

DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2014/11/18
Person Assigned	James Philbin
Submitter Name	Jonathan Whitby (jwhitby@vitalimages.com)
Submission Date	2013/10/03

Correction Number	CP-1350
Log Summary: Add retrieval of referenced instances, series metadata and instance metadata to WADO-RS	
Name of Standard PS 3 2014b	
<p>Rationale for Correction:</p> <p>All DICOM instances that include references to other series or instances allow them to be referenced using one or more retrieval methods. These retrieval methods should include WADO-RS. This requires adding a WADO-RS Retrieval Sequence to:</p> <ul style="list-style-type: none"> • Referenced Instances and Access Macro • Hierarchical Series Reference Macro • Instance Availability Notification Module <p>In addition, it should be added to similar modules used in Storage Commit and Modality Worklist.</p> <p>Furthermore, if a WADO-RS Retrieval Sequence is added, it makes sense to allow a client to use that information to retrieve series or instance metadata. It is useful to be able to include a reference to a DICOM KOS or SR instance in an external system such as FHIR. Since those instances will typically only include metadata it is not possible to retrieve them in an XML format at present unless the entire set of Study metadata is retrieved.</p>	
Correction Wording:	

Update PS 3.3 Table 10-3b as indicated

Table 10-3b. Referenced Instances and Access Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Type of Instances	(0040,E020)	1	Type of object instances referenced. Defined Terms: DICOM CDA
Study Instance UID	(0020,000D)	1C	Unique identifier for the Study.

Attribute Name	Tag	Type	Attribute Description
			Required if Type of Instances (0040,E020) is DICOM
Series Instance UID	(0020,000E)	1C	Unique identifier for the Series that is part of the Study identified in Study Instance UID (0020,000D), if present, and contains the referenced object instance(s). Required if Type of Instances (0040,E020) is DICOM
Referenced SOP Sequence	(0008,1199)	1	References to object instances. One or more Items shall be included in this sequence
>Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.
>Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.
>HL7 Instance Identifier	(0040,E001)	1C	Instance Identifier of the encapsulated HL7 Structured Document, encoded as a UID (OID or UUID), concatenated with a caret ("^") and Extension value (if Extension is present in Instance Identifier). Required if Type of Instances (0040,E020) is CDA.
>Referenced Frame Number	(0008,1160)	1C	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames, and Referenced Segment Number (0062,000B) is not present.
>Referenced Segment Number	(0062,000B)	1C	Identifies the Segment Number to which the reference applies. Required if the Referenced SOP Instance is a Segmentation and the reference does not apply to all segments and Referenced Frame Number (0008,1160) is not present.
DICOM Retrieval Sequence	(0040,E021)	1C	Details for retrieving instances via the DICOM Retrieve Service. Required if DICOM Media Retrieval Sequence (0040,E022), WADO Retrieval Sequence (0040,E023), and XDS Retrieval Sequence (0040,E024), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise. This sequence shall only identify sources known to have instances referenced in Referenced SOP Sequence (0008,1199). One or more Items shall be included in this sequence.
>Retrieve AE Title	(0008,0054)	1	Title of a DICOM Application Entity where the referenced instance(s) may be retrieved on the network.
DICOM Media Retrieval Sequence	(0040,E022)	1C	Details for retrieving instances from Media. Required if DICOM Retrieval Sequence (0040,E021), WADO Retrieval Sequence (0040,E023), and XDS Retrieval Sequence (0040,E024), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise. This sequence shall only identify media known to have instances referenced in Referenced SOP Sequence (0008,1199). One or more Items shall be included in this sequence.
>Storage Media File-Set ID	(0088,0130)	2	The user or implementation specific human readable identifier that identifies the Storage Media on which the referenced instance(s)

Attribute Name	Tag	Type	Attribute Description
			reside.
>Storage Media File-Set UID	(0088,0140)	1	Uniquely identifies the Storage Media on which the referenced instance(s) reside.
WADO Retrieval Sequence	(0040,E023)	1C	<p>Details for retrieving instances available as Uniform Resources via WADO-URI.</p> <p>Note: This sequence addresses use of the URI-based Web Access to DICOM Objects. Retrieval via the Web Services-based WADO-WS is addressed in the XDS Retrieval Sequence (0040,E024).</p> <p>Required if DICOM Retrieval Sequence (0040,E021), DICOM Media Retrieval Sequence (0040,E022), and XDS Retrieval Sequence (0040,E024), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise.</p> <p>One or more Items shall be included in this sequence.</p>
>Retrieve URI	(0040,E010)	1	<p>URI/URL specifying the location of the referenced instance(s). Retrieval access path to the referenced instance(s). Includes fully specified scheme, authority, path, and query in accordance with RFC3986.</p> <p>Note: The VR of this attribute has changed from UT to UR.</p>
XDS Retrieval Sequence	(0040,E024)	1C	<p>Details for retrieving instances using WADO-WS or IHE XDS transactions.</p> <p>Note: This sequence addresses use of the Web Services-based WADO-WS. Retrieval via WADO-URI is addressed by the WADO Retrieval Sequence (0040,E023). Retrieval via WADO-RS is addressed by the WADO-RS Retrieval Sequence (0040,E025).</p> <p>Required if DICOM Retrieval Sequence (0040,E021), DICOM Media Retrieval Sequence (0040,E022), and WADO-URI Retrieval Sequence (0040,E023), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise.</p> <p>This sequence shall only identify repositories known to have instances referenced in Referenced SOP Sequence (0008,1199).</p> <p>One or more Items shall be included in this sequence.</p>
>Repository Unique ID	(0040,E030)	1	Uniquely identifies a Repository from which the referenced instances can be retrieved.
>Home Community ID	(0040,E031)	3	Uniquely identifies a Community to which requests for the referenced instances can be directed.
WADO-RS Retrieval Sequence	(0040,E025)	1C	<p>Details for retrieving instances via WADO-RS.</p> <p>Note: Retrieval via WADO-URI is addressed in the WADO Retrieval Sequence (0040,E023). Retrieval via WADO-WS is addressed in the XDS Retrieval Sequence (0040,E024).</p> <p>Required if DICOM Retrieval Sequence (0040,E021), DICOM Media Retrieval Sequence (0040,E022), WADO Retrieval Sequence (0040,E023) and XDS Retrieval Sequence (0040,E024) are not present. May be present otherwise.</p> <p>One or more Items shall be included in this sequence.</p>
>Retrieve URL	(0008,1190)	1	URI/URL specifying the location of the referenced instance(s).

Update PS 3.3 Section C.2.2.1.1 as indicated

C.2.2.1.1 Referenced Patient Photo Sequence

A Patient Photo may be provided as an additional means to confirm the identity of the patient.

When the Referenced SOP Sequence (0008,1199) is present, the Referenced SOP Class UID (0008,1150) shall be either VL Photographic Image Storage (1.2.840.10008.5.1.4.1.1.77.1.4) or Secondary Capture Image Storage (1.2.840.10008.5.1.4.1.1.7).

When the WADO Retrieval Sequence (0040,E023) or **WADO-RS Retrieval Sequence (0040,E025)** is present, the Retrieve URI (0040,E010) shall refer to a JPEG image if the referenced server is not WADO-compliant.

Update PS 3.3 Table C.4.23-1 as indicated

Table C.4.23-1

INSTANCE AVAILABILITY NOTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Attribute Description
Referenced Performed Procedure Step Sequence	(0008,1111)	Uniquely identifies the Performed Procedure Step SOP Instance to which this availability notification instance is related, if any. Zero or one Item shall be included in this sequence. Notes: 1. This may refer to a different PPS than that encoded in the composite instances themselves. 2. It is typically used for notification about instances created as a consequence of some scheduled activity.
<i>>Include SOP Instance Reference Macro Table 10-11</i>		
>Performed Workitem Code Sequence	(0040,4019)	A sequence that conveys the (single) type of procedure performed. Only a single Item shall be included in this sequence.
<i>>>Include Code Sequence Macro Table 8.8-1</i>		<i>Baseline CID 9231</i>
Study Instance UID	(0020,000D)	Unique identifier for the Study of which all the Instances referenced in this notification are part.
Referenced Series Sequence	(0008,1115)	Sequence of Items where each Item includes references to Instances within the same Series. One or more Items shall be included in this Sequence.
>Series Instance UID	(0020,000E)	Unique identifier of the Series of which all the Instances referenced in this Item are part.
>Referenced SOP Sequence	(0008,1199)	Sequence of Items where each Item includes a reference to a single Instance within this Series. One or more Items shall be included in this Sequence.
<i>>>Include SOP Instance Reference Macro Table 10-11</i>		
>>Instance Availability	(0008,0056)	The availability of the referenced Instance. See Section C.4.23.1.1
>>Retrieve AE Title	(0008,0054)	Title of the DICOM Application Entity from which the referenced Instance may or may not be retrievable, i.e. the scope for which Instance Availability (0008,0056) applies.

		See Section C.4.23.1.1.
>>Retrieve URL	(0008,1190)	URI/URL specifying the location of the referenced instance(s). See PS 3.18 Section 6.5.
>>Retrieve Location UID	(0040,E011)	Unique identifier of the system where the Composite Object(s) may be retrieved on the network.
>>Retrieve URI	(0040,E010)	Fully specified URI/URL (see RFC 3986) the location of the referenced instance. Retrieval access path to the referenced SOP instance(s). Includes fully specified URI, i.e. scheme, authority, path, and query in accordance with RFC 3986. Note: The VR of this attribute has changed from UT to UR.
>>Storage Media File-Set ID	(0088,0130)	The user or implementation specific human readable identifier that identifies the offline storage media on which the instance resides.
>>Storage Media File-Set UID	(0088,0140)	Uniquely identifies the offline storage media on which the instance resides.

Update PS 3.3 Table C.17-3a as indicated

Table C.17-3a
HIERARCHICAL SERIES REFERENCE MACRO ATTRIBUTES

Series Instance UID	(0020,000E)	1	Unique identifier of a Series that is part of this Study and contains the referenced Composite Object(s).
Retrieve AE Title	(0008,0054)	3	Title of the DICOM Application Entity where the Composite Object(s) may be retrieved on the network.
Retrieve URL	(0008,1190)	3	URI/URL specifying the location of the referenced instance(s).
Retrieve Location UID	(0040, E011)	3	Unique identifier of the system where the Composite Object(s) may be retrieved on the network.
Storage Media File-Set ID	(0088,0130)	3	The user or implementation specific human readable identifier that identifies the Storage Media on which the Composite Object (s) reside.
Storage Media File-Set UID	(0088,0140)	3	Uniquely identifies the Storage Media on which the Composite Object (s) reside.
Referenced SOP Sequence	(0008,1199)	1	References to Composite Object SOP

			Class/SOP Instance pairs that are part of the Study defined by Study Instance UID and the Series defined by Series Instance UID (0020,000E) One or more Items shall be included in this sequence.
...			

Update PS 3.4 Table R.3.2-1 as indicated

**Table R.3.2-1
INSTANCE AVAILABILITY NOTIFICATION SOP CLASS N-CREATE ATTRIBUTES**

Attribute Name	Tag	Req. Type N-CREATE (SCU/SCP)
Specific Character Set	(0008,0005)	1C/1C (Required if an extended or replacement character set is used)
<i>All other Attributes of SOP Common Module</i>		3/3
Referenced Performed Procedure Step Sequence	(0008,1111)	2/2
>Referenced SOP Class UID	(0008,1150)	1/1
>Referenced SOP Instance UID	(0008,1155)	1/1
>Performed Workitem Code Sequence	(0040,4019)	2/2
>>Code Value	(0008,0100)	1/1
>>Coding Scheme Designator	(0008,0102)	1/1
>>Code Meaning	(0008,0104)	1/1
>>All other Attributes from Performed Workitem Code Sequence		3/3
Study Instance UID	(0020,000D)	1/1
Referenced Series Sequence	(0008,1115)	1/1
>Series Instance UID	(0020,000E)	1/1
>Referenced SOP Sequence	(0008,1199)	1/1
>>Referenced SOP Class UID	(0008,1150)	1/1
>>Reference SOP Instance UID	(0008,1155)	1/1
>>Instance Availability	(0008,0056)	1/1
>>Retrieve AE Title	(0008,0054)	1/1
>> Retrieve URL	(0008,1190)	3/3
>>Retrieve Location UID	(0040,E011)	3/3

>>Retrieve URI	(0040,E010)	3/3
>>Storage Media File-Set ID	(0088,0130)	3/3
>>Storage Media File-Set UID	(0088,0140)	3/3

Table CC.2.5-2c. Referenced Instances and Access Macro

Attribute Name	Tag	Req. Type N-CREATE (SCU/SCP)	Req. Type N-SET (SCU/SCP)	Final State	Req. Type N-GET (SCU/SCP)	Match Key Type	Return Key Type	Remark/Matching Type
Type of Instances	(0040,E020)	1/1	1/1		-1	O	1	
Study Instance UID	(0020,000D)	1C/1	1C/1		-1	O	1	Required if Type of Instances (0040,E020) is DICOM
Series Instance UID	(0020,000E)	1C/1	1C/1		-1	O	1	Required if Type of Instances (0040,E020) is DICOM
Referenced SOP Sequence	(0008,1199)	1/1	1/1		-1	O	1	
>Referenced SOP Class UID	(0008,1150)	1/1	1/1		-1	*	1	
>Referenced SOP Instance UID	(0008,1155)	1/1	1/1		-1	*	1	
>HL7 Instance Identifier	(0040,E001)	1C/1	1C/1		-1	*	1	Required if Type of Instances (0040,E020) is CDA.
>Referenced Frame Number	(0008,1160)	1C/1	1C/1		-2	*	1	Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames, and Referenced Segment Number (0062,000B) is not present.
>Referenced Segment Number	(0062,000B)	1C/1	1C/1		-2	*	1	Required if the Referenced SOP Instance is a Segmentation and the reference does not apply to all segments and Referenced Frame Number (0008,1160) is not present.
DICOM Retrieval Sequence	(0040,E021)	1C/1	1C/1		-1	O	1C	Required if Media Retrieval Sequence (0040,E022), WADO Retrieval Sequence (0040,E023), and XDS Retrieval Sequence (0040,E024), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise.
>Retrieve AE Title	(0008,0054)	1/1	1/1		-1	*	1	

Attribute Name	Tag	Req. Type N-CREATE (SCU/SCP)	Req. Type N-SET (SCU/SCP)	Final State	Req. Type N-GET (SCU/SCP)	Match Key Type	Return Key Type	Remark/Matching Type
Media Retrieval Sequence	(0040,E022)	1C/1	1C/1		-1	O	1C	Required if DICOM Retrieval Sequence (0040,E021), WADO Retrieval Sequence (0040,E023), and XDS Retrieval Sequence (0040,E024), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise.
>Storage Media File-Set ID	(0088,0130)	2/2	2/2		-2	*	2	
>Storage Media File-Set UID	(0088,0140)	1/1	1/1		-1	*	1	
WADO Retrieval Sequence	(0040,E023)	1C/1	1C/1		-1	O	1C	Required if DICOM Retrieval Sequence (0040,E021), Media Retrieval Sequence (0040,E022), and XDS Retrieval Sequence (0040,E024), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise.
>Retrieve Location UID	(0040,E011)	4/4	4/4		-4	*	4	
>Retrieve URI	(0040,E010)	1/1	1/1		-1	*	1	
XDS Retrieval Sequence	(0040,E024)	1C	1C/1		-1	O	1C	Required if DICOM Retrieval Sequence (0040,E021), Media Retrieval Sequence (0040,E022), and WADO Retrieval Sequence (0040,E023), and WADO-RS Retrieval Sequence (0040,E025) are not present. May be present otherwise.
>Repository Unique ID	(0040,E030)	1	1/1		-1	*	1	
>Home Community ID	(0040,E031)	3/2	3/2		3/2	*	2	
WADO-RS Retrieval Sequence	(0040,E025)	1C/1	1C/1		-1	O	1C	Required if DICOM Retrieval Sequence (0040,E021), Media Retrieval Sequence (0040,E022), and WADO Retrieval Sequence

Attribute Name	Tag	Req. Type N-CREATE (SCU/SCP)	Req. Type N-SET (SCU/SCP)	Final State	Req. Type N-GET (SCU/SCP)	Match Key Type	Return Key Type	Remark/Matching Type
								(0040,E023), and XDS Retrieval Sequence (0040,E024) are not present. May be present otherwise.
>Retrieve URL	(0008,1190)	1/1	1 /1		-1	* _	1	

Update PS 3.6 Table 6.1

(0040,E025)	WADO-RS Retrieval Sequence	WADORSRetrievalSequence	SQ	1	
-------------	----------------------------	-------------------------	----	---	--

Update PS 3.18 Section 6.1 INTERACTION as indicated.

6.1 Interaction

The interaction shall be as shown in Figure 6-1.

Multiple communications modes are possible:

- URI based mechanism using HTTP Get: WADO-URI Type request
- Web Services (WS*) using HTTP Post: WADO-WS, either:
 - a. DICOM Requester (Retrieve Imaging Document Set)
 - b. Rendered Requester (Retrieve Rendered Imaging Document Set)
 - c. Metadata Requester (Retrieve Imaging Document Set Metadata)
- RESTful Services (RS) using HTTP Get: WADO-RS, either:
 - a. DICOM Requester (Retrieve Study, Series, or Instance DICOM Objects)
 - b. Pixel Data Requester (Retrieve Instance Frame Pixel Data)
 - c. Bulk Data Requester (Retrieve Study, Series, Instance bulk data)
 - d. Metadata Requester (Retrieve Study, **Series, Instance** Metadata)
- RESTful Services (RS) using HTTP Get: QIDO-RS:
 - a. Query Requester (Search for Study, Series or Instance DICOM Objects)
- RESTful Services (RS) using HTTP POST: STOW-RS, either:
 - a. DICOM Creator (Store Instances)
 - b. Metadata and Bulk Data Creator (Store Instances)

Update PS 3.18 Section 6.5 RS REQUEST/RESPONSE as indicated.

6.5 RS Request/RESPONSE

...

6. RetrieveMetadata

This action retrieves the DICOM instances presented as the **full** study, **series, or instance** metadata with the bulk data removed.

Update PS 3.18 Section 6.5.2.2 Response as indicated.

6.5.2.2 Response

The Server shall provide the document(s) indicated in the request. In order to parse the bulk data items it is necessary to **also** retrieve the **corresponding** metadata for the **specified** Study, **Series, or Instance**.

Update PS 3.18 Section 6.5.3.2 Response as indicated.

6.5.3.2 Response

The Server shall provide either a single DICOM PS3.10 object for the SOP Instance or one or more bulk data items. In order to parse the bulk data items it is necessary to also retrieve the **corresponding** metadata for the **specified** Study, **Series, or Instance**.

Update PS 3.18 Section 6.5.4.2 Response as indicated.

6.5.4.2 Response

The Server shall provide the document(s) indicated in the request. In order to parse the bulk data items it is necessary to also retrieve the **corresponding** metadata for the **specified** Study, **Series, or Instance**.

Update PS 3.18 Section 6.5.5.2 Response as indicated.

6.5.4.2 Response

The Server shall provide the document(s) indicated in the request. In order to parse the bulk data items it is necessary to also retrieve the **corresponding** metadata for the **specified** Study, **Series, or Instance**.

Update PS 3.18 Section 6.5.6 RS – RetrieveMetadata as indicated.

6.5.6 WADO-RS RS – RetrieveMetadata

This action retrieves the DICOM instances presented as the full study, **series, or instance** metadata with the bulk data removed. The response is metadata for the DICOM attributes.

The full study, **series**, or **instance** metadata includes all attributes of the study; however, a RESTful Service is permitted to replace the Value Field of an attribute with a BulkDataURL for attributes with Value Representations (VR) of FL, FD, IS, LT, OB, OD, OF, OW, SL, SS, ST, UL, UN, US, and UT. The client can use the BulkDataURL with the RetrieveBulkData action to retrieve the original Value Field of that attribute.

6.5.6.1 Request

The specific Services resources to be used for the RetrieveMetadata action shall be as follows:

- Resources
 - {SERVICE}/studies/{StudyInstanceUID}/metadata, where
 - **{SERVICE}/studies/{StudyInstanceUID}/series/{SeriesInstanceUID}/metadata**
 - **{SERVICE}/studies/{StudyInstanceUID}/series/{SeriesInstanceUID}/instances/{SOPInstanceUID}/metadata**

where,

- {SERVICE} is the base URL for the service. This may be a combination of protocol (either http or https), host, port, and application.
 - {StudyInstanceUID} is the study instance UID for a single study.
 - **{SeriesInstanceUID} is the series instance UID for a single series.**
 - **{SOPInstanceUID} is the SOP Instance UID for a single SOP Instance.**
- Method

Update PS 3.18 Section 6.5.6.2.1 as indicated.

6.5.6.2.1 Metadata Response

- Content-Type:
 - multipart/related; type=application/dicom+xml
- The entire multipart response contains all metadata for the specified Study, **Series, or Instance.**

Update PS 3.18 (2013) Table 6.6.1-2. Store Instances Response Module Attributes

Attribute Name	Tag	Type	Attribute Description
Retrieve URL	(0008,1190)	2	The URL where the Study is available for retrieval via a WADO-RS Retrieve Study service.
Failed SOP Sequence	(0008,1198)	1C	A sequence of Items where each Item references a single SOP Instance for which storage could not be provided. Required if one or more SOP Instances failed to store.
<i>>Table 10-11 "SOP Instance Reference Macro Attributes" in PS3.3</i>			
>Failure Reason	(0008,1197)	1	The reason that storage could not be provided for this SOP Instance. See Section 6.6.1.3.2.1.2.
Referenced SOP Sequence	(0008,1199)	1C	A sequence of Items where each Item references a single SOP Instance that was successfully stored. Required if one or more SOP Instances were successfully stored.
<i>>Table 10-11 "SOP Instance Reference Macro Attributes" in PS3.3</i>			
>Retrieve URL	(0008,1190)	2	The URL where the SOP Instance is available for retrieval via a WADO-RS service. If the study Retrieve URL is specified above, this URI can be constructed if the client knows the series and instance UIDs. Note: The VR of this attribute has changed from UT to UR.
...			