

DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2014/06/25
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Correction Number	CP-1203
Log Summary:	PDR Pulse Details in RT Brachy Session Record
Name of Standard	PS 3.3, 2013
Rationale for Correction:	<p>With the current RT Brachy Session record it is not possible to record exactly the details of the individual pulses. This information would be needed to do a complete verification and or progress overview.</p> <ul style="list-style-type: none"> If one RT Brachy Treatment Record IOD (containing the Brachy Session Record module) is to be specified for one PDR treatment (consisting of N pulses), then it is <u>not clear to which pulse the following attributes are associated with</u>: 'Reference Air Kerma Rate', 'Total Reference Air Kerma', 'Source Strength Reference Date & Time', 'Specified Channel Total Time', 'Delivered Channel Total Time'. This may be of clinical significance with long pulse repetition intervals. Source decays between each pulse. In case of an <u>interrupted treatment</u>, the Brachy Session Record cannot unambiguously specify at which control point the PDR treatment was terminated. This makes it impossible for the Treatment Management System to produce Brachy Delivery Instruction IOD (or plan IOD) for remaining partial fraction. <p>Further on, the following items are fixed with that CP:</p> <ul style="list-style-type: none"> The Brachy Session Record module contains the attribute 'Delivered Channel Total Time', which refers to "Control Point 0 and final Control Point of the Brachy Control Point Sequence (300A,02D0) for current Channel", but again, the Brachy Control Point Delivered Sequence (3008,0160) is to be mentioned.
Correction Wording:	

In PS 3.3, C.8.8.22 'RT Brachy Session Record Module', add following in Table C.8-58

RT Brachy Session Record Module

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Table C.8-58—RT BRACHY SESSION RECORD MODULE ATTRIBUTES

...			
Recorded Source Sequence	(3008,0100)	1	Introduces sequence of Sources to be used within Application Setups. One or more Items shall be included in this sequence.

>Source Number	(300A,0212)	1	Identification number of the Source. The value of Source Number (300A,0212) shall be unique within the Recorded Source Sequence (3008,0100) in which it is created.
>Source Type	(300A,0214)	1	Type of Source. Defined Terms: POINT, LINE, CYLINDER, SPHERE.
>Source Manufacturer	(300A,0216)	2	Manufacturer of source.
>Source Serial Number	(3008,0105)	2	Serial Number of source.
>Source Isotope Name	(300A,0226)	1	User-defined name of Isotope.
>Source Isotope Half Life	(300A,0228)	1	Half-life of Isotope (days).
>Source Strength Units	(300A,0229)	1C	Measurement unit of Source Strength. Required if the source is not a gamma-emitting (photon) source. May be present otherwise. Enumerated Values: AIR_KERMA_RATE = Air Kerma Rate if Source is Gamma emitting Isotope. DOSE_RATE_WATER = Dose Rate in Water if Source is Beta emitting Isotope.
>Reference Air Kerma Rate	(300A,022A)	1	Air Kerma Rate in air of Isotope specified at Source Strength Reference Date (300A,022C) and Source Strength Reference Time (300A,022E) (in $\mu\text{Gy h}^{-1}$ at 1 m). Value shall be zero for non-gamma sources.
>Source Strength	(300A,022B)	1C	Source Strength of Isotope at Source Strength Reference Date (300A,022C) and Source Strength Reference Time (300A,022E), in units specified in Source Strength Units (300A,0229). Required if the source is not a gamma-emitting (photon) source. See C.8.8.15.13.
>Source Strength Reference Date	(300A,022C)	1	Reference date for Reference Air Kerma Rate (300A,022A) or Source Strength (300A,022B) of Isotope.
>Source Strength Reference Time	(300A,022E)	1	Reference time for Air Kerma Rate (300A,022A) or Source Strength (300A,022B) of Isotope.
Treatment Session Application Setup Sequence	(3008,0110)	1	Introduces sequence of Application Setups for RT Treatment Record for current RT Plan. One or more Items shall be included in this sequence.
>Application Setup Type	(300A,0232)	1	Type of Application Setup. Defined Terms: FLETCHER_SUIT, DELCLOS, BLOEDORN, JOSLIN_FLYNN, CHANDIGARH, MANCHESTER, HENSCHKE, NASOPHARYNGEAL, OESOPHAGEAL, ENDOBRONCHIAL, SYED_NEBLETT, ENDORECTAL, PERINEAL.
...			

>Total Reference Air Kerma	(300A,0250)	1	Total Reference Air Kerma for current Application Setup, i.e. the sum of the products of the Air Kerma Rates of each Source in each Channel with its respective Channel Time (μGy at 1 m). Value shall be zero for non-gamma sources.
...			
>Referenced Calculated Dose Reference Sequence	(3008,0090)	3	Introduces sequence of doses estimated for each treatment delivery. One or more Items are permitted in this sequence.
>>Referenced Dose Reference Number	(300C,0051)	1	Uniquely identifies Dose Reference specified by Dose Reference Number (300A,0012) in Dose Reference Sequence (300A,0010) in RT Prescription Module of referenced RT Plan. Required if Referenced Calculated Dose Reference Number (3008,0092) is not sent. It shall not be present otherwise.
>>Referenced Calculated Dose Reference Number	(3008,0092)	1C	Uniquely identifies Calculated Dose Reference specified by Calculated Dose Reference Number (3008,0072) within Calculated Dose Reference Sequence (3008,0070). Required if Referenced Dose Reference Number (300C,0051) is not sent. It shall not be present otherwise.
>>Calculated Dose Reference Dose Value	(3008,0076)	1	Calculated Dose (Gy).
...			
>Recorded Channel Sequence	(3008,0130)	1	Introduces sequence of Channels for current Application Setup. One or more Items shall be included in this sequence.
>>Channel Number	(300A,0282)	1	Identification number of the Channel. The value of Channel Number (300A,0282) shall be unique within the Application Setup in which it is created.
>>Channel Length	(300A,0284)	2	Length of Channel (mm). See RT Plan IOD.
>>Specified Channel Total Time	(3008,0132)	1	<u>Total amount of time specified between Control Point 0 and final Control Point of the Brachy Control Point Sequence (300A,02D0) for current Channel (sec). Total amount of time in seconds, scaled for the current source delivery strength and other delivery factors, specified to be delivered at the time of treatment between the first Control Point and the final Control Point for the current Channel.</u> <u>In the case of resuming a partially delivered treatment, the Specified Channel Total time will only include the remainder to be treated.</u> <u>See C.8.8.22.2.</u>

>>Delivered Channel Total Time	(3008,0134)	1	Total amount of time in seconds actually delivered between Control Point 0 and final Control Point of the Brachy Control Point Delivered Sequence (300A8,02D00160) for current Channel (sec).
>>Source Movement Type	(300A,0288)	1	Type of Source movement. Defined Terms: STEPWISE, FIXED, OSCILLATING, UNIDIRECTIONAL.
>>Specified Number of Pulses	(3008,0136)	1C	Number of Pulses specified per fraction for current Channel. Required if Brachy Treatment Type (300A,0202) is PDR. See C.8.8.22.1.
>>Delivered Number of Pulses	(3008,0138)	1C	Number of Pulses actually delivered per fraction for current Channel. Required if Brachy Treatment Type (300A,0202) is PDR. See C.8.8.22.1.
>>Specified Pulse Repetition Interval	(3008,013A)	1C	Pulse repetition interval (sec) specified for current Channel. Required if Brachy Treatment Type (300A,0202) is PDR. See C.8.8.22.1
>>Delivered Pulse Repetition Interval	(3008,013C)	1C	Pulse repetition interval (sec) actually delivered for current Channel. Required if Brachy Treatment Type (300A,0202) is PDR. See C.8.8.22.1.
...			
>>Safe Position Exit Date	(3008,0162)	1C	Date on which the source(s) exited the safe. Required if Recorded Channel Sequence (3008,0130) is sent and Brachy Treatment Type (300A,0202) is not MANUAL or PDR .
>>Safe Position Exit Time	(3008,0164)	1C	Time enat which the source(s) exited the safe. Required if Recorded Channel Sequence (3008,0130) is sent and Brachy Treatment Type (300A,0202) is not MANUAL or PDR .
>>Safe Position Return Date	(3008,0166)	1C	Date on which the source(s) returned to the safe. Required if Recorded Channel Sequence (3008,0130) is sent and Brachy Treatment Type (300A,0202) is not MANUAL or PDR .
>>Safe Position Return Time	(3008,0168)	1C	Time enat which the source(s) returned to the safe. Required if Recorded Channel Sequence (3008,0130) is sent and Brachy Treatment Type (300A,0202) is not MANUAL or PDR .
...			
>>Brachy Control Point Delivered Sequence	(3008,0160)	1	Introduces sequence of machine configurations describing this Channel. Two or more items shall be included in this sequence. See RT Plan IOD and C.8.8.22.1 for description of Brachy Control Point Delivered Sequence.
>>>Referenced Control Point Index	(300C,00F0)	3	Index of current Control Point, starting at 0

			for first Control Point.
>>>Treatment Control Point Date	(3008,0024)	1	Date when the delivery of radiation at this control point began. For the final control point this shall be the Date when the previous control point ended.
>>>Treatment Control Point Time	(3008,0025)	1	Time when the delivery of radiation at this control point began. For the final control point this shall be the Time when the previous control point ended.
>>>Control Point Relative Position	(300A,02D2)	1	Distance in mm between current Control Point Position and the distal-most possible Source position in current Channel- (mm) . See RT Plan IOD.
>>>Override Sequence	(3008,0060)	3	Introduces sequence of parameters which were overridden during the administration of the treatment immediately prior to the current control point. One or more Items are permitted in this sequence.
>>>>Override Parameter Pointer	(3008,0062)	2	Contains the Data Element Tag of the attribute which was overridden.
>>>>Operators' Name	(0008,1070)	2	Name of operator who authorized override.
>>>>Override Reason	(3008,0066)	3	User-defined description of reason for override of parameter specified by Override Parameter Pointer (3008,0062).
>>Pulse Specific Brachy Control Point Delivered Sequence	(3008,0171)	3	<u>Brachy Control Point Delivered Sequence for each PDR treatment pulse. Number of items in the sequence shall be equal to the Delivered Number of Pulses (3008,0138).</u>
>>>Pulse Number	(3008,0172)	1	<u>Identification Number of this delivered Pulse .</u> <u>The pulse numbers for a treatment start at 1 and increase monotonically by 1. A given SOP instance might only contain some of the pulses of the given treatment.</u>
>>>>Safe Position Exit Date	(3008,0162)	1	<u>Date on which the source(s) exited the safe.</u>
>>>>Safe Position Exit Time	(3008,0164)	1	<u>Time at which the source(s) exited the safe.</u>
>>>>Safe Position Return Date	(3008,0166)	1	<u>Date on which the source(s) returned to the safe.</u>
>>>>Safe Position Return Time	(3008,0168)	1	<u>Time at which the source(s) returned to the safe.</u>
>>>>Brachy Pulse Control Point Delivered Sequence	(3008,0173)	1	<u>List of control points for this pulse. See C.8.8.22.1.</u>
>>>>Referenced Control Point Index	(300C,00F0)	3	<u>Index of current Control Point, starting at 0 for first Control Point in this sequence.</u>
>>>>Treatment Control Point Date	(3008,0024)	1	<u>Date when the delivery of radiation at this control point began.</u> <u>For the final control point, this shall be</u>

			<u>the Date when the previous control point ended.</u>
<u>>>>>Treatment Control Point Time</u>	<u>(3008,0025)</u>	<u>1</u>	<u>Time when the delivery of radiation at this control point began.</u> <u>For the final control point, this shall be the Time when the previous control point ended.</u>
<u>>>>>Control Point Relative Position</u>	<u>(300A,02D2)</u>	<u>1</u>	<u>Distance in mm between current Control Point Position and the distal-most possible Source position in current Channel.</u> <u>See C.8.8.15.9.</u>
<u>>>>>Override Sequence</u>	<u>(3008,0060)</u>	<u>3</u>	<u>Parameters which were overridden during the administration of the treatment immediately prior to the current control point.</u> <u>One or more Items are permitted in this sequence.</u>
<u>>>>>>Override Parameter Pointer</u>	<u>(3008,0062)</u>	<u>2</u>	<u>Data Element Tag of the attribute which was overridden.</u>
<u>>>>>>Operators' Name</u>	<u>(0008,1070)</u>	<u>2</u>	<u>Name of operator who authorized override.</u>
<u>>>>>>Override Reason</u>	<u>(3008,0066)</u>	<u>3</u>	<u>User-defined description of reason for override..</u>

C.8.8.22.1 PDR (Pulsed Dose Rate) Treatment

In Brachytherapy treatment techniques where Brachy Treatment Type (300A,0202) is PDR, the Brachy Control Point Delivered Sequence (3008,0160) shall consist of 2N items, where N = Delivered Number of Pulses (3008,0138). Each control point pair shall specify the start and end of a single pulse. Each control point pair shall represent a single pulse and consist of the first control point of the pulse and the last control point of the pulse.

The Brachy Pulse Control Point Delivered Sequence (3008,0173) is consistent with the Brachy Control Point Delivered Sequence (3008,0160) as defined in the enclosing Recorded Channel Sequence (3008,0130) except all control points delivered are listed in this sequence as opposed to listing only the start and end control points in the Brachy Control Point Delivered Sequence (3008,0160).

C.8.8.22.2 Specified Channel Total Time

Total time is derived from the Brachy Control Point Sequence (300A, 02D0) by scaling times for the current source delivery strength and accounting for other delivery device capabilities influencing the actual delivery.

In brachytherapy treatment techniques where Brachy Treatment Type (300A,0202) is PDR, the Specified Channel Total Time (3008,0132) shall consist of the specified channel total time summed over the Specified Number of Pulses (3008,0136).

The following examples describe the contents of Specified Channel Total Time (3008,0132), Delivered Channel Total Time (3008,0134) and Treatment Termination Status (3008,002A) under normal and interrupted delivery conditions.

Example:

Fraction delivered without interruption

Session 1:

Specified Channel Total Time = 100.0 seconds

Delivered Channel Total Time = 100.0 seconds
Treatment Termination Status = NORMAL

Fraction delivered with interruption. Second session delivered in timely manner such that there is negligible source decay between sessions.

Session 1:

Specified Channel Total Time = 100.0 seconds
Delivered Channel Total Time = 50.0 seconds
Treatment Termination Status = OPERATOR or MACHINE

Session 2:

Specified Channel Total Time = 50.0 seconds
Delivered Channel Total Time = 50.0 seconds
Treatment Termination Status = NORMAL

Fraction delivered with interruption. Second session delivered later such that additional source decay between sessions must be accounted for. In Session 2 the source is at approximately 96% of Session 1 strength.

Session 1:

Specified Channel Total Time = 100.0 seconds
Delivered Channel Total Time = 50.0 seconds
Treatment Termination Status = OPERATOR or MACHINE

Session 2:

Specified Channel Total Time = 52.0 seconds
Delivered Channel Total Time = 52.0 seconds
Treatment Termination Status = NORMAL

In Part 6 Addendum: Add the following data elements to PS3.6:

<u>(3008,0171)</u>	<u>Pulse Specific Brachy Control Point Delivered Sequence</u>	<u>PulseSpecificBrachyControlPoint DeliveredSequence</u>	<u>SQ</u>	<u>1</u>
<u>(3008,0172)</u>	<u>Pulse Number</u>	<u>PulseNumber</u>	<u>US</u>	<u>1</u>
<u>(3008,0173)</u>	<u>Brachy Pulse Control Point Delivered Sequence</u>	<u>BrachyPulseControlPointDeliveredSequence</u>	<u>SQ</u>	<u>1</u>