DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2024/06/16
Person Assigned	Christof Schadt
Submitter Name	Christof Schadt christof.schadt@brainlab.com
Submission Date	2023/09/08

Correction Number CP-2379
Log Summary: Add new codes for referencing prior dose
Name of Standard PS3.3, PS3.16 2024b
Rationale for Correction: The 1st Generation RT Dose SOP Class cannot convey the concept of a weighted dose, if e.g. the dose from a prior treatment was taken into account but with a weighting factor to address radiobiological effects. Still, in order to not lose this information entirely, new codes are added to provide corresponding semantics supporting this use case: - A code that provides the semantic of a dose from a prior treatment. This code can be used from the RT Plan (Referenced Instance Sequence in the General Reference Module) to annotate additional input information (CID 7022). - Codes that provide the semantics for a derivation where it is stated that the derived dose is adapted due to either radiobiological effects or partial deliveries. This code can be used from an RT Dose Instance to annotate a derivation relationship (CID 7220). A dose weighting factor is explicitly not added. As the weighted dose due to radiobiological effects is not a physical dose, but an effective dose, a corresponding note is added to the Dose Type (3004,0004) to clarify this expectation.
Correction Wording:

Update the following in PS3.3 Annex C:

Table C.8-39. RT Dose Module Attributes

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1C	Number of samples (planes) in this image. See Section C.8.8.3.4.1 for specialization. Required if Pixel Data (7FE0,0010) is present.
Photometric Interpretation	(0028,0004)	1C	Specifies the intended interpretation of the pixel data. See Section C.8.8.3.4.2 for specialization. Required if Pixel Data (7FE0,0010) is present.
Bits Allocated	(0028,0100)	1C	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See Section C.8.8.3.4.3 for specialization. Required Pixel Data (7FE0,0010) is present.

Attribute Name	Tag	Type	Attribute Description
Bits Stored	(0028,0101)	1C	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See Section C.8.8.3.4.4 for specialization. Required if Pixel Data (7FE0,0010) is present.
…			
Dose Type	(3004,0004)	1	Type of dose. Defined Terms: PHYSICAL physical dose EFFECTIVE physical dose after correction for biological effect using user-defined modeling technique ERROR difference between desired and planned dose **See Section C.8.8.3.6.**
…			
Derivation Code Sequence	(0008,9215)	3	A coded description of how this dose was derived from other RT Dose and/or RT Plan objects. One or more Items are permitted in this Sequence. More than one Item indicates that successive derivation steps have been applied.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			*DCID 7220 "RT Dose Derivation".*
Referenced Instance Sequence	(0008,114A)	3	The set of SOP Instances used to derive this RT Dose SOP Instance **from other RT Dose and/or RT Plan objects**. One or more Items are permitted in this Sequence.
>Include Table 10-11 "SOP Instance Reference Macro Attributes"			
>Purpose of Reference Code Sequence	(0040,A170)	1	Code describing the purpose of the reference to the Instance(s). Only a single Item is permitted in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			*DCID 7221 "RT Dose Purpose of Reference".*
…			

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C.8.8.3.6 Dose Type

If the Derivation Code Sequence (0008,9215) contains a value of (DCM, 121377, "Composed with radiobiological effects") then the value of Dose Type (3004,0004) shall be EFFECTIVE.

Update in PS3.16, Annex B

CID 7022 RADIOTHERAPY PURPOSE OF REFERENCE

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**

Keyword: RadiotherapyPurposeOfReference
FHIR Keyword: dicom-cid-7022-RadiotherapyPurposeOfReference
Type: Extensible
Version: ~~20180916~~20240616
UID: 1.2.840.10008.6.1.1115

Table CID 7022 Radiotherapy Purpose of Reference

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	121310	RT treatment plan for the position being verified
DCM	129210	Registration used in Planning
DCM	129211	Registration created during Treatment
DCM	**129212**	**Dose from prior Treatment**

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CID 7220 RT DOSE DERIVATION

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: RTDoseDerivation
FHIR Keyword: dicom-cid-7220-RTDoseDerivation
Type: Extensible
Version: ~~20140106~~20240616
UID: 1.2.840.10008.6.1.968

Table CID 7220 RT Dose Derivation

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	121370	Composed from prior doses
DCM	121371	Composed from prior doses and current plan
DCM	**121377**	**Composed with radiobiological effects**
DCM	**121378**	**Composed with weighting for fractions delivered**

Add the following to the table in PS3.16, Annex D:

Annex D DICOM controlled terminology definitions (normative)

Code Value	Code Meaning	Definition	Notes
121310	RT treatment plan for the position being verified	The referenced instance is an RT treatment plan of some type, which contains treatment positioning information, which has been verified using the information in the referencing instance.	
129210	Registration used in Planning	Registrations that have been used in the treatment planning process	
129211	Registration created during Treatment	Registrations that have been created in the execution of a treatment session	
129212	**Dose from prior Treatment**	**Dose volume from prior treatment(s).**	
…			
121370	Composed from prior doses	The dose object created was calculated by summation of existing, previously calculated, RT Dose instances.	
121371	Composed from prior doses and current plan	The dose object created was calculated by summation of existing, previously calculated, RT Dose instances and dose newly calculated by the application. The newly calculated dose may or may not exist as an independent object.	
121377	**Composed with radiobiological effects**	**The dose object created was calculated using previously calculated RT Dose Instances by taking radiobiological effects into account.**	
121378	**Composed with weighting for fractions delivered**	**The dose object was calculated based on weighted contributions along the actual number of fractions delivered.**	
…			