.26-1 'Attribute Value Macro Attributes'*			

234

236

238 | **In PS3.3, make the following additions to Annex F, Table F.3.3:**

Table F.3-3. Directory Information Module Attributes

240

Attribute Name	Tag	Type	Attribute Description
…			
>Directory Record Type	(0004,1430)	1	Defines a specialized type of Directory Record by reference to its position in the Media Storage Directory Information Model (see Section F.4).
			Enumerated Values:
			PATIENT
			STUDY
			SERIES
			IMAGE
			RT DOSE
			RT STRUCTURE SET
			RT PLAN
			RT TREAT RECORD
			PRESENTATION
			WAVEFORM
			SR DOCUMENT
			KEY OBJECT DOC
			SPECTROSCOPY
			RAW DATA
			REGISTRATION
			FIDUCIAL
			HANGING PROTOCOL
			ENCAP DOC
			HL7 STRUC DOC
			VALUE MAP
			STEREOMETRIC
			PALETTE
			IMPLANT
			IMPLANT GROUP
			IMPLANT ASSY
			MEASUREMENT
			SURFACE
			SURFACE SCAN
			ASSESSMENT
			PRIVATE

			Privately defined record hierarchy position. Type shall be defined by Private Record UID (0004,1432).
			Note
			Enumerated Values PRINT QUEUE, FILM SESSION, FILM BOX, and IMAGE BOX were previously defined in DICOM for this Attribute. They are now retired. See PS3.3-1998.
			Enumerated Values OVERLAY, MODALITY LUT, VOI LUT, CURVE, TOPIC, VISIT, RESULTS, INTERPRETATION, STUDY COMPONENT and STORED PRINT were previously defined in DICOM for this Attribute. They are now retired. See *PS3.3-2004*.
			Enumerated Value MRDR was previously defined in DICOM for this Attribute, to allow indirect reference to a File by multiple Directory Records. It is now retired. FSUs and FSRs are unlikely to be capable of supporting this mechanism. See PS3.3-2004.

242 **In PS3.3, make the following additions to PS3.3, Annex F, Table F.4-1**

F.4   BASIC DIRECTORY IOD INFORMATION MODEL

244   **Table F.4-1**
                    RELATIONSHIP BETWEEN DIRECTORY RECORDS

246

Directory Record Type	Section	Directory Record Types which may be included in the next lower-level directory Entity
(Root Directory Entity)	¾	PATIENT, HANGING PROTOCOL, PALETTE, PRIVATE
PATIENT	F.5.1	STUDY, HL7 STRUC DOC, PRIVATE
STUDY	F.5.2	SERIES, PRIVATE
SERIES	F.5.3	IMAGE, RT DOSE, RT STRUCTURE SET, RT PLAN, RT TREAT RECORD, PRESENTATION, WAVEFORM, SR DOCUMENT, KEY OBJECT DOC, SPECTROSCOPY, RAW DATA, REGISTRATION, FIDUCIAL, ENCAP DOC, VALUE MAP, STEREOMETRIC, PLAN, MEASUREMENT, SURFACE, **ASSESSMENT** , PRIVATE
IMAGE	F.5.4	PRIVATE
RT DOSE	F.5.19	PRIVATE
RT STRUCTURE SET	F.5.20	PRIVATE
RT PLAN	F.5.21	PRIVATE
RT TREAT RECORD	F.5.22	PRIVATE
PRESENTATION	F.5.23	PRIVATE
WAVEFORM	F.5.24	PRIVATE
SR DOCUMENT	F.5.25	PRIVATE
KEY OBJECT DOC	F.5.26	PRIVATE

SPECTROSCOPY	F.5.27	PRIVATE
RAW DATA	F.5.28	PRIVATE
REGISTRATION	F.5.29	PRIVATE
FIDUCIAL	F.5.30	PRIVATE
HANGING PROTOCOL	F.5.31	PRIVATE
ENCAP DOC	F.5.32	PRIVATE
HL7 STRUC DOC	F.5.33	PRIVATE
VALUE MAP	F.5.34	PRIVATE
STEREOMETRIC	F.5.35	PRIVATE
PALETTE	F.5.36	PRIVATE
ASSESSMENT	**F.5.45**	**PRIVATE**
PRIVATE	F.6.1	PRIVATE, (any of the above as privately defined)

248

250   **In PS 3.3, Annex F.5 Definition of Specific Directory Records, Figure F.4-1, Basic Directory IOD Information Model, make the following additions:**

       Add "Content Assessments Result DR" box at the bottom.

252   **Set Multiplicity to 0-n**

254   **In PS3.3, Annex F.5, add the following Section F.5.45:**

F.5.45   Content Assessment Results Directory Record Definition

256   The Directory Record is based on the specification of Section F.3. It is identified by a Directory Record Type of Value "ASSESSMENT". Table F.5-45 lists the set of keys with their associated Types for such a
258   Directory Record Type. The description of these keys may be found in the Modules related to the Content Assessment Results IOD. This Directory Record shall be used to reference a Content Assessment
260   Results SOP Instance. This type of Directory Record may reference a Lower-Level Directory Entity that includes one or more Directory Records as defined in Table F.4-1.

262   **Table F.5-45**
                              CONTENT ASSESSMENT RESULTS KEYS

Key	Tag	Type	Attribute Description
Specific Character Set	(0008,0005)	1C	Required if an extended or replacement character set is used in one of the keys.
Instance Number	(0020,0013)	1	
Instance Creation Date	(0008,0012)	1	
Instance Creation Time	(0008,0013)	2	
Any other Attribute of the Content Assessment Results IE Modules		3	

264

       Note:

266   Because Referenced SOP Instance UID in File (0004,1511) may be used as a "pseudo" Directory Record Key (See Table F.3-3), it is not duplicated in this list of keys.

268

Part 4 Addendum

270   **Add the following to PS3.4, Appendix B.5, Table B.5-1**

Table B.5-1. Standard SOP Classes

SOP Class Name	SOP Class UID	IOD Specification (defined in PS3.3)
Content Assessment Results Storage	1.2.840.10008.5.1.4.1.1.90.1	Content Assessment Results IOD

272

Add the following Section B.5.1.20 to PS3.4, Annex B.5.1:

274 **B.5.1.20   Content Assessment Results Storage SOP Classes**

An SCU of the Content Assessment Results Storage SOP Class that creates SOP Instances of the Class
276 shall identify in its Conformance Statement the criteria for setting the Observation Significance
(0082,0008).

278 **Add the following to PS3.4, Appendix I.4, Table I.4-1**

Table I.4-1 Media Storage Standard SOP Classes

SOP Class Name	SOP Class UID	IOD Specification (defined in PS3.3)
Content Assessment Results Storage	1.2.840.10008.5.1.4.1.1.90.1	Content Assessment Results IOD

280

Part 6 Addendum

282 **Add the following Data Elements to PS3.6:**

Table 6-1. Registry of DICOM Data Elements

Tag	Name	Keyword	VR	VM
(0082,0001)	Assessment Summary	AssessmentSummary	CS	1
(0082,0003)	Assessment Summary Description	AssessmentSummaryDescription	UT	1
(0082,0004)	Assessed SOP Instance Sequence	AssessedSOPInstanceSequence	SQ	1
(0082,0005)	Referenced Comparison SOP Instance Sequence	ReferencedComparisonSOPInstanceSequence	SQ	1
(0082,0006)	Number of Assessment Observations	NumberOfAssessmentObservations	UL	1

Tag	Name	Keyword	VR	VM
(0082,0007)	Assessment Observations Sequence	AssessmentObservationsSequence	SQ	1
(0082,0008)	Observation Significance	ObservationSignificance	CS	1
(0082,000A)	Observation Description	ObservationDescription	UT	1
(0082,000C)	Structured Constraint Observation Sequence	StructuredContraintObservationSequence	SQ	1
(0082,0010)	Assessed Attribute Value Sequence	AssessedAttributeValueSequence	SQ	1
(0082,0016)	Assessment Set ID	AssessmentSetID	LO	1
(0082,0017)	Assessment Requester Sequence	AssessmentRequesterSequence	SQ	1
(0082,0018)	Selector Attribute Name	SelectorAttributeName	LO	1
(0082,0019)	Selector Attribute Keyword	SelectorAttributeKeyword	LO	1
(0082,0021)	Assessment Type Code Sequence	AssessmentTypeCodeSequence	SQ	1
(0082,0022)	Observation Basis Code Sequence	ObservationBasisCodeSequence	SQ	1
(0082,0023)	Assessment Label	AssessmentLabel	LO	1
(0082,0032)	Constraint Type	ConstraintType	CS	1
(0082,0033)	Specification Selection Guidance	SpecificationSelectionGuidance	UT	1
(0082,0034)	Constraint Value Sequence	ConstraintValueSequence	SQ	1
(0082,0035)	Recommended Default Value Sequence	RecommendedDefaultValueSequence	SQ	1
(0082,0036)	Constraint Violation Significance	ConstraintViolationSignificance	CS	1
(0082,0037)	Constraint Violation Condition	ConstraintViolationCondition	UT	1
(0072,005E)	Selector AE Value	SelectorAEValue	AE	1-n
(0072,005F)	Selector AS Value	SelectorASValue	AS	1-n
(0072,0061)	Selector DA Value	SelectorDAValue	DA	1-n
(0072,0063)	Selector DT Value	SelectorDTValue	DT	1-n
(0072,0065)	Selector OB Value	SelectorOBValue	OB	1
(0072,0067)	Selector OF Value	SelectorOFValue	OF	1
(0072,0069)	Selector OW Value	SelectorOWValue	OW	1

Tag	Name	Keyword	VR	VM
(0072,006B)	Selector TM Value	SelectorTMValue	TM	1-n
(0072,006D)	Selector UN Value	SelectorUNValue	UN	1
(0072,006F)	Selector UC Value	SelectorUCValue	UC	1-n
(0072,0071)	Selector UR Value	SelectorURValue	UR	1
(0072,0073)	Selector OD Value	SelectorODValue	OD	1
(0072,0075)	Selector OL Value	SelectorOLValue	OL	1

284

Add the following to PS3.6 Annex A:

286

ANNEX A   REGISTRY OF DICOM UNIQUE IDENTIFIERS (UID) (NORMATIVE)

UID Value	UID Name	UID Type	Part
1.2.840.10008.5.1.4.1.1.90.1	Content Assessment Results Storage	SOP Class	PS 3.4

288

Table A-3
290 **CONTEXT GROUP UID VALUES**

Context UID	Context Identifier	Context Group Name
1.2.840.10008.6.1.1116	701	Content Assessment Types
1.2.840.10008.6.1.1117	702	RT Content Assessment Types
1.2.840.10008.6.1.1118	703	Basis of Assessment

292

294   **Part 16 Addendum**

In PS3.16 add the following CID tables to Annex B:

296

CID 701   CONTENT ASSESSMENT TYPES

298   **Context ID 701**

                                      Content Assessment Types

300   **Type: Extensible   Version: 20160318**

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
Include CID 702 'RT Content Assessment Type'		

302   **CID 702   RT CONTENT ASSESSMENT TYPES**

                                          Context ID 702

304   **RT Content Assessment Types**

                           Type: Extensible   Version: 20160318

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	121373	RT Pre-Treatment Dose Check
DCM	121374	RT Pre-Treatment Consistency Check

306

CID 703   BASIS OF ASSESSMENT

308   **Context ID 703**

                                      Basis of Assessment

310   **Type: Extensible   Version: 20160318**

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	121375	Assessment By Comparison
DCM	121376	Assessment By Rules

312   **In PS3.16, Annex D, add the following codes to Table D-1:**

Table D-1. DICOM Controlled Terminology Definitions

314

Code Value	Code Meaning	Definition	Notes
…			
121373	**RT Pre-Treatment Dose Check**	**An assessment of the dose delivery parameters performed before treatment.**	
121374	**RT Pre-Treatment Consistency Check**	**An assessment of consistency with a previously quality-assured treatment plan performed before treatment.**	
121375	**Assessment By Comparison**	**The basis of the assessment was a comparison object.**	
121376	**Assessment By Rules**	**The basis of the assessment was a set of rules on expected values, ranges and relationships.**	

316   **Part 17 Addendum**

In PS3.17, add the following section:

318

ZZZ   CONTENT ASSESSMENT (INFORMATVE)

320   The following use cases exemplify the use of Content Assessment Results IOD.

ZZZ.1 RT PLAN TREATMENT ASSESSMENT USE CASE

322   A RT Plan SOP Instance is sent from a Treatment Planning System (TPS) to a Quality Assurance (QA)
       Application and to the Treatment Management System (TMS). The TMS de-composes the content for
324   internal storage. At the time of treatment the TMS re-composes the Instance and sends it to the operator
       console of the linear accelerator. However, during re-composition an error occurs and one jaw
326   specification is omitted from the recomposed Instance and the Beam Dose in the Fraction Scheme
       Module is set to 0.0.

328   The operator console requests the QA Application to perform an assessment to compare the copy of the
       Instance received from the operator console with the copy of the Instance received earlier from the TPS.
330   The QA Application retrieves the Instance from the operator console. The QA Application also performs an
       assessment by re-calculation of the dosimetric parameters in the assessed plan. Although the Beam
332   Meterset in the assessed plan (from the operator console) is the same as the Beam Meterset in the
       comparison plan (from the TPS), the Beam Meterset re-calculated by the QA Application is different due to
334   the missing jaw. Further on it is detected, that all Beam Dose values have the value 0.0.

       Beam Meterset for the current treatment device in this example is expressed in Monitor Units.

336 **Table ZZZ.1-1. Content Assessment Results Module Example of a RT Plan Treatment Assessment**

Nesting	Attribute Name	Tag	VR	Value
	Assessment Label	(0082,0023)	LO	Pre-Treatment Assessment of Fraction 7
	Assessment Type Code Sequence	(0082,0021)	SQ	
%item				
	>Code Value	(0008,0100)	SH	121373
	>Coding Scheme Designator	(0008,0102)	SH	DCM
	>Code Meaning	(0008,0104)	LO	RT Pre-Treatment Consistency Check
%enditem				
%endsq	(Assessment Type Code Sequence)			
	Assessment Set ID	(0082,0016)	LO	ID12345
	Assessment Requester Sequence	(0082,0017)	SQ	
%item				
	>Observer Type	(0040,A084)	CS	DEV
	>Station Name	(0008,1010)	SH	CONSOLE 1
	>Device UID	(0018,1002)	UI	1.2.3.4.5.6.7.8.9.10
	>Manufacturer	(0008,0070)	LO	Fancy Linac Inc.
	>Manufacturer's Model Name	(0008,1090)	LO	Linear Accelerator Console
	>Institution Name	(0008,0080)	LO	RT Clinic 1
	>Institution Code Sequence	(0008,0082)	SQ	
%item				
	>>Code Value	(0080,0100)	SH	Clinic1
	>>Coding Scheme Designator	(0008,0102)	SH	99MyCounty
	>>Code Meaning	(0008,0104)	LO	RT Clinic 1
%enditem				
%endsq	(>Institution Code Sequence)			
%enditem				

Nesting	Attribute Name	Tag	VR	Value
%endsq	(Assessment Requester Sequence)			
	Assessed SOP Instance Sequence	(0082,0004)	SQ	
%item				
	>Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.5.1.4.1.1.481.5 (RT Plan Storage)
	>Referenced SOP Instance UID	(0008,1155)	UI	1.2.3.4.5.300
%enditem				
	>Referenced Comparison SOP Instance Sequence	(0082,0005)	SQ	
%item				
	>>Referenced SOP Class UID	(0008,1150)	UI	1.2.840.10008.5.1.4.1.1.481.5 (RT Plan Storage)
	>>Referenced SOP Instance UID	(0008,1155)	UI	1.2.3.4.5.300
%enditem				
%endsq	(>Referenced Comparison SOP Instance Sequence)			
%enditem				
%endsq	(Assessed SOP Instance Sequence)			
	Assessment Summary	(0082,0001)	CS	FAILED
	Assessment Summary Description	(0082,0003)	UT	Plan Checker result: Failed! The assessed RT Plan does not match the reference RT Plan it is compared to. One or more relevant attributes are not equal. Monitor Unit values and Beam Doses have unreasonable values.
	Number of Assessment Observations	(0082,0006)	UL	3
	Assessment Observations Sequence	(0082,0007)	SQ	
%item				
	>Observation Significance	(0082,0008)	CS	MAJOR
	>Observation Basis Code	(0082,0022)	SQ	

Nesting	Attribute Name	Tag	VR	Value
	Sequence			
%item				
	>>Code Value	(0008,0100)	SH	121375
	>>Coding Scheme Designator	(0008,0102)	SH	DCM
	>>Code Meaning	(0008,0104)	LO	Assessment By Comparison
%enditem				
%endsq	(>Assessment Basis Code Sequence)			
	>Observation Description	(0082,000A)	UT	Attribute value of Leaf Jaw Positions is not equal.
	>Structured Constraint Observation Sequence	(0082,000C)	SQ	
%item				
	>>Selector Attribute Name	(0082,0018)	LO	Leaf Jaw Positions
	>>Selector Attribute VR	(0072,0050)	CS	DS
	>>Selector Attribute	(0072,0026)	AT	300A011C
	>>Selector Value Number	(0072,0028))	US	1
	>>Selector Sequence Pointer	(0072,0052)	AT	300A00B0\300A0111\300A011A
	>>Selector Sequence Pointer Items	(0074,1057)	IS	1\2\2
	>>Constraint Type	(0082,0032)	CS	EQUAL
	>> Constraint Violation Significance	(0082,0036)	CS	FAILURE
	>>Constraint Value Sequence	(0082,0034)	SQ	
%item				
	>>>Selector DS Value	(0072,0072)	DS	-75.000\75.000
%enditem				
%endsq	(>>Constraint Value Sequence)			
	>>Assessed Attribute Value Sequence	(0082,0010)	SQ	

Nesting	Attribute Name	Tag	VR	Value
%item				
	>>>Selector DS Value	(0072,0072)	DS	-75.000
%enditem				
%endsq	(>>Assessed Attribute Value Sequence)			
%enditem				
%endsq	(>Constraint Observation Sequence)			
%enditem				
%item				
	>Observation Significance	(0082,0008)	CS	MAJOR
	>Observation Basis Code Sequence	(0082,0022)	SQ	
%item				
	>>Code Value	(0008,0100)	SH	121376
	>>Coding Scheme Designator	(0008,0102)	SH	DCM
	>>Code Meaning	(0008,0104)	LO	Assessment By Quality Rules
%enditem				
%endsq	(>Assessment Basis Code Sequence)			
	>Observation Description	(0082,000A)	UT	Monitor Units re-calculation failed. The re-calculation of the beam meterset resulted in a different value (76MU) than the value in the assessed RT Plan. This value is outside the tolerance of reasonable differences acceptable on re-calculation.
	>Structured Constraint Observation Sequence	(0082,000C)	SQ	
%item				
	>>Selector Attribute Name	(0082,0018)	LO	Beam Meterset
	>>Selector Attribute VR	(0072,0050)	CS	DS
	>>Selector Attribute	(0072,0026)	AT	300A0086
	>>Selector Value Number	(0072,0028))	US	1
	>>Selector Sequence	(0072,0052)	AT	300A0070\300C0004

Nesting	Attribute Name	Tag	VR	Value
	Pointer			
	>>Selector Sequence Pointer Items	(0074,1057)	IS	1\1
	>>Constraint Type	(0082,0032)	CS	RANGE_INCL
	>> Constraint Violation Significance	(0082,0036)	CS	FAILURE
	>>Constraint Value Sequence	(0082,0034)	SQ	
%item				
	>>>Selector DS Value	(0072,0072)	DS	68
%enditem				
%item				
	>>>Selector DS Value	(0072,0072)	DS	84
%enditem				
%endsq	(>>Constraint Value Sequence)			
	>>Assessed Attribute Value Sequence	(0082,0010)	SQ	
%item				
	>>>Selector DS Value	(0072,0072)	DS	108
%enditem				
%endsq	(>>Assessed Attribute Value Sequence)			
%enditem				
%endsq	(>Constraint Observation Sequence)			
%enditem				
%item				
	>Observation Significance	(0082,0008)	CS	MODERATE
	>Observation Basis Code Sequence	(0082,0022)	SQ	
%item				
	>>Code Value	(0008,0100)	SH	121376

Nesting	Attribute Name	Tag	VR	Value
	>>Coding Scheme Designator	(0008,0102)	SH	DCM
	>>Code Meaning	(0008,0104)	LO	Assessment By Quality Rules
%enditem				
%endsq	(>Observation Basis Code Sequence)			
	>Observation Description	(0082,000A)	UT	The Beam Dose value of all Beams is zero, but Beam Meterset is non-zero.
%enditem				
%endsq	(Assessment Observations Sequence)			

338