Integrating the Healthcare Enterprise

IHE Endoscopy
Technical Framework Supplement

Endoscopy Image Archiving
(EIA)

Rev. 1.1 – Trial Implementation

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Foreword

This is a supplement to the future IHE Endoscopy Technical Framework. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

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This supplement is published on November 28, 2018 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the forthcoming Endoscopy Technical Framework. Comments are invited and may be submitted at https://www.ihe.net/Endoscopy_Public_Comments.

35

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

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> *Amend Section X.X by the following:*

Where the amendment adds text, make the added text **<u>bold underline</u>**. Where the amendment removes text, make the removed text **~~bold strikethrough~~**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

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General information about IHE can be found at www.ihe.net.

Information about the IHE Endoscopy domain can be found at http://www.ihe.net/IHE_Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at http://www.ihe.net/IHE_Process and http://www.ihe.net/Profiles.

50

The current version of the IHE Endoscopy Technical Framework can be found at http://www.ihe.net/Technical_Frameworks.

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CONTENTS

Introduction to this Supplement

145   The Endoscopy Image Archiving Profile defines specific implementations of established standards to achieve integration goals for endoscopy. Such integration promotes appropriate sharing of medical information to support optimal patient care.

This Profile relies heavily on, and references, transactions defined in the IHE Radiology Technical Framework.

Open Issues and Questions

150   None

Closed Issues

None

General Introduction

155 | *Update the following Appendices to the General Introduction as indicated below. Note that these are not appendices to Volume 1.*

Appendix A – Actor Summary Definitions

Add the following new actors to the IHE Technical Frameworks General Introduction list of actors:

160 None

Appendix B – Transaction Summary Definitions

Add the following new transactions to the IHE Technical Frameworks General Introduction list of Transactions:

165

Transaction	Definition
Fill Endoscopy Order [ENDO-5]	Inform recipients about a scheduled endoscopy order.
Modality PS in Progress [ENDO-8]	Inform about the start of the endoscopy procedure.
Modality PS Completed [ENDO-9]	Inform about the end of the endoscopy procedure.
Modality Images/Videos Stored [ENDO-10]	Store the images/videos acquired during the endoscopy procedure.

Appendix D – Glossary

Add the following new glossary terms to the IHE Technical Frameworks General Introduction Glossary:

170 None

Volume 1 – Profiles

Copyright Licenses

Add the following to the IHE Technical Frameworks General Introduction Copyright section:

Not applicable

175

Domain-specific additions

Not applicable

Add new Section X...

180 ## X Endoscopy Image Archiving (EIA) Profile

The Endoscopy Image Archiving (EIA) defines a workflow focusing on the image information communication during the endoscopy procedure.

The Acquisition Modality obtains the endoscopy orders from the Order Filler and sends the images and videos acquired during the endoscopy procedure to the Image Archive.

185 Several options are defined which introduce transactions that might not be needed at most installations.

X.1 EIA Actors, Transactions, and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A
190 found at https://www.ihe.net/resources/technical_frameworks/#GenIntro.

Figure X.1-1 shows the actors directly involved in the EIA Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes.

195

← Notify Performed Procedure Information [ENDO-4]

Order Placer

↓ Placer Order Management [RAD-2]
↑ Filler Order Management [RAD-3]

→ Fill Endoscopy Order [ENDO-5]
← Notify Performed Procedure Information [ENDO-4]

Order Filler

Performed Procedure Reporter

↑ Query Modality Worklist [RAD-5]

↓ Fill Endoscopy Order [ENDO-5]

→ Storage Commitment [RAD-10]

Acquisition Modality

Image Manager

Image Archive

→ Modality Images /Videos Stored [ENDO-10]

↓ Modality PS in Progress [ENDO-8]
↓ Modality PS Completed [ENDO-9]

Figure X.1-1: EIA Actor Diagram

Table X.1-1 lists the transactions for each actor directly involved in the EIA Profile. To claim compliance with this profile, an actor shall support all required transactions (labeled "R") and may support the optional transactions (labeled "O").

Table X.1-1: EIA Profile - Actors and Transactions

Actors	Transactions	Optionality	Reference
Order Filler	Fill Endoscopy Order [ENDO-5]	O	ENDO TF-2: 3.5
	Query Modality Worklist [RAD-5]	R	RAD TF 2: 4.5
Performed Procedure Reporter	Modality PS in Progress [ENDO-8]	R	ENDO TF-2: 3.8
	Modality PS Completed [ENDO-9]	R	ENDO TF-2: 3.9
Acquisition Modality	Query Modality Worklist [RAD-5]	R	RAD TF 2: 4.5
	Modality PS in Progress [ENDO-8]	O	ENDO TF-2: 3.8
	Modality PS Completed [ENDO-9]	O	ENDO TF-2: 3.9
	Modality Images/Videos Stored [ENDO-10]	R	ENDO TF-2: 3.10
	Storage Commitment [RAD-10]	O	RAD TF-2: 3.10
Image Manager/ Image Archive	Fill Endoscopy Order [ENDO-5]	R	ENDO TF-2: 3.5
	Modality Images/Videos Stored [ENDO-10]	R	ENDO TF-2: 3.10
	Storage Commitment [RAD-10]	R	RAD TF-2: 4.10

X.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in Transactions (Volume 2) and Content Modules (Volume 3). This section documents any additional requirements on profile's actors.

X.1.1.1 Order Filler

In Query Modality Worklist [RAD-5] the Order Filler shall support Patient Based Query and shall also support Scheduled Procedure Step Description (0040,0007) as a matching key instead of Requested Procedure ID (0040,1001).

Although it is desirable, the Order Filler is not required to support the multi-attribute Broad Query.

In each of the transactions assigned in Table X.1-1, the Order Filler shall implement the HL7[®1] v2.5.1 Message Semantics when such semantics are defined.

Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2 Appendix E.

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[1] HL7 is the registered trademark of Health Level Seven International.

X.1.1.2 Image Manager/Image Archive

In each of the transactions assigned in Table X.1-1, the Image Manager/Image Archive shall implement the HL7 v2.5.1 Message Semantics when such semantics are defined.

220

Note: The HL7 v2.5.1 message semantics maintain semantic equivalency with the HL7 v2.3.1 message semantics and the field correspondences are summarized in RAD TF-2 Appendix E.

X.1.1.3 Acquisition Modality

In Query Modality Worklist [RAD-5], the Acquisition Modality shall support Scheduled Procedure Step Description (0040,0007) as a matching key instead of Requested Procedure ID (0040,1001).

225 In Query Modality Worklist [RAD-5], the Acquisition Modality shall support a reasonable combination of the attributes in the Patient-Based Query. It is desirable but not required for the Acquisition Modality to support the Broad Query and additional attribute combinations for the Patient Based Query.

X.2 EIA Actor Options

230 Options that may be selected for each actor in this profile, if any, are listed in the Table X.2-1. Dependencies between options when applicable are specified in notes.

Table X.2-1: EIA - Actors and Options

Actor	Option Name	Reference
Order Filler	No options defined	--
Performed Procedure Reporter	No options defined	--
Acquisition Modality	Procedure Tracking Option	Section X.2.1
	Broad Worklist Query Option	Section X.2.2
	Storage Commitment Option	Section X.2.3
Image Manager/ Image Archive	No options defined	--
Performed Procedure Step Manager	No options defined	--

X.2.1 Procedure Tracking Option

235 The Procedure Tracking Option allows IT systems to monitor the progress of the endoscopy procedure.

Typically, the same endoscopist performs all operations in an endoscopy examination, including the endoscopy procedure itself, data entry, report creation, and pathology order. In this case, it is believed there is little need to use transactions to track the procedure. However, since it is
240 expected there will be other cases and deployments that will want to track the procedure,

endoscopy variants of the Modality PS in Progress [ENDO-8] and Modality PS Completed [ENDO-9] transactions have been defined.

Acquisition Modality Actors that claim this option shall support sending transactions [ENDO-8] and [ENDO-9] to the Performed Procedure Reporter.

245 **X.2.2 Broad Worklist Query Option**

The Broad Worklist Query Option allows Acquisition Modalities to query for scheduled procedures without looking for a specific patient.

When an Acquisition Modality Actor supports the Board Query Option, it shall support the matching key attributes listed in RAD TF-2:4.5 – Table 4.5-2 MWL Keys for Broad Worklist 250 Queries.

X.2.3 Storage Commitment Option

The Storage Commitment Option allows Acquisition Modalities to confirm that storage of images or videos to the Image Archive was successful and it is safe or the Acquisition Modality to delete its internal copy of the images and videos.

255 When an Acquisition Modality Actor supports the Storage Commitment Option, it shall support the transaction defined in RAD TF-2:4.10.

X.3 EIA Required Actor Groupings

An actor from this profile (Column 1) shall implement all of the required transactions and/or content modules in this profile *in addition to* all of the transactions required for the grouped 260 actor (Column 2).

Section X.5 describes some optional groupings that may be of interest for security considerations and Section X.6 describes some optional groupings in other related profiles.

Table X.3-1: EIA - Required Actor Groupings

EIA Actor	Actor to be grouped with	Reference	Content Bindings Reference
Order Filler	Endoscopy Workflow - Performed Procedure Reporter	ENDO TF-1: X.1	--
Performed Procedure Reporter	None	--	--
Acquisition Modality	None	--	--
Image Manager	Endoscopy Image Archiving – Image Archive	ENDO TF-1: X.1	--
Image Archive	Endoscopy Image Archiving - Image Manager	ENDO TF-1: X.1	--

X.4 EIA Overview

The primary features of the Endoscopy Image Archiving (EIA) Profile are:

- Bridging HL7 orders into DICOM[2] worklists
- Acquisition of DICOM data with proper structure and identifiers

X.4.1 Concepts

The EIA Profile is based on a part of the SWF Profile designed for Radiology.

EIA handles specific circumstances in the endoscopy field:

- To treat the video frames
- How to treat the acquired images after changing an endoscope during a procedure
- Not to treat the concept "discontinued" after starting a procedure

X.4.2 Use Cases

X.4.2.1 Use Case #1: Basic Endoscopy Procedure

X.4.2.1.1 Basic Endoscopy Procedure Use Case Description

The most typical use case involves an endoscopy procedure being ordered, scheduled and performed for a registered patient.

The endoscopy order is scheduled and then the endoscopy procedure is performed, with imaging data being produced and status messages communicated to interested systems.

This case covers both inpatient and outpatient procedures. The patient may be new or known to the current healthcare facility.

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[2] DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

X.4.2.1.2 Basic Endoscopy Procedure Process Flow

285
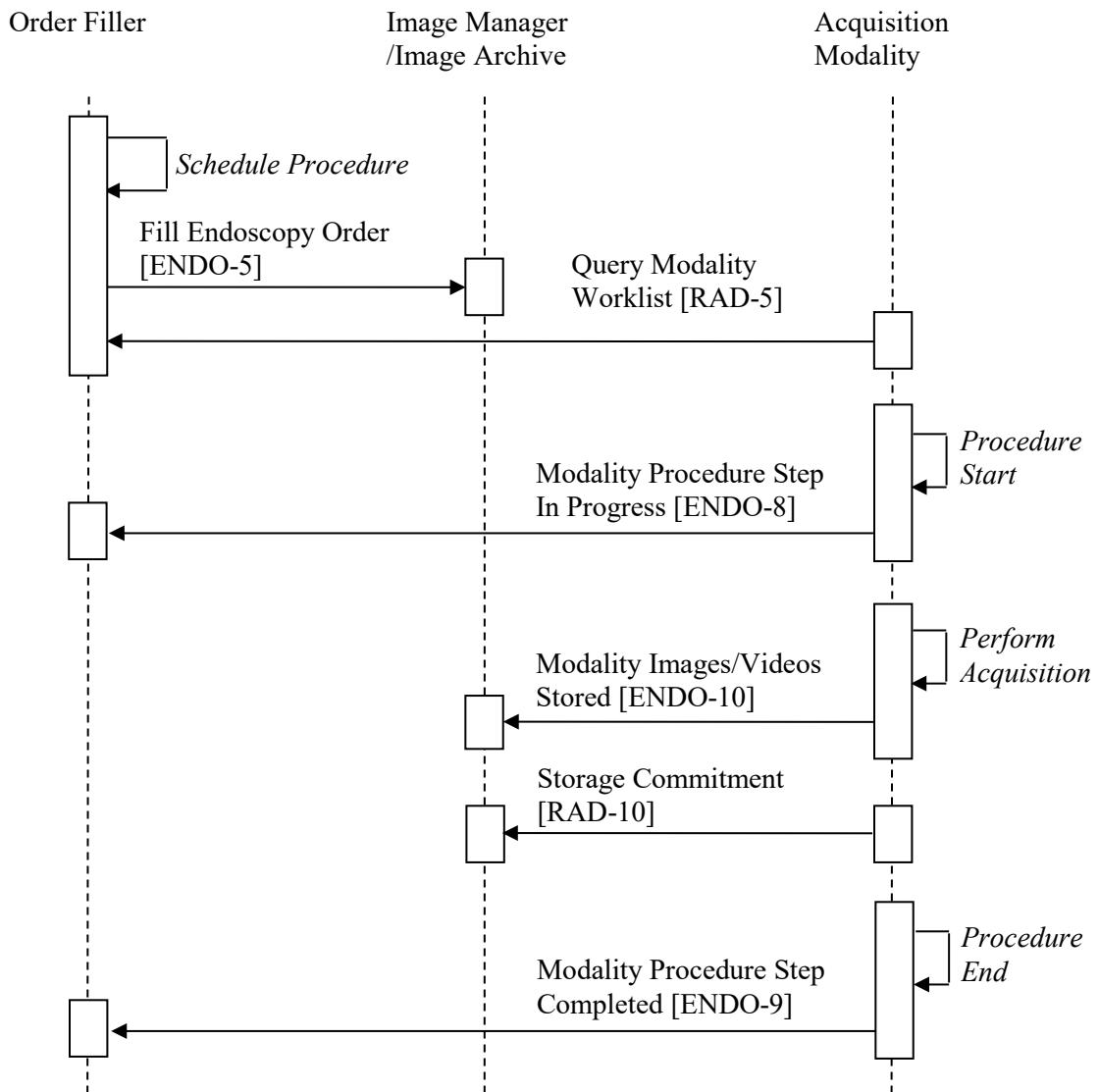
Figure X.4.2.1.2-1: Basic Process Flow in EIA Profile

X.4.2.2 Use Case #2: Minimal Endoscopy Procedure

X.4.2.2.1 Minimal Endoscopy Procedure Use Case Description

290   The simplest use case consists of the minimal set of only required transactions.

The endoscopy order is scheduled and then the endoscopy procedure is performed, with imaging data being produced and stored.

X.4.2.2.2 Minimal Endoscopy Procedure Process Flow
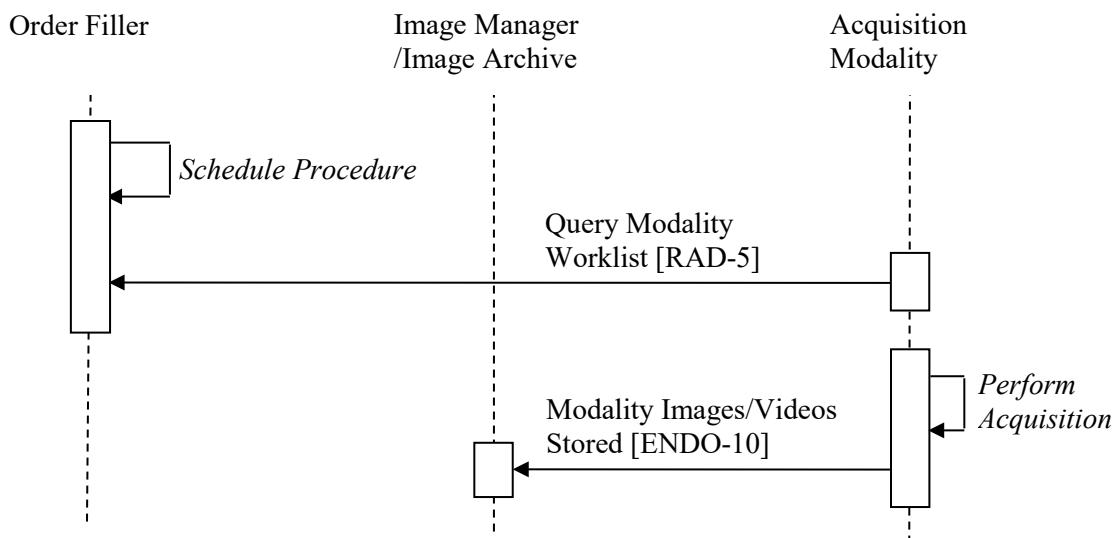
295

Figure X.4.2.2.2-1: Minimal Process Flow in EIA Profile

X.4.2.3 Future Use Cases

In some endoscopy procedures, multiple modalities are used in one procedure. For example:

300
- Endoscope Video Processor and Endoscopic Ultrasound Processor are used in EUS (Endoscopic ultrasonography)

- Endoscope Video Processor and X-Ray equipment are used in ERCP (Endoscopic retrograde cholangiopancreatography)

However, most medical devices, like PACS, already installed in the hospital have been developed based on the assumption that just one modality is used in one procedure until the
305 development of multi-modality devices like PET-CT.

Compatibility with medical devices already installed in the hospital needs to be maintained, so handling the multi-modality procedure is a future challenge.

X.5 EIA Security Considerations

Refer to RAD TF-1: Appendix F Security Environment Considerations.

310 ## X.6 EIA Cross Profile Considerations

EWF– Endoscopy Ordering Workflow

An Order Filler in the Endoscopy Ordering Workflow Profile has to be grouped with an Order Filler to manage ordering information.

PAM – Patient Administration Management

315 A Patient Demographics Consumer and Patient Encounter Consumer in the Patient Administration Management Profile could be grouped with an Order Filler to manage patient demographics.

PDQ – Patient Demographics Query

A Patient Demographics Consumer and Patient Encounter Consumer in the Patient
320 Demographics Query Profile could be grouped with an Order Filler to manage patient demographics.

CT – Consistent Time

A Time Client in the Consistent Time Profile could be grouped with an Order Filler, Performed Procedure Reporter, Acquisition Modality, Image Manager, and Image Archive to synchronize
325 the clocks of the devices involved in endoscopy image archiving.

Appendices

None

Volume 2 – Transactions

Modify Section 3.5 as shown below:

330 ## 3.5 Fill Endoscopy Order [ENDO-5]

~~This transaction corresponds to Transaction ENDO-5 of the IHE Technical Framework.~~
~~Transaction ENDO-5 is used by the actors: Order filler~~**,** ~~and Performed Procedure~~
~~Reporter~~.

335 *Modify Section 3.5.1 as shown below:*

3.5.1 Scope

This transaction notifies the recipients about scheduled endoscopy procedures.

Modify Section 3.5.2 as shown below:

340 ### 3.5.2 Actor Roles
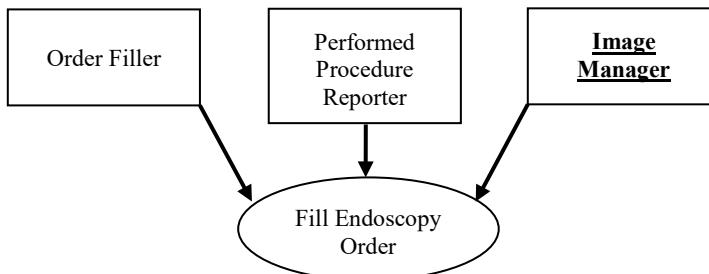
Figure 3.5.2-1: Use Case Diagram

Table 3.5.2-1: Actor Roles

Actor:	Order Filler
Role:	Provide endoscopy order filling information.
Actor:	Performed Procedure Reporter
Role:	Receives endoscopy **order** filling information.
Actor:	**Image Manager**

Role:	**Receives endoscopy order filling information.**

345 | *Modify Section 3.5.4 as shown below:* |

3.5.4 Interaction Diagram

Performed Procedure Reporter

Order Filler   **Image Manager**

OMI^O23 → Fill Endoscopy Order

ORI^O24 ← Response
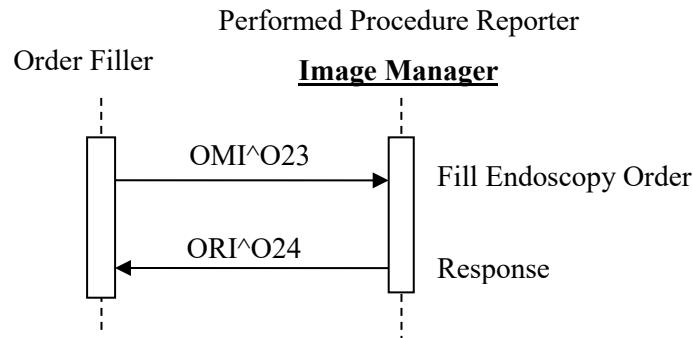
Figure 3.5.4-1: OMI Interaction Diagram

350

<table>
<tr><td>Add Section 3.8</td></tr>
</table>

3.8 Modality Procedure Step In Progress [ENDO-8]

3.8.1 Scope

355 This transaction notifies that a Performed Procedure Step is in progress. This may be an unscheduled procedure step.

This transaction is based on RAD-6 which was designed for Radiology. In the endoscopy procedure, the following relationship types between Scheduled Procedure Step (SPS) and Performed Procedure Step (PPS) should be considered.

360
- 1 to 1
- 0 to 1

There is a use case that an endoscope is exchanged during the procedure because of some reason like insertion trouble by lesion. In this case, the relationship type between Scheduled Procedure Step (SPS) and Performed Procedure Step (PPS) should be "1 to 1" finally.

365 The Append Case is not supported for Endoscopy procedures.

3.8.2 Actor Roles
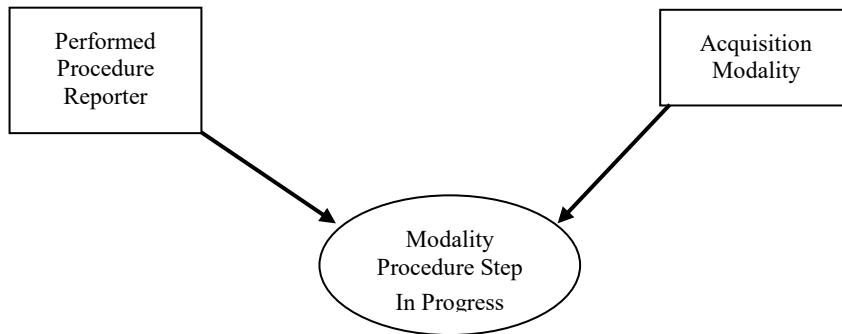
Figure 3.8.2-1: Use Case Diagram

Table 3.8.2-1: Actor Roles

Actor:	Performed Procedure Reporter
Role:	Receives the PPS information.
Actor:	Acquisition Modality

Role:	Provides PPS information that a particular Performed Procedure Step has started.

370

Transaction text specifies behavior for each role. The behavior of specific actors may also be specified when it goes beyond that of the general role.

3.8.3 Referenced Standards

DICOM 2015 PS 3.4: Modality Performed Procedure Step SOP Class.

375 ### 3.8.4 Interaction Diagram
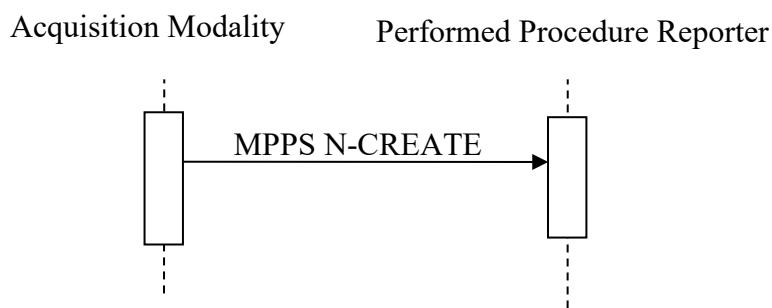
3.8.4.1 Procedure Step In Progress Message

3.8.4.1.1 Trigger Events

Endoscopist at the Acquisition Modality starts the endoscopy procedure.

380 ### 3.8.4.1.2 Message Semantics

The message uses the Modality Performed Procedure Step SOP Class (N-CREATE Service). The Acquisition Modality is the SCU. The Performed Procedure Reporter is the SCP.

The SOP Instance UID value of the Performed Procedure Step shall be conveyed in the Affected SOP Instance UID (0000,1000) during this interchange (see also corresponding notes in RAD
385 TF-2: A.1). The following aspects shall be taken into account during implementation of this step:

3.8.4.1.2.1 Patient/Procedure/Scheduled Procedure Step Information

The Acquisition Modality shall ensure that the Patient/Procedure/Scheduled Procedure Step information it has is valid and current.

3.8.4.1.2.2 Required Attributes

390 Appendix A lists a number of attributes that have to be properly handled by the Acquisition Modality to ensure consistency between the Performed Procedure Step object attributes, Scheduled Step information in the Modality Worklist, and the information included in the generated SOP instances.

3.8.4.1.2.3 Relationship between Scheduled and Performed Procedure Steps

395 The relationship between Scheduled and Performed Procedure Step information is shown in the following 2 cases. Refer to Appendix A for details of forming attributes (Study Instance UID, Procedure ID, Accession Number, etc.) in each of these cases.

3.8.4.1.2.3.1 Simple Case
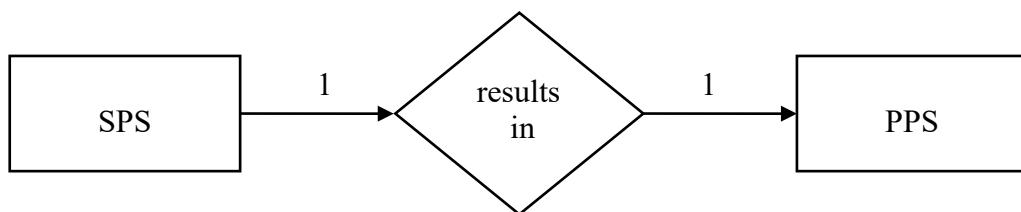
400

This case indicates a 1-to-1 relationship between SPS and PPS. Information about the Scheduled Procedure Step and Requested Procedure shall be copied from the Scheduled Procedure Step object to the Performed Procedure Step Relationship Module (see Appendix A).

3.8.4.1.2.3.2 Unscheduled Case
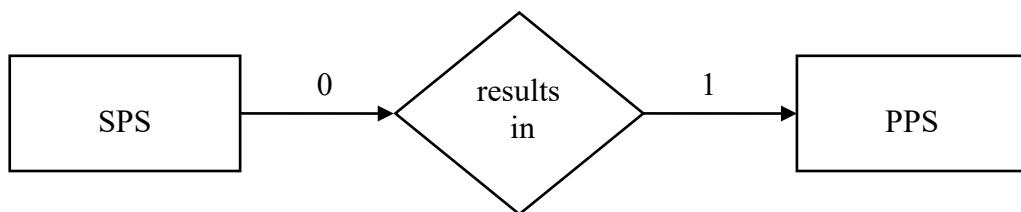
405

This case indicates a 0-to-1 relationship between SPS and PPS. Information about the Scheduled Procedure Step and, possibly, Requested Procedure is not available to the Acquisition Modality due to different reasons (emergency procedure, Modality Worklist SCP not available, etc.).

410 3.8.4.1.3 Expected Actions

The Performed Procedure Reporter receives information from the Acquisition Modality and links it with the Requested Procedure and Scheduled Procedure Step. If the Requested Procedure ID is transmitted empty (Unscheduled Performed Procedure Step case), the Performed Procedure Reporter shall create an exception that must be manually resolved to link the Performed
415 Procedure Step to the appropriate procedure.

3.8.5 Security Considerations

Section not applicable

Add Section 3.9

420 3.9 Modality Procedure Step Completed [ENDO-9]

3.9.1 Scope

This transaction notifies that the Performed Procedure Step is completed. The Modality Procedure Step Completed message does not necessarily mean that the set of images is complete or available for retrieval.

425 This transaction is based on RAD-7 which was designed for Radiology. The main difference is that "Discontinued" at the modality is not used in endoscopy procedures so the Abandoned case is not supported. If the endoscope procedure has been started, it is regarded that the procedure has been done, even if Images/Videos are not captured during the procedure.

3.9.2 Actor Roles
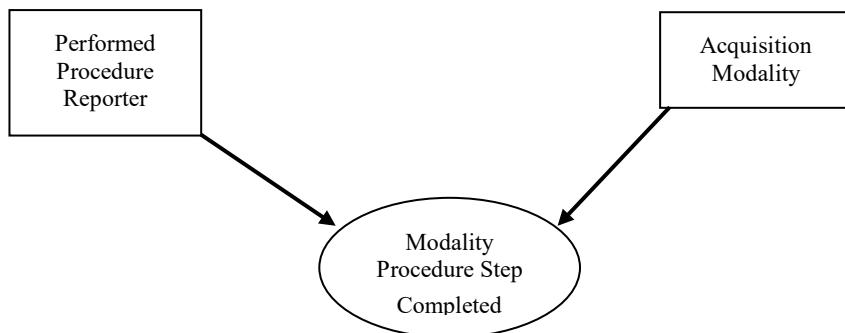
430

Figure 3.9.2-1: Use Case Diagram

Table 3.9.2-1: Actor Roles

Actor:	Performed Procedure Reporter
Role:	Receives the PPS information from the Acquisition Modality.
Actor:	Acquisition Modality.
Role:	Informs the Performed Procedure Reporter that a particular Performed Procedure Step has completed.

Transaction text specifies behavior for each role. The behavior of specific actors may also be
435 specified when it goes beyond that of the general role.

3.9.3 Referenced Standards

DICOM 2015 PS 3.4: Modality Performed Procedure Step SOP Class.

3.9.4 Interaction Diagram
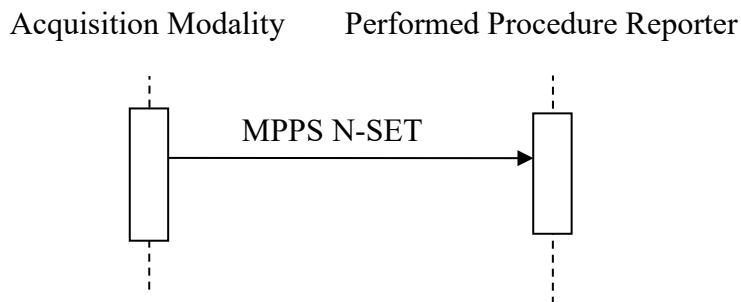
440   Note: The diagram above shows the sequencing of messages for the Modality Performed Procedure Step SOP Class. Acquisition Modalities will also implement the Storage and Storage Commitment classes. The timing relationship between PPS messages and Storage and Storage Commitment messages is not specified. That is, PPS messages may occur before or after storage requests.

445 **3.9.4.1 Procedure Step Completed Message**

3.9.4.1.1 Trigger Events

Endoscopist at the Acquisition Modality completes the endoscopy procedure.

3.9.4.1.2 Message Semantics

The message uses the Modality Performed Procedure Step SOP Class (N-SET service). The
450 Acquisition Modality is the SCU. The Performed Procedure Reporter is the SCP.

The N-SET has the MPPS status of "COMPLETED".

3.9.4.1.3 Expected Actions

The Performed Procedure Reporter receives information about the Performed Procedure Step being completed.

455 **3.9.5 Security Considerations**

Section not applicable

3.10 Modality Images/Videos Stored [ENDO-10]

460 **3.10.1 Scope**

In the Modality Images/Videos Stored transaction, the Acquisition Modality sends the acquired images and videos to the Image Archive. The information provided from the Query Modality Worklist [RAD-5] transaction (see IHE RAD TF-2:Section 4.5) shall be included in the headers of the generated images and videos.

465 This transaction is based on Modality Images Stored [RAD-8] with modifications appropriate to endoscopy workflows. Video frames are used routinely in endoscopy procedures.

An Acquisition Modality in endoscopy has a video processor that performs the image processing and generates the DICOM images, and an endoscope that provides signals to the video processor. When the endoscope is changed in the midst of a procedure, all images acquired during the
470 procedure (before and after the change) should be placed in the same series.

3.10.2 Actor Roles
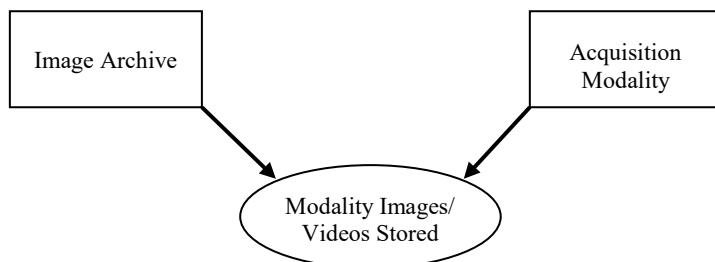
Figure 3.10.2-1: Use Case Diagram

Table 3.10.2-1: Actor Roles

Actor:	Acquisition Modality
Role:	Transmit acquired images and videos to Image Archive.
Actor:	Image Archive.
Role:	Accept and store images and videos from Acquisition Modalities

475

Transaction text specifies behavior for each role. The behavior of specific actors may also be specified when it goes beyond that of the general role.

3.10.3 Referenced Standards

480 DICOM 2015 PS 3.4: Storage Service Class.

3.10.4 Interaction Diagram

3.10.4.1 Images/Videos Stored

3.10.4.1.1 Trigger Events

485 The Acquisition Modality can transfer images to the Image Archive sequentially within one or more DICOM associations, as the images become available or collectively.

3.10.4.1.1.1 Study UIDs and Series UIDs

Study UID creation details and timing are clearly defined by the IHE. The Radiology Scheduled Workflow (SWF.b) Profile explains how the Study information and identifiers such as the Study 490 Instance UID are generated by the Order Filler and made available to the modality through the Modality Worklist. Generation of these items by the modality or workstation are restricted in general and are only permitted in specifically outlined exception cases, when a PPS is unscheduled (ENDO TF-2: Appendix A, Table A.1-2).

Series UID creation must be compatible with a number of DICOM rules.

495 Multiple performed procedure steps are not permitted to reference the same series. So conversely, one series cannot contain the output of different performed procedure steps. Therefore, adding images to a series in a procedure step which has been completed is not permitted since a procedure step cannot be modified.

Note that a series may fulfill more than one scheduled procedure step. This is referred to in IHE 500 as the group case.

Adding images after completion of a procedure step shall trigger the creation of a new series.

One series cannot contain the output of different equipment (in part because a series must have a single Frame Of Reference). Creating images on different equipment shall trigger the creation of a new series.

505   All images in a series must share the same Frame Of Reference. Generally this means creating images with different patient positioning shall trigger the creation of a new series. Note that if the Frame Of Reference is not present (at the Series level), this requirement is avoided.

Images reconstructed on a different piece of equipment are required to be in a separate Series.

510   For consistency, IHE specifies that reconstructed images shall be stored in a separate series from the acquired tomographic images from which they were reconstructed regardless of whether they are reconstructed on the Acquisition Modality or an Evidence Creator.

3.10.4.1.2 Message Semantics

The Acquisition Modality uses the DICOM C-STORE message to transfer the images/videos. The Acquisition Modality is the SCU and the Image Archive is the SCP.

515   The endoscopist validates the available information for the patient and the Scheduled Procedure Step/Requested Procedure. It is a requirement that certain information be recorded in the image/videos header. The details of the mapping to DICOM image/video instances are specified in Appendix A. Effectively, this appendix strengthens the type definition of some DICOM attributes for the IHE Endoscopy Technical Framework.

520   3.10.4.1.3 Expected Actions

The Image Archive will store the received DICOM objects.

The DICOM objects shall be stored such that they can be later retrieved (see RAD TF-2: 4.16 Retrieve Images) in a fashion meeting the requirements defined for a DICOM Level 2 Storage SCP (Refer to DICOM PS 3.4 B.4.1).

525   Acquisition Modalities shall support at least one of the SOP classes defined by Table 3.10.4.1.3.1-1.

Image Archives shall support all of the SOP classes listed in Table 3.10.4.1.3.1-1.

Table 3.10.4.1.3.1-1: Endoscopy Images/Videos Storage SOP Classes

Storage Format	SOP Class UID	SOP Class Name
Single Frame	1.2.840.10008.5.1.4.1.1.77.1.1	VL Endoscopic Image Storage
	1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
	1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage
Multi Frame	1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage
Video Frame	1.2.840.10008.5.1.4.1.1.77.1.1.1	Video Endoscopic Image Storage

530   Transfer Syntaxes are identified and grouped into three categories: uncompressed, lossy compressed, and lossy compressed for video frames per Table 3.10.4.1.3.1-2.

Table 3.10.4.1.3.1-2: Endoscopy Images/Videos Transfer Syntaxes

Category	Transfer Syntax UID	Transfer Syntax Name
Uncompressed	1.2.840.10008.1.2	Implicit VR Little Endian: Default Transfer Syntax for DICOM
Lossy Compressed	1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression
Lossy Compressed for Video Frames	1.2.840.10008.1.2.4.100	MPEG2 Main Profile @ Main Level
	1.2.840.10008.1.2.4.101	MPEG2 Main Profile @ High Level
	1.2.840.10008.1.2.4.102	MPEG-4 AVC/H.264 High Profile / Level 4.1
	1.2.840.10008.1.2.4.103	MPEG-4 AVC/H.264 BD-compatible High Profile / Level 4.1
	1.2.840.10008.1.2.4.104	MPEG-4 AVC/H.264 High Profile / Level 4.2 For 2D Video
	1.2.840.10008.1.2.4.105	MPEG-4 AVC/H.264 High Profile / Level 4.2 For 3D Video
	1.2.840.10008.1.2.4.106	MPEG-4 AVC/H.264 Stereo High Profile /Level 4.2

535 At an endoscopy procedure, an endoscopist makes a diagnosis based on the real time image displayed on the observation monitor during the procedure. Acquired images/videos during the procedure are used for reference, not for primary diagnosis.

Therefore, endoscope images and videos are often acquired in a lossy compressed format to save storage volume in the Image Archive.

540 Acquisition Modalities that support one or more Single Frame or Multi Frame Storage Formats specified in Table 3.10.4.1.3.1-1 shall support both Uncompressed and Lossy Compressed transfer syntaxes in Table 3.10.4.1.3.1-2. There are no requirements to support lossless compression transfer syntaxes.

Acquisition Modalities that support one or more Video Frame Storage Formats specified in
545 Table 3.10.4.1.3.1-1 shall support at least one Lossy Compressed for Video Frames transfer syntax in Table 3.10.4.1.3.1-2.

Image Archives shall be able to negotiate, offer and accept at least one transfer syntax from each category listed in Table 3.10.4.1.3.1-2. Acquisition Modalities and Image Archives may support transfer syntaxes beyond what is specified in Table 3.10.4.1.3.1-2.

550 **3.10.5 Security Considerations**

The DICOM objects conveyed typically constitute personal health information.

3.10.5.1 Security Audit Considerations

This transaction is associated with a Begin-storing-instances ATNA Trigger Event on the Sender and an Instances-Stored ATNA Trigger Event on the Receiver.

Appendices

555

Appendix A – Attribute Consistency between Modality Worklist, Composite IODs, Modality Performed Procedure Step

This appendix is an integral part of the IHE Technical Framework. It reflects IHE's adoption of DICOM-defined attribute consistency (Annex J, PS.3.17, since DICOM 2006; before: Annex M, PS3.4). It includes two sections:

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- The first section contains the IHE clarifications, additions and a summary of DICOM, PS.3.17, Annex J that relate to image acquisition. IHE requires that Modality Actors support the Attribute mapping defined in this table as they implement MWL, various IOD Storage and PPS SOP Classes for transactions [ENDO-8] and [ENDO-9]. IHE restates or extends some of the DICOM requirements as well as select some of the choices offered or enforce some of the recommendations of DICOM. A few additional IHE recommendations are also specified.

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- The second section defines additional IHE requirements for consistency of DICOM C-FIND Return Key Attributes.

570

A.1 Image Acquisition Integration-critical Attributes

The tables below describe requirements, recommendations or explanations on integration-critical attributes for image/video acquisition cases. They define which integration-critical attributes need to be equal (copied or generated locally), in order to correctly relate scheduled and performed procedure steps for the PPS cases described in Section 3.8.4.1.2.3.

575 **General table structure:**

- The 1st column denotes the DICOM attributes whose values shall be mapped between the DICOM objects (equal values in the same table row). The DICOM attribute tag is indicated for clarity.

- The 2nd to 4th columns define where attribute values come from: all defined attribute values of one table row are equal.

580

- These columns read left to right: MWL return values (2nd column), if existing, shall be used as the source for copies to Image/ Standalone or MPPS IODs.

- The MWL column is omitted if the described case does not include any MWL return values, or to simplify the table (as in the Append Case in Table A.1-3).

585

Cell content conventions:

- **"Source"** in a table cell means that the DICOM object defined in the table column (e.g., MWL) and created by one actor shall be the source of this value for the DICOM attribute for another actor to fill in this value for their own objects (e.g., Image or MPPS).

590
- **"Copy"** in a table cell means that the value shall be copied from a corresponding source attribute of another DICOM object, as defined by the table column.

- **"Copy from: <DICOM attribute>"** means that, instead of using the DICOM attribute of the same row as the source, the source as specified in the referenced DICOM attribute shall be used.

595
- **"Equal"** in a table cell means that an actor already knows the value, e.g., from some previously performed action. Thus, the circumstances of value generation do not matter.

- **"Equal (internally generated)"** in a table cell means that an actor has internally generated a value that may be used in more than one DICOM object, without having obtained this value from another actor (i.e., no copy).

600
- **"Equal (copied from MWL)"** in a table cell means that the actor shall use a value that it already knows from an MWL query result obtained for the same SPS in the append case.

- **"Source-1"**, **"Copy-1"** or **"Equal-1"** etc., are corresponding mapping attribute values, if several sources appear in one table row.

- **"See (IHE-X)"** in a table cell denotes additional requirements, recommendations or
605 explanations for the attribute value, as described in the table's note "(IHE-X)". Otherwise, brief text that fits into a table cell is presented in the cell.

- **"n.a."** in a table cell means that such an attribute or value shall not exist. Either the attribute is not defined by the DICOM standard for this object, or the particular sequence attribute is a DICOM type 3 attribute, and DICOM requires at least one sequence item to
610 be present.

Actor Behavior:

- An attribute from the column "Modality Worklist" shall be requested by a MWL SCU (Acquisition Modality) as a return key in its C-FIND Requests. The Order Filler shall return attribute values in the Modality Worklist C-FIND response (for a complete
615 description, see Table 3.7.4.1.2.2-1).

- The MWL return attribute values, if available as a source, shall be used by the Acquisition Modality in filling the attribute shown on the corresponding rows both for Composite Instances and MPPS Instances.

- If the MWL value is not existing ("n.a."), then the Modality shall generate certain values
620 internally

- The Order Filler roles shall be capable of handling the attributes shown in the corresponding row of the column titled "MPPS IOD" as defined by the SCP Type and the additional notes.

625

- An empty Referenced Study Sequence (0008,1110) in a MPPS Instance indicates an unscheduled case (no Scheduled Procedure Step involved).

Table A.1-1: Simple Case - required mapping of corresponding attributes

In the simple normal case, a Procedure Step is performed exactly as scheduled.

DICOM attribute	Modality Worklist	Filling values for:		
	(return attribute values)	Image IOD		MPPS IOD
Study Instance UID (0020,000D)	Source	Copy		Copy
Referenced Study Sequence (0008,1110)	Source	Copy		Copy
Accession number (0008,0050)	Source	Copy See (IHE-A.1.1)		Copy See (IHE-A.1.1)
Requested Procedure ID (0040,1001)	Source		Copy	Copy
Requested Procedure Description (0032,1060)	Source		Copy	Copy
Scheduled Procedure Step ID (0040,0009)	Source	Requested Attributes Sequence (0040,0275)	Copy	Scheduled Step Attributes Sequence (0040,0270) Copy
Scheduled Procedure Step Description (0040,0007)	Source		Copy	Copy
Scheduled Protocol Code Sequence (0040,0008)	Source		Copy	Copy
Performed Protocol Code Sequence (0040,0260)	n.a.	Equal (internally generated). Recommendation: Absent if the value is not known. Is non-empty if Assisted Protocol Setting Option is supported (see Section 4.6.4.1.2.4).		Equal (internally generated). Shall be zero length if the value is not known, e.g., Assisted Protocol Setting not supported.
Study ID (0020,0010)	n.a.	Equal (internally generated). Recommendation: use Requested Procedure ID.		Equal (internally generated). Recommendation: use Requested Procedure ID.
Performed Procedure Step ID (0040,0253)	n.a.	n.a.		Equal (internally generated).
Performed Procedure Step Start Date (0040,0244)	n.a.	n.a.		Equal (internally generated).

DICOM attribute	Modality Worklist (return attribute values)	Filling values for: Image IOD	MPPS IOD
Performed Procedure Step Start Time (0040,0245)	n.a.	n.a.	Equal (internally generated).
Performed Procedure Step Description (0040,0254)	n.a.	n.a.	Equal (internally generated).
Requested Procedure Code Sequence (0032,1064)	Value shall be used for Procedure Code Sequence as specified below.	n.a.	n.a.
Procedure Code Sequence (0008,1032)	n.a.	n.a.	Copy from: Requested Procedure Code Sequence (0032,1064). Recommendation: empty, if empty in MWL or performed acquisition is different to what was scheduled.
Referenced SOP Class UID (0008,1150)	n.a.	n.a.	Equal (internally generated). See (IHE-A.1.2)
Referenced SOP Instance UID (0008,1155)	n.a.	n.a.	Equal (internally generated). See (IHE-A.1.3)
Protocol Name (0018,1030)	n.a.	n.a.	Performed Series Sequence (0040,0340) — Equal (internally generated)

- (IHE-A.1.1) A Zero Length Accession Number (one of the options proposed by DICOM PS 3.17 Annex J) shall be created when no reliable value for this attribute is available. Reliable values are those that can be conveyed by means other than manual data entry such as a value received from the Order Filler via a Modality Worklist including an Accession Number or received through a bar code reader.

- (IHE-A.1.2) In MPPS, SOP Class UID is sent in the Affected SOP Class UID (0000,0002) for the PPS N-Create message and in Requested SOP Class UID (0000,0003) for the PPS N-Set message. SOP Class UID (0008,0016) shall not be used.

- (IHE-A.1.3) In MPPS, SOP Instance UID is sent in the Affected SOP Instance UID (0000,1000) of the PPS N-Create message and in Requested SOP Instance UID (0000,1001) for the PPS N-Set message. SOP Instance UID (0008,0018) shall not be used.

640

Table A.1-2: Unscheduled Case - required mapping of corresponding attributes

DICOM attribute	Filling values for:			
	Image IOD		**MPPS IOD**	
Study Instance UID (0020,000D)	Equal (internally generated).		Scheduled Step Attributes Sequence (0040,0270)	Equal (internally generated).
Referenced Study Sequence (0008,1110)	n.a.			Shall be empty.
Accession number (0008,0050)	Shall be empty (zero length).			Shall be empty.
Requested Procedure ID (0040,1001)	Requested Attributes Sequence (0040,0275)	n.a.		Shall be empty.
Requested Procedure Description (0032,1060)				Shall be empty.
Scheduled Procedure Step ID (0040,0009)				Shall be empty.
Scheduled Procedure Step Description (0040,0007)				Shall be empty.
Scheduled Protocol Code Sequence (0040,0008)				Shall be empty.
Performed Protocol Code Sequence (0040,0260)	Equal (internally generated). Recommendation: Absent if the value is not known. Is non-empty if Assisted Protocol Setting Option is supported (see 4.6.4.1.2.4).		Equal (internally generated). Shall be zero length if the value is not known, e.g., Assisted Protocol Setting not supported.	
Study ID (0020,0010)	Equal (internally generated)		Equal (internally generated)	
Performed Procedure Step ID (0040,0253)	n.a.		Equal (internally generated).	
Performed Procedure Step Start Date (0040,0244)	n.a.		Equal (internally generated).	
Performed Procedure Step Start Time (0040,0245)	n.a.		Equal (internally generated).	
Performed Procedure Step Description (0040,0254)	n.a.		Equal (internally generated).	
Requested Procedure Code Sequence (0032,1064)	n.a.		n.a.	
Procedure Code Sequence (0008,1032)	n.a.		Shall be empty.	
Referenced SOP Class UID (0008,1150)	n.a.		Equal (internally generated). See (IHE-A.2.1)	
Referenced SOP Instance UID (0008,1155)	n.a.		Equal (internally generated). See (IHE-A.2.2)	

DICOM attribute	Filling values for:		
	Image IOD	MPPS IOD	
Protocol Name (0018,1030)	n.a.	**Performed Series Sequence (0040,0340)**	Equal (internally generated)

- (IHE-A.2.1) In MPPS, SOP Class UID is sent in the Affected SOP Class UID (0000,0002) for the PPS N-Create message and in Requested SOP Class UID (0000,0003) for the PPS N-Set message. SOP Class UID (0008,0016) shall not be used.

645
- (IHE-A.2.2) In MPPS, SOP Instance UID is sent in the Affected SOP Instance UID (0000,1000) of the PPS N-Create message and in Requested SOP Instance UID (0000,1001) for the PPS N-Set message. SOP Instance UID (0008,0018) shall not be used.

A.2 Context-critical Attributes

650 This section extends the above table with additional IHE Requirements based on a number of context-critical attributes (Type 2 in DICOM) common to most images and standalone IODs when provided in response to a C-FIND Request in Return Key Attributes. The content of this table is strictly consistent with PS 3.17 Annex J of DICOM.

Modality Worklist	Images IOD	MPPS IOD
Patient Name	Patient Name (note 1)	Patient Name (note 1)
Patient ID	Patient ID (note 1)	Patient ID (note 1)
Patient's Birth Date	Patient's Birth Date (note 2)	Patient's Birth Date (note 2)
Patient's Sex	Patient's Sex (note 2)	Patient's Sex (note 2)
Referring Physician's Name	Referring Physician's Name (note 2)	----

655 Note 1: This Attribute may be zero length when the Order Filler providing the Modality Worklist service is not accessible. Pre-registered values for Patient ID and Patient Name will be used in the Unidentified Patient cases defined in the IHE Technical Framework.

Note 2: Attribute may be zero length when the Order Filler providing Modality Worklist service is not accessible or the Attributes returned by MWL are zero length.

660

Volume 3 – Content Modules

This section is not applicable.

Volume 4 – National Extensions

665 | *Add appropriate Country section*

This section is not applicable.