

DICOM Correction Item

Correction Number		CP-312
Log Summary: Clarify type 1 and 1C within Sequences		
Type of Modification	Name of Standard	
Correction	PS 3.3 2002	
<p>Rationale for Correction</p> <p>There are different practices being used to document requirements on attributes included within sequences. Older sections often place a condition on attributes within sequences of the form: "Required if <parent sequence attribute> is sent". Newer sections omit the condition since it is redundant. For an example, see the PS 3.4, Table C.8-18, US Image Module, and the attributes within Referenced Curve Sequence (0008,1145) in contrast to the attributes within Referenced Waveform Sequence (0008,113A).</p> <p>These different documentation conventions confuse readers. Explanatory text is added to PS 3.3 explaining these documentation conventions.</p> <p>WG6 has a consensus understanding that the Type of an Attribute in a Sequence is implicitly constrained by the presence of a Item of the Sequence. Thus a Type 1 attribute may be present in a Type 2 or 3 Sequence, and it is only Type 1 if an Item is actually present in the Sequence. A Type 2 or 3 Sequence may indeed be zero-length, and the presence of Type 1 or 2 Attributes in that Sequence does not force an Item to be present.</p> <p>The semantics of Data Element Types within a Sequence should be explicitly defined in Part 5. In particular, the historical use of the Type 1C condition "Required if Sequence is sent" in a Type 2 or 3 Sequence should be noted to not imply that an Item must be present in the Sequence. It is meant to be equivalent to "Required if Sequence <i>Item</i> is present", and the conditionality is in effect meaningless.</p>		
<p>Sections of documents affected</p> <p>PS 3.3 Section 5.2</p> <p>PS 3.5 Section 7.4</p>		
Correction Wording:		

Modify Section 5.2 of PS 3.3:

5.2 SEQUENCES

Certain Tables in this Standard describe Sequences of Items by using the symbol: '>'. The symbol '>' precedes the Attribute (or Module) Name of the members of an Item. All marked Attributes (or Modules) belong to the generic description of an Item which may be repeated to form a Sequence of Items. This Sequence of Items is nested in the Attribute (or Module) which precedes in the table the first member marked with a '>'.

Note: The following table describes the "Referenced Series Sequences" Attribute as a Sequence of one or more Items where each Item contains the three Attributes marked by a '>'. The Sequence of Items is nested inside the value of the Referenced Series Sequence Attribute. The following Attribute (not marked) is not part of the Items of the Sequence.

.....
Referenced Series Sequence
> Series Date
> Series Time
> Series Instance UID
Modality

This notation may be used to create nested hierarchical structures by using '>>' at the second level of nesting and so on.

The Type of the Sequence attribute defines whether the Sequence attribute itself must be present, and the Attribute Description of the Sequence attribute may define whether and how many Items shall be present in the Sequence. The Types of the attributes of the Data Set included in the Sequence, including any conditionality, are specified within the scope of each Data Set, i.e., for each Item present in the Sequence. See PS 3.5.

Notes: 1. Some sections of the Standard often include Attributes within a Sequence of Items under the condition that a Sequence Item is present. For example, as shown in the following table, Requested Procedure ID (0040,1001) has Type 1C and is included under the condition that "Required if Sequence Item is present":

<u>Attribute Name</u>	<u>Tag</u>	<u>Type</u>	<u>Attribute Description</u>
<u>Request Attributes Sequence</u>	<u>(0040,0275)</u>	<u>3</u>	<u>Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.</u>

>Requested Procedure ID	(0040,1001)	1C	Identifier which identifies the Requested Procedure in the Imaging Service Request. Required if Sequence Item is present.
>Scheduled Procedure Step ID	(0040,0009)	1C	Identifier which identifies the Scheduled Procedure Step. Required if Sequence Item is present.

2. The condition may be omitted since it is redundant with the Type of the Sequence attribute. The above example may be equivalently specified without the conditions, as illustrated in the following table:

Attribute Name	Tag	Type	Attribute Description
Request Attributes Sequence	(0040,0275)	3	Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.
>Requested Procedure ID	(0040,1001)	1	Identifier which identifies the Requested Procedure in the Imaging Service Request.
>Scheduled Procedure Step ID	(0040,0009)	1	Identifier which identifies the Scheduled Procedure Step.

Modify Section 7.4 of PS 3.5:

7.4 DATA ELEMENT TYPE

An attribute, encoded as a Data Element, may or may not be required in a Data Set, depending on that Attribute's Data Element Type.

The Data Element Type of an Attribute of an Information Object Definition or an Attribute of a SOP Class Definition is used to specify whether that Attribute is mandatory or optional. The Data Element Type also indicates if an Attribute is conditional (only mandatory under certain conditions). The Data Element Types of Attributes of Composite IODs are specified in PS 3.3. The Data Element Types of Attributes of Normalized IODs are specified as Attributes of SOP Classes in PS 3.4.

7.4.1 TYPE 1 REQUIRED DATA ELEMENTS

IODs and SOP Classes define Type 1 Data Elements that shall be included and are mandatory elements. The Value Field shall contain valid data as defined by the elements VR and VM as

specified in PS 3.6. The Length of the Value Field shall not be zero. Absence of a valid Value in a Type 1 Data Element is a protocol violation.

7.4.2 TYPE 1C CONDITIONAL DATA ELEMENTS

IODs and SOP Classes define Data Elements that shall be included under certain specified conditions. Type 1C elements have the same requirements as Type 1 elements under these conditions. It is a protocol violation if the specified conditions are met and the Data Element is not included.

When the specified conditions are not met, Type 1C elements shall not be included in the Data Set.

7.4.3 TYPE 2 REQUIRED DATA ELEMENTS

IODs and SOP Classes define Type 2 Data Elements that shall be included and are mandatory Data Elements. However, it is permissible that if a Value for a Type 2 element is unknown it can be encoded with zero Value Length and no Value. If the Value is known the Value Field shall contain that value as defined by the elements VR and VM as specified in PS 3.6. These Data Elements shall be included in the Data Set and their absence is a protocol violation.

Note: The intent of Type 2 Data Elements is to allow a zero length to be conveyed when the operator or application does not know its value or has a specific reason for not specifying its value. It is the intent that the device should support these Data Elements.

7.4.4 TYPE 2C CONDITIONAL DATA ELEMENTS

IODs and SOP Classes define Type 2C elements that have the same requirements as Type 2 elements under certain specified conditions. It is a protocol violation if the specified conditions are met and the Data Element is not included.

When the specified conditions are not met, Type 2C elements shall not be included in the Data Set.

Note: An example of a Type 2C Data Element is Inversion Time (0018,0082). For several SOP Class Definitions, this Data Element is required only if the Scanning Sequence (0018,0020) has the Value "IR." It is not required otherwise. See PS 3.3.

7.4.5 TYPE 3 OPTIONAL DATA ELEMENTS

IODs and SOP Classes define Type 3 Data Elements that are optional Data Elements. Absence of a Type 3 element from a Data Set does not convey any significance and is not a protocol violation. Type 3 elements may also be encoded with zero length and no Value. The meaning of a zero length Type 3 Data Element shall be precisely the same as that element being absent from the Data Set.

7.4.6 DATA ELEMENT TYPES WITHIN A SEQUENCE

When an IOD defines a Sequence Data Element (see Section 7.5), the Type of the Sequence attribute defines whether the Sequence attribute itself must be present, and the Attribute Description of the Sequence attribute may define whether and how many Items shall be present in the Sequence. The Types of the attributes of the Data Set included in the Sequence, including any conditionality, are specified within the scope of each Data Set, i.e., for each Item present in the Sequence.

- Notes:**
- 1. The Type and Attribute Description of the Sequence determines whether Items are present; conditionality constraints on Data Elements of the Items cannot force an Item to be present.**
 - 2. Historically, many IODs declared Type 1 and Type 2 Data Elements of the Sequence to be Type 1C and Type 2C, respectively, with the condition that an Item is present. This is exactly the same as simply defining them as Type 1 and Type 2.**
 - 3. In particular, the conditionality constraint “Required if Sequence is sent” on the Type 1C or Type 2C Data Elements subsidiary to a Type 2 or 3 Sequence attribute does not imply that an Item must be present in the Sequence. These conditions are meant to be equivalent to “Required if a Sequence Item is present”, and the conditionality is not strictly necessary. Any Type 2 or Type 3 Sequence attribute may be sent with zero length.**
 - 4. In particular, the conditionality constraint “Required if <name-of-parent-sequence-attribute> is sent” on the Type 1C or Type 2C Data Elements subsidiary to a Type 2 or 3 Sequence attribute does not imply that an Item must be present in the Sequence. These conditions are meant to be equivalent to “Required if a Sequence Item is present”, and the conditionality is not strictly necessary. Any Type 2 or Type 3 Sequence attribute may be sent with zero length.**