

Integrating the Healthcare Enterprise



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**IHE Eye Care (EYECARE)
Technical Framework**

Volume 2

IHE EYECARE TF-2

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Transactions

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1 Introduction

This document, Volume 2 of the IHE Eye Care (EYECARE) Technical Framework, defines transactions used in IHE Eye Care profiles.

190 1.1 Introduction to IHE

Integrating the Healthcare Enterprise (IHE) is an international initiative to promote the use of standards to achieve interoperability among health information technology (HIT) systems and effective use of electronic health records (EHRs). IHE provides a forum for care providers, HIT experts and other stakeholders in several clinical and operational domains to reach consensus on standards-based solutions to critical interoperability issues.

The primary output of IHE is system implementation guides, called IHE Profiles. IHE publishes each profile through a well-defined process of public review and trial implementation and gathers profiles that have reached final text status into an IHE Technical Framework, of which this volume is a part.

200 For more general information regarding IHE, refer to www.ihe.net. It is strongly recommended that, prior to reading this volume, the reader familiarizes themselves with the concepts defined in the [IHE Technical Frameworks General Introduction](#).

1.2 Intended Audience

The intended audience of IHE Technical Frameworks Volume 2 is:

- 205 • IT departments of healthcare institutions
- Technical staff of vendors participating in the IHE initiative
- Experts involved in standards development

1.3 Overview of Technical Framework Volume 2

Volume 2 is comprised of several distinct sections:

- 210 • Section 1 provides background and reference material.
- Section 2 presents the conventions used in this volume to define the transactions.
- Section 3 provides a simple Framework Overview.
- Section 4 defines IHE Eye Care transactions in detail, specifying the roles for each actor, the standards employed, the information exchanged, and in some cases, implementation options for the transaction.

215 The appendices in Volume 2 provide clarification of technical details of the IHE data model and transactions. A glossary of terms and acronyms used in the IHE Technical Framework, including those from relevant standards, is provided in the [IHE Technical Frameworks General Introduction](#). Due to the length of the document, some domains may divide Volume 2 into smaller volumes labeled 2a, 2b, etc. In this case, the Volume 2 appendices are gathered in

220

Volume 2x. Code and message samples may also be stored on the IHE ftp server. In this case, explicit links to the ftp server will be provided in the transaction text.

1.4 Comment Process

225 IHE International welcomes comments on this document and the IHE initiative. They can be submitted by sending an email to the co-chairs and secretary of the Eye Care domain committees at eyecare@ihe.net.

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 disclosure process to the secretary of the IHE International Board: secretary@ihe.net.

1.8 History of Document Changes

This section provides a brief summary of changes and additions to this document.

Date	Document Revision	Change Summary
2006	2.0	First Release of IHE Eye Care Technical Framework, generated Eye Care Workflow, Charge Posting and Eye Care Evidence Documents transactions
2007-2008	3.2	Update CPs and Generated Eye Care Displayable Reports transactions
2009-2010	3.7	Update CPs
2016	4.0	Update CPs, Add Unified Eye Care Workflow transactions

270

2 Conventions

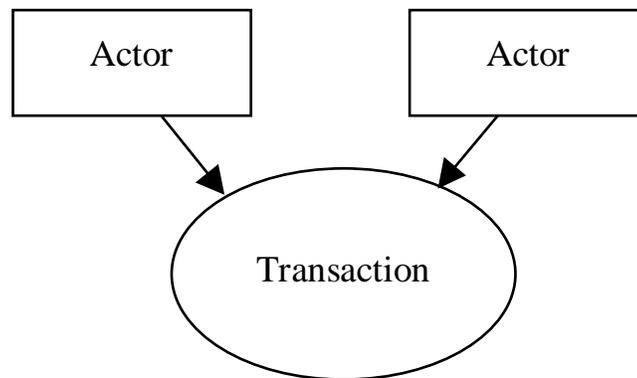
275 This document has adopted the following conventions for representing the framework concepts and specifying how the standards upon which the IHE Eye Care Technical Framework is based shall be applied.

2.1 The Generic IHE Transaction Model

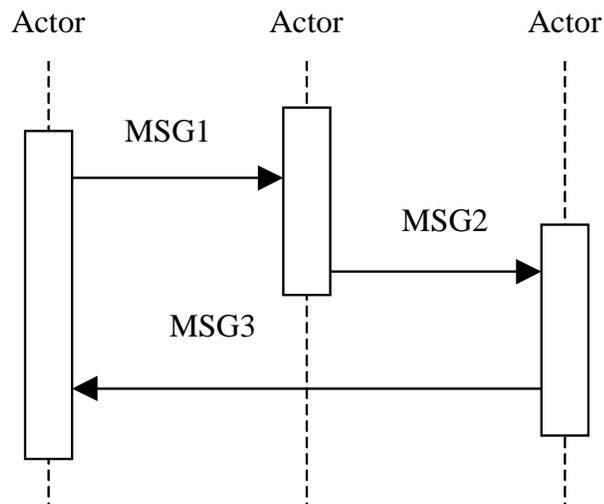
Transaction descriptions are provided in Section 4. In each transaction description, the actors, the roles they play, and the transactions between them are presented as use cases.

The generic IHE transaction description includes the following components:

- 280
- Scope: a brief description of the transaction.
 - Use case roles: textual definitions of the actors and their roles, with a simple diagram relating them, e.g.:



- 285
- *Referenced Standards*: the standards (stating the specific parts, chapters or sections thereof) to be used for the transaction.
 - *Interaction Diagram*: a graphical depiction of the actors and transactions, with related processing within an actor shown as a rectangle and time progressing downward, similar to:



290 The interaction diagrams used in the IHE Technical Framework are modeled after those
described in Grady Booch, James Rumbaugh, and Ivar Jacobson, *The Unified Modeling
Language User Guide*, ISBN 0-201-57168-4. Simple acknowledgment messages are
omitted from the diagrams for brevity. One or more messages may be required to satisfy
a transaction. Each message is represented as an arrow starting from the actor initiating
295 the message.

- *Message definitions*: descriptions of each message involved in the transaction, the events that trigger the message, its semantics, and the actions that the message triggers in the receiver.

2.2 DICOM^{®3} Usage Conventions

300 For some DICOM transactions described in this document, IHE has strengthened the
requirements on the use of selected Type 2 and Type 3 attributes. These situations are explicitly
documented in Section 4 and in the appendices.

IHE specifically emphasizes that DICOM Type 2 attributes (for instance, Patient Name, Patient
ID) shall be transmitted with zero length if the source system does not possess valid values for
305 such attributes; in other words, the source system shall not assign default values to such
attributes. The receiving system must be able to handle zero-length values for such attributes.

IHE has also defined requirements related to the support for and use of matching and return keys
in DICOM queries by both Service Class Users (SCUs) and Service Class Providers (SCPs).
Matching keys are used to select instances for inclusion in the response by the query SCP to the
310 SCU, whereas return keys only return specific data and are not used for matching.

³ DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

- Required matching key SCU:

315 A key that the Query SCU shall have the ability to offer to its user as a selection criterion. The definition of the means offered to the user of the Query SCU to trigger the sending of a matching key in the Query request is beyond the scope of IHE (e.g., enter a value, select an entry).

- Required matching key SCP:

320 An IHE required matching key is processed by the Query SCP just as if it were a DICOM-required matching key. In most cases, IHE-required matching keys are also DICOM-required matching keys.

- Required return key SCU:

325 A key that the Query SCU requests from the Query SCP, receives in the query responses, and displays for the user, if required. The definition of the means offered to the user of the Query SCU to request a return key (e.g., by default, check a box) and to make it visible to the user is beyond the scope of IHE.

- Required return key SCP:

325 IHE-required return keys specified within DICOM as type 1 or type 2 return keys are processed according to their DICOM type. IHE-required return keys specified within DICOM as type 3 will be processed as if they were type 2.

330 Query Key Requirement Tables in the framework use the following legend to specify requirements for SCUs and SCPs:

- R Required
- O Optional

The following modifiers are also used:

- 335 R+ The Requirement is an IHE extension of the DICOM requirements
- R* The attribute is not required to be displayed

Table 2.2-1 provides an example table defining matching and return keys.

340

Table 2.2-1: Images Query Matching and Return Keys

Attributes Name	Tag	Query Keys Matching		Query Keys Return		Notes
		SCU	SCP	SCU	SCP	
Scheduled Human Performers Sequence	(0040,4034)	R+	R	R+*	R	
>Human Performer Code Sequence	(0040,4009)	R+	R	R+*	R	
>>Code Value	(0008,0100)	R+	R	R+*	R	
>>Coding Scheme Designator	(0008,0102)	R+	R	R+*	R	
>>Code Meaning	(0008,0104)	-	-	R+	R	Query Keys Matching SCU or SCP do not use the Code Meaning values (“-“).
>Human Performer's Name	(0040,4037)	R+	R+	R+	R+	
>Human Performer's Organization	(0040,4036)	O	O	O	R+	
Referenced Study Component Sequence	(0008,1111)	O	O	O	O	
>Referenced SOP Class UID	(0008,1150)	O	O	O	R	
>Referenced SOP Instance UID	(0008,1155)	O	O	O	R	
Input Information Sequence	(0040,4021)	O	O	R+*	R	

2.3 Use of Coded Entities and Coding Schemes

345

IHE does not produce, maintain or otherwise specify a coding scheme or other resource for controlled terminology (coded entities). Where applicable, coding schemes required by the HL7 and DICOM standards take precedence. In the cases where such resources are not explicitly identified by the standards, implementations may utilize any resource (including proprietary or local) provided any licensing/copyright requirements are satisfied.

3 Framework Overview

The IHE Technical Framework is based on actors that interact through transactions.

350 Actors are information systems or components of information systems that produce, manage, or act on information associated with operational activities in the enterprise.

Transactions are interactions between actors that transfer the required information through standards-based messages.

355 Specific sets of actors and transactions are specified in the Integration Profiles (see EYECARE TF-1).

4 IHE Transactions

This section defines each IHE transaction in detail, specifying the standards used, the information transferred, and the conditions under which the transaction is required or optional.

4.1 Query Modality Worklist [EYECARE-1]

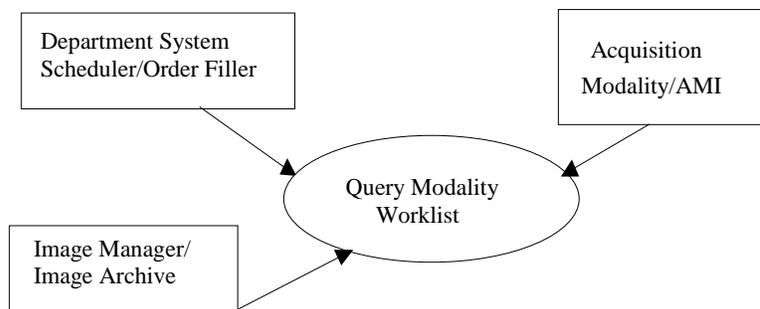
360 This transaction is identical to Query Modality Worklist [RAD-5] (see RAD TF-2: 4.5), with the addition of some features.

Note: The Radiology Technical Framework requires that the Acquisition Modality support at least one of the Worklist Query choices (i.e., Patient and/or Broad). Eye Care requires support for both options for both the Acquisition Modality and Acquisition Modality Importer. See EYECARE TF-1: 9.2.

365 4.1.1 Scope

This transaction takes place at the Acquisition Modality or the Acquisition Modality Importer (AMI) at the point of scan/acquisition. When a patient arrives for the scheduled procedure, the user performing the procedure must examine key information elements as they relate to the procedure, the correctness of the procedure that has been ordered, and comments that may have
370 been entered by the referring healthcare provider. The user at the Acquisition Modality or the Acquisition Modality Importer uses the DICOM Modality Worklist to query the Department System Scheduler/Order Filler or Image Manager/Image Archive for Scheduled Procedure Steps. The list is downloaded to the modality and the user verifies the information on the modality console. In the Modality/Evidence Images Stored transaction this information will be included in
375 the header of the generated objects (see RAD TF-2: 4.8 and RAD TF-2: Appendix A).

4.1.2 Use Case Roles



Actor: Acquisition Modality and Acquisition Modality Importer

380 **Role:** Responsible for requesting and receiving data from the Department System Scheduler/Order Filler or Image Manager/Image Archive, with the ability to validate the data and correct some discrepancies.

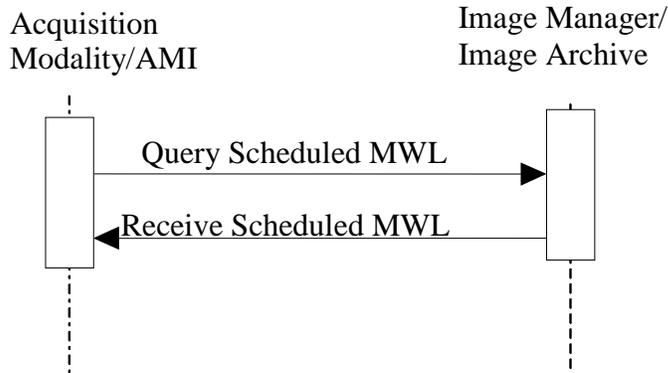
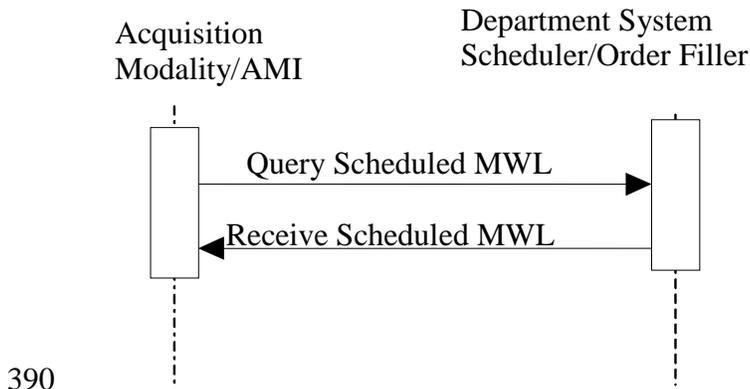
Actor: Department System Scheduler/Order Filler or Image Manager/Image Archive

Role: Responsible for accepting requests for MWL from an Acquisition Modality or Acquisition Modality Importer, performing the query, and sending the response back.
385

4.1.3 Referenced Standards

DICOM PS 3.4: Modality Worklist SOP Class

4.1.4 Interaction Diagram



4.1.4.1 Query Scheduled MWL Message

395 This is the worklist query message sent to the Department System Scheduler/Order Filler or Image Manager/Image Archive.

4.1.4.1.1 Trigger Events

The patient arrives at the modality for a procedure.

4.1.4.1.2 Message Semantics

400 The Acquisition Modality or Acquisition Modality Importer uses the C-FIND Request of the DICOM Modality Worklist SOP Class to query for the worklist from the Department System

Scheduler/Order Filler (DSS/Order Filler) or Image Manager/Image Archive. The Acquisition Modality or Acquisition Modality Importer performs the SCU role, and the DSS/Order Filler performs the SCP role. The types of queries specified are defined in the RAD TF-2: 4.5.

405 **4.1.4.1.3 Expected Actions**

The expected actions are defined in RAD TF-2: 4.5. This section provides some further explanation for one Eye Care use case.

410 Various types of acquisition devices are able to create ophthalmic photography images and/or ophthalmic tomography images. For example, both fundus cameras and slit-lamp biomicroscopes are able to create ophthalmic photography images. When performing Modality Worklist clinics may desire to schedule protocols for each device separately (i.e., see a separate list for the fundus and slit-lamp biomicroscopes). This use case is solved in most specialties by using the Modality attribute in the MWL query; however, since the modality for each device is OP, this does not satisfy the use case in eye care. The solution to this use case is the DSS/OF or Image
415 Manager/Image Archive managing the attribute Scheduled Station AE Title.

The Scheduled Station AE Title attribute is used to determine the actual device asking the MWL query. If the clinic wishes to schedule each device separately, then the Scheduled AE Title is used to distinguish between devices. However, this is not a very common case and more common is when a clinic wishes to schedule based upon device type. For this scenario, the
420 DSS/OF or Image Manager/Image Archive provides the solution by creating a table of AE Titles for each type of similar device. Therefore, when the fundus camera and slit-lamp biomicroscope acquisition modalities use Scheduled Station AE Title in their MWL query, they will each receive a different list of scheduled procedures. This is just one scenario for how the DSS/OF or Image Manager/Image Archive should manage the attribute Scheduled Station AE Title. Others
425 may also be required based upon the needs of the clinic.

4.1.5 Issuer of Patient ID

The Patient Registration Source transmits information regarding the assigning authority (issuer) of the Patient ID to the DSS/Order Filler or Image Manager/Image Archive; this is defined in [RAD-1] (see RAD TF-2: 4.1). However, [RAD-5] (see RAD TF-2: 4.5) does not require the
430 DICOM attribute “Issuer of Patient ID” be filled in by the DSS/Order Filler Actor if asked by the Acquisition Modality or Acquisition Modality Importer during a Modality Worklist query. This extension requires support for this attribute. See EYECARE TF-1: 9.4.6 for use case explanation.

For this EYECARE-1 extension, Table 4.5-3 from [RAD-5] (see RAD TF-2: 4.5) shall be extended as defined by the following table entry.
435

Table 4.1.5-1: Return and Matching Keys For Modality Worklist

Attribute Name	Tag	Query Keys Matching		Query Keys Return	
		SCU	SCP	SCU	SCP
Patient Identification					
Issuer of Patient ID	(0010,021)	O	O	O	R+

440 Note: The Acquisition Modality and Acquisition Modality Importer are not required to ask for the Issuer of Patient ID in their queries; however, if they do ask for the attribute, the DSS/Order Filler or Image Manager/Image Archive is required to return a valid value in the response.

4.1.6 Imaging Procedure Instructions Option

445 When an order for a procedure is created, a health care provider may wish to include instructions to the technician. For example there might be instructions to tape the eyelids while performing a visual field or to concentrate on a specific region of the eye during the early stage of an angiogram, etc.

This can be accomplished via various workflows, such as:

- When an Order Placer and/or DSS/Order Filler transmits HL7 ORM messages which are defined in [EYECARE-10] and [EYECARE-11], see Section 4.10 and Section 4.11 for complete specifications.
- 450 • When a DSS/Order Filler in Model I and II generates an internal order and captures procedure instructions.
- When a DSS/Order Filler in Model III generates an internal order, captures procedure instructions and provides the instructions in the NTE optional segment in Procedure Scheduled [EYECARE-21] transaction to the Image Manager/Image Archive.

455 If instructions for a procedure are provided, the DSS/OF or Image Manager/Image Archive that supports the Imaging Procedure Instructions Option shall convey these instructions to the Acquisition Modality or Acquisition Modality Importer during a Modality Worklist query using the DICOM attribute “Requested Procedure Comments”. The Acquisition Modality and/or Acquisition Modality Importer Actors shall display the instructions to the technician prior to
460 performing the procedure.

Table 4.1.6-1: Return and Matching Keys for Modality Worklist

Attribute Name	Tag	Query Keys Matching		Query Keys Return	
		SCU	SCP	SCU	SCP
Requested Procedure Comments					
Requested Procedure Comments	(0040,1400)	O	O	R+	R+

4.2 Modality Images/Evidence Stored [EYECARE-2]

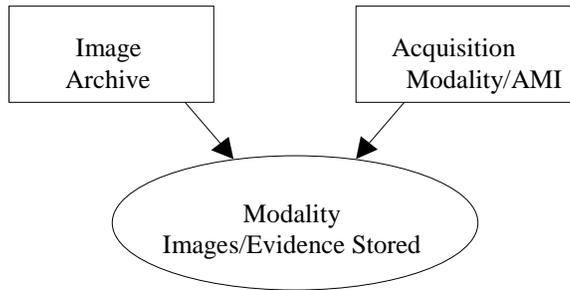
465 This transaction is identical to Modality Images Stored [RAD-8] (see RAD TF-2: 4.8) except for the list of SOP Classes supported which are defined in later sections.

4.2.1 Scope

In the Modality Images/Evidence Stored transaction, the Acquisition Modality or Acquisition Modality Importer sends the acquired images/evidence documents to the Image Archive. The

470 information provided from the Modality Worklist transaction (see RAD TF-2: 4.5) shall be included in the headers of the generated images.

4.2.2 Use Case Roles



Actor: Acquisition Modality or Acquisition Modality Importer

475 **Role:** Transmit acquired image/evidence documents data to Image Archive.

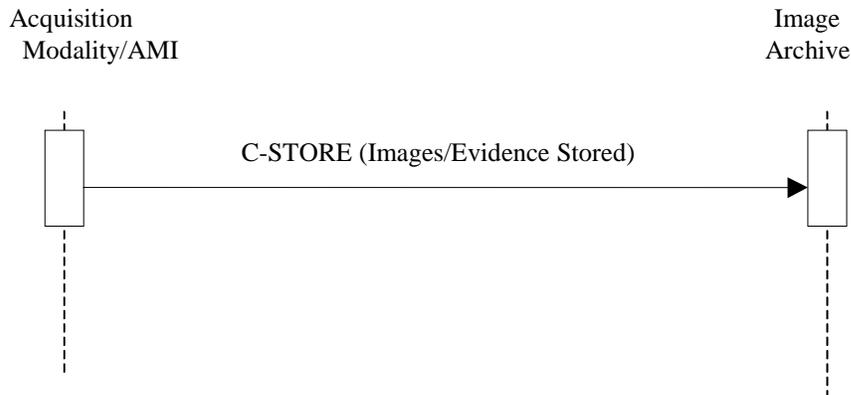
Actor: Image Archive

Role: Accept and store images/evidence documents from Acquisition Modalities and Acquisition Modality Importers.

4.2.3 Referenced Standards

480 DICOM PS 3.4: Storage Service Class.

4.2.4 Interaction Diagram



4.2.4.1 Images/Evidence Stored

4.2.4.1.1 Trigger Events

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

4.2.4.1.1.1 Study UIDs and Series UIDs

490 Study UID creation details and timing are clearly defined by the IHE. The Radiology Scheduled Workflow and Patient Reconciliation Profiles explain how the Study information and identifiers such as the Study Instance UID are generated by the DSS/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 (RAD TF-2: Appendix A, Table A.1-2) or when several SPS
495 belonging to different Requested Procedures are satisfied by a single PPS (RAD TF-2: Appendix A, Table A.1-5).

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

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.

500 Therefore, adding images/evidence documents 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.

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

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

510 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/evidence documents reconstructed on a different piece of equipment are required to be in a separate Series.

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

Note: Reconstructed and derived eye care image examples can include but are not limited to: mosaics, panoramas, 2-D/3-D renderings, superimposed images, combined images, statistical image maps, interpolated images, etc.

520 **4.2.4.1.2 Message Semantics**

The Acquisition Modality and Acquisition Modality Importers use the DICOM C-STORE message to transfer the images/evidence documents. The Acquisition Modality or Acquisition Modality Importer is the DICOM Storage SCU and the Image Archive is the DICOM Storage SCP.

525 The user 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 object header of the image/evidence document. The details of the mapping to DICOM image/evidence documents instances are specified in RAD TF-2: Appendix A. Effectively, this appendix strengthens the type definition of some DICOM attributes for the IHE Technical Framework

530 **4.2.4.1.3 Issuer of Patient ID into Stored Images or Evidence Documents**

EYECARE-1 defines the ability for Acquisition Modalities to query for the attribute Issuer of Patient ID using DICOM Modality Worklist, see Section 4.1 for the specification. This section defines the requirement that this attribute be placed in the images and/or evidence documents if obtained via the query worklist.

535 If an Acquisition Modality or Acquisition Modality Importer obtains a valid value for the attribute Issuer Of Patient ID (0010,00210) via the Query Worklist Transaction, it shall include this attribute in any images and/or evidence documents it creates related to this specific patient.

4.2.5 Eye Care Image Option

540 Acquisition Modalities that support the Eye Care Image Option shall support at least one of the SOP Classes defined by Table 4.2.5-1.

Acquisition Modalities that support the Eye Care Image Option to create Ophthalmic Photography Images shall be able to support Ophthalmic 8-bit Photography and/or Ophthalmic 16-bit Photography Image Storage.

545 Acquisition Modalities that support the Eye Care Image Option to create Ophthalmic Tomography Images shall be able to support Ophthalmic Tomography Image Storage.

Image Archives that support the Eye Care Image Option shall support all of the SOP classes listed in Table 4.2.5-1.

550 **Table 4.2.5-1: Eye Care Storage SOP Classes**

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.1	Ophthalmic 8-bit Photography Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.2	Ophthalmic 16-bit Photography Image Storage
1.2.840.10008.5.1.4.1.1.88.33	Stereometric Relationship Storage
1.2.840.10008.5.1.4.1.1.77.1.5.4	Ophthalmic Tomography Image Storage

1.2.840.10008.5.1.4.1.1.82.1	Corneal Topography Map Storage
1.2.840.10008.5.1.4.1.1.81.1	Ophthalmic Thickness Map Storage
1.2.840.10008.5.1.4.1.1.80.1	Ophthalmic Visual Field Static Perimetry Measurements Storage
1.2.840.10008.5.1.4.1.1.78.7	Ophthalmic Axial Measurements Storage
1.2.840.10008.5.1.4.1.1.78.8	Intraocular Lens Calculations Storage
1.2.840.10008.5.1.4.1.1.77.1.5.5	Wide Field Ophthalmic Photography Stereographic Projection Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.6	Wide Field Ophthalmic Photography 3D Coordinates Image Storage

555 Note: In order to correctly display images, some DICOM Image SOP Classes require advanced imaging visualization capabilities (i.e., Wide Field Ophthalmic Photography 3D Coordinates Image Storage SOP Class, etc.) Not all image viewing systems have such capabilities and rely on more basic image display functionality. Therefore, it is recommended that acquisition modality actors have the ability to send DICOM images via their native DICOM SOP Class but also have a configurable option to send the image(s) via the DICOM Secondary Capture SOP Class. This will facilitate a higher level of interoperability for systems supporting basic image display only (i.e., EHRs, etc.).

560 Ophthalmic images may become very large as many are based upon multi-frame IODs. Thus image compression requirements are very important to ensure timely accessibility to such images. The compression specifications defined in this section are required for Acquisition Modalities that support the ophthalmic SOP Classes defined in Table 4.2.5-2.

Table 4.2.5-2: Eye Care Image Storage SOP Classes

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.1	Ophthalmic 8-bit Photography Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.2	Ophthalmic 16-bit Photography Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.4	Ophthalmic Tomography Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.5	Wide Field Ophthalmic Photography Stereographic Projection Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.6	Wide Field Ophthalmic Photography 3D Coordinates Image Storage

565 Transfer Syntaxes are identified and grouped into three categories: uncompressed, lossless compressed, and lossy compressed as per Table 4.2.5-3.

Table 4.2.5-3: Eye Care Standard Image 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

Lossless Compressed	1.2.840.10008.1.2.4.70	JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression
	1.2.840.10008.1.2.4.90	JPEG 2000 Image Compression (Lossless Only)
Lossy Compressed	1.2.840.10008.1.2.4.50	JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image
	1.2.840.10008.1.2.4.91	JPEG 2000 Image Compression

570 Acquisition Modalities that support SOP classes specified in Table 4.2.5-2 shall be able to negotiate and offer at least one uncompressed, one lossless compressed and one lossy compressed transfer syntax from Table 4.2.5-3 (depending on the system configuration and/or user storage selection). However if the image acquisition chain of the Acquisition Modality is configured for lossy compression, the requirement for uncompressed or lossless compressed transfer syntaxes is waived; in this case only one of the lossy compressed transfer syntaxes from Table 4.2.5-3 is required. It is up to the Acquisition Modality to determine which transfer syntax of each category is most appropriate for the particular image(s) being stored.

580 Note: For certain types of images, JPEG 2000 is able to provide compression ratios, bit lengths, and image quality greater than original JPEG algorithms. This provides storage and image quality benefits for its use. However, many modern development platforms and internet browsers do not natively support the JPEG 2000 format. Display systems convert images compressed using the JPEG-2000 format to a natively supported image format using a complex conversion algorithm prior to rendering the image on the display system. This conversion process significantly increases the CPU utilization for affected display systems, potentially resulting in poor imaging performance and increased computing costs on these systems.

585 IHE Eye Care does not currently address video applications (i.e., surgical microscopes, video ultrasound, etc.). Thus this specification does not specify DICOM Transfer Syntaxes such as MPEG2 or MPEG4. However certain implementations may wish to use DICOM IODs such as the Ultrasound and OP for video solutions. Implementations that are using DICOM Eye Care IODs for video solutions only are not bound by the Transfer Syntax rules specified in this section.

Note: Future version of Eye Care may include specifications for video solutions.

Image Archives shall be able to negotiate, offer and accept any of the transfer syntaxes listed in Table 4.2.5-3.

595 Acquisition Modalities and Image Archives may support transfer syntaxes beyond what is specified in Table 4.2.5-3.

Note: Here are some practical examples of how to interpret these transfer syntax requirements:

- 600 1. A digital fundus camera system may meet the requirements by allowing user configuration to store images using the DICOM default transfer syntax, JPEG lossless and JPEG lossy compression.
- 2. A spectral domain OCT scanner which acquires images using up-front lossy compression may meet these requirements by supporting only JPEG 2000 compression.
- 605 3. A digital surgical microscope system which acquires a video stream does not need to support the listed transfer syntaxes and may, for example, only support MPEG2.

4.2.5.1 Radiological Studies of the Eye

Eye care healthcare providers frequently order radiological studies of the eye and surrounding anatomy. In many instances the interpretation of the study by a radiologist is all that is required. However, in certain instances such as suspected disease or trauma of the orbit (eye socket) or sinuses the ophthalmologist considers both a radiologist report and personal evaluation of the imaging study. One common example would be an orbital CT scan looking for fracture of the orbital floor, which may require surgical repair. Another example is the use of an orbital MRI looking for suspected tumor. Plain x-ray films of the facial bones may be obtained when there is trauma near the eye. In all these instances the ophthalmologist gains specific diagnostic value by his or her own evaluation of the images and may also use this function in the OR to guide surgical intervention.

Image Display and Archive Actors are recommended to support the radiological SOP Classes defined in Table 4.2.5.1-1.

Table 4.2.5.1-1: Radiological Studies SOP Classes

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.1	Computed Radiography Image Storage
1.2.840.10008.5.1.4.1.1.1.1	Digital X-Ray Image Storage – For Presentation
1.2.840.10008.5.1.4.1.1.2	CT Image Storage
1.2.840.10008.5.1.4.1.1.4	MR Image Storage
1.2.840.10008.5.1.4.1.1.12.1	X-Ray Angiographic Image Storage
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage

4.2.6 Encapsulated PDF Option for Evidence Documents

There are many Acquisition Modalities that create evidence documents in addition to or instead of standalone images such as derived images, combined data, measurements, plots, graphs and other diagnostic information.

Acquisition Modalities that support the Encapsulated PDF Option shall support the SOP Class defined by Table 4.2.6-1.

In 2008, DICOM SOP Classes have been defined for many devices that create measurements, such as lensometers, auto-refractors, keratometers, and subjective refraction devices. Therefore, they are required to support the Eye Care Measurements Option defined in Section 4.2.8. Image Archives that support the Encapsulated PDF Option shall support the SOP Class defined by Table 4.2.6-1.

Table 4.2.6-1: Eye Care SOP Classes for Evidence Documents

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Storage

635 **4.2.6.1 Encapsulated PDF Option for Evidence Documents Attributes**

4.2.6.1.1 Concept Name Code Sequence

The Concept Name Code Sequence is the attribute used to provide standardized coded titles for documents. Report Creators which support the Encapsulated PDF Option should be able to configure this attribute based upon the clinic requirements or a chosen industry standard.

640 Note: This requirement allows users and implementations to identify the different types of encapsulated documents.

4.2.6.2 PDF Version Requirements

645 The DICOM standard does not define use of a specific version of PDF when encapsulated PDF is used. This may result in incorrect display of reports when using a different PDF version of software from that which was used to create the files. Common errors include blank or missing pages, missing or displaced graphics, or important changes in format, leading to risk for clinical error.

650 Another difficulty is that PDF files are very large when only pixel data is used in the file. This causes unacceptable clinical impacts such as very slow network transmission speeds. Pixel data PDFs also may cause unreadable display upon zooming in or out, allowing only small portions of a document to be viewed at one time, etc. When searchable PDF is used to store information as text the files are much smaller, solving many of the issues identified. The ability to search the text files is an additional critical benefit, allowing a clinician to locate specific information quickly.

655 ISO PDF based standards have been developed in order to address these issues. Acquisition Modality and Evidence Creator Actors are recommended to support PDF/A ISO 19005-1. Document management – Electronic document file format for long-term preservation- Part 1: Use of PDF (PDF/A).

660 The PDF contents of the DICOM Encapsulated PDF objects are recommended to conform to PDF/A-1a (level A conformance to the PDF/A Part 1 standard). The advantage of supporting PDF/A-1a is to ensure that the rendered visual appearance of the document is reproducible across computer platforms and over the course of time, and that the document can be displayed in natural reading order on a mobile device (for example a PDA) or other devices in accordance with Section 508 of the US Rehabilitation Act.

665 The Image Display shall conform to the PDF/A reader requirements for the display of DICOM Encapsulated PDF documents that are conformant to the PDF/A standard. This is intended to ensure the correct visual rendering of these documents.

An individual profile may decide to require the PDF/A Standard.

4.2.7 Eye Care Measurements Option

670 There are many Acquisition Modalities in eye care that create measurement information, such as lensometers, auto-refractors, keratometers, and subjective refraction devices. This option allows support for such devices.

Acquisition Modalities that support the Eye Care Measurements Option shall support at least one of the SOP Classes defined by Table 4.2.7-1.

675 Image Archives that support the Eye Care Measurements Option are required to support all the SOP Classes defined in Table 4.2.7-1.

Table 4.2.7-1: Eye Care Measurement Storage SOP Classes

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.78.1	Lensometry Measurements
1.2.840.10008.5.1.4.1.1.78.2	Autorefracton Measurements
1.2.840.10008.5.1.4.1.1.78.3	Keratometry Measurements
1.2.840.10008.5.1.4.1.1.78.4	Subjective Refraction Measurements
1.2.840.10008.5.1.4.1.1.78.5	Visual Acuity Measurements
1.2.840.10008.5.1.4.1.1.78.6	Spectacle Prescription Report

4.2.8 Relative Image Position Coding Option

680 When a healthcare provider is reading fundus photos it is occasionally difficult to determine what location in the retina, or even which eye, he or she is viewing. Laterality (right vs left eye) is a required attribute in DICOM Ophthalmic Photography Image SOP Classes, enabling image display vendors to display this information. However, the DICOM attribute Relative Image Position Code Sequence is an optional attribute and is often not conveyed in the OP images.

685 Acquisition Modality Actors that support the Relative Image Position Coding Option shall support the requirements in Tables 4.2.8-1 and 4.2.8-2.

Table 4.2.8-1: Relative Image Position Coding Extended Attributes and Codes

Attribute Name	Tag	Type
Relative Image Position Code Sequence	(0022,001D)	1C – Required for images that have an assigned imaging code review recommendation
>Include ‘Code Sequence Macro’ Table 8.8.1 Code Sequence Macro defined in DICOM PS 3.3: Information Object Definitions		Enumerated Value for Context ID 4207

690 The Eye Care domain may utilize many different image position codes. DICOM CID 4207 identifies some of these codes however healthcare providers may wish to utilize image position codes beyond CID 4207 according to other acquisition protocols. Acquisition Modality Actors shall support the extended codes defined in Table 4.2.8-2 AND shall be configurable in order to support the codification scheme selected or defined by the healthcare enterprise.

695 IHE has submitted codes in Table 4.2.8-2 to DICOM and they have been added to DICOM CID 4207. Implementations are recommended to use the updated codes specified in DICOM CID 4207 instead of the IHE codes. The DICOM codes are shown below, however, implementations should use Part 16 of DICOM to obtain the actual standardized codes.

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4.2.8-2: Relative Image Position Extended Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
99IHEEYECARE	330001	Macula centered
DCM	111900	Macula centered
99IHEEYECARE	330002	Disc centered
DCM	111901	Disc centered
99IHEEYECARE	330003	Mid-peripheral, superior
DCM	111904	Mid-peripheral-superior
99IHEEYECARE	330004	Mid-peripheral, superior temporal
DCM	111905	Mid-peripheral-superior temporal
99IHEEYECARE	330005	Mid-peripheral, temporal
DCM	111906	Mid-peripheral-temporal
99IHEEYECARE	330006	Mid-peripheral, inferior temporal
DCM	111907	Mid-peripheral-inferior temporal
99IHEEYECARE	330007	Mid-peripheral, inferior
DCM	111908	Mid-peripheral-inferior
99IHEEYECARE	330008	Mid-peripheral, inferior nasal
DCM	111909	Mid-peripheral-inferior nasal
99IHEEYECARE	330009	Mid-peripheral, nasal
DCM	111910	Mid-peripheral-nasal
99IHEEYECARE	330010	Mid-peripheral, superior nasal
DCM	111911	Mid-peripheral-superior nasal
99IHEEYECARE	330011	Peripheral, superior
DCM	111912	Peripheral-superior
99IHEEYECARE	330012	Peripheral, superior temporal
DCM	111913	Peripheral-superior temporal
99IHEEYECARE	330013	Peripheral, temporal
DCM	111914	Peripheral-temporal
99IHEEYECARE	330014	Peripheral, inferior temporal
DCM	111915	Peripheral-inferior temporal
99IHEEYECARE	330015	Peripheral, inferior
DCM	111916	Peripheral-inferior
99IHEEYECARE	330016	Peripheral, inferior nasal
DCM	111917	Peripheral-inferior nasal
99IHEEYECARE	330017	Peripheral, nasal
DCM	111918	Peripheral-nasal

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
99IHIEEYECARE	330018	Peripheral, superior nasal
DCM	111919	Peripheral-superior nasal
99IHIEEYECARE	330019	Lesion centered
DCM	111902	Lesion centered

4.2.9 Stereo Relationship Option

705 Stereo photography such as for the optic disk requires determination of the stereo relationships between two OP images. The DICOM standard provides a mechanism for storing separate stereo relationship objects referencing the left and right images.

Acquisition Modality, Image Archive and Image Display Actors supporting the Stereo Relationship Option shall support the DICOM SOP Class defined in Table 4.2.9-1.

710 For the Acquisition Modality, this may involve user inputs to determine the left and right images, and possibly the horizontal displacement, vertical displacement and rotation of the right image relative to the left for optimal display. The Acquisition Modality may of course store the stereo relationships automatically without user input. If the device is aware of the angle of separation, the DICOM attribute Stereo Baseline Angle (0022,0010) should be conveyed.

715 The Acquisition Modality shall at minimum support determination of stereo relationships between single-frame images or individual frames of multi-frame images; it may support determination of stereo relationships between multiple frames of multi-frame images.

Table 4.2.9-1: Stereo Relationship SOP Class

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.77.1.5.3	Stereometric Relationship Storage

4.2.10 Contrast Start Time Reporting in OP Images

720 The time stamp for initiation of contrast injection is termed Contrast Bolus start time. Timing of contrast injection is very important in some clinical settings, but due to variable clinical workflow in ophthalmic angiography there is potential for this data field to not strictly represent the contrast injection time. The only way to control quality of this data is through proper implementation of the OP acquisition modality. This hinges on proper manufacturers' documentation, end user training, and strict attention to protocol during operation. Clinical settings where this feature may be useful include a variety of cerebral and ocular vascular occlusive diseases such as carotid artery occlusion, and central retinal artery/vein occlusion. As an example, in carotid occlusive disease a significant delay in the arm to retinal circulation time (ARCT) could be used to facilitate risk stratification for further cerebrovascular and cardiovascular work-up.

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Table 4.2.10-1: Storage SOP Classes Requiring Contrast Tracking

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.77.1.5.1	Ophthalmic 8-bit Photography Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.2	Ophthalmic 16-bit Photography Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.5	Wide Field Ophthalmic Photography Stereographic Projection Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.6	Wide Field Ophthalmic Photography 3D Coordinates Image Storage

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Acquisition Modality Actors that support the SOP Classes specified in Table 4.2.10-1 shall support the attribute requirements as specified in Table 4.2.10-2 when contrast has been administered to the patient.

Table 4.2.10-2: Contrast Attribute Requirements

>Contrast Administration Profile Sequence	(0018,9340)	1	Sequence that describes one or more phases of contrast administered. If present, shall contain one or more Items.
>>Contrast/Bolus Volume	(0018,1041)	2	Volume administered during this phase in milliliters of diluted contrast agent.
>>Contrast/Bolus Start Time	(0018,1042)	1	Time of start of administration.
>>Contrast/Bolus Stop Time	(0018,1043)	3	Time of end of administration.
>>Contrast Flow Rate	(0018,1046)	3	Rate of administration in milliliters/sec. Only a single value shall be present.
>>Contrast Flow Duration	(0018,1047)	3	Duration of injection in seconds. Only a single value shall be present.

4.2.11 Acquisition Modality Importer Actor Storage

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Acquisition Modality Importer Actors provide IHE integration capabilities to eye care acquisition instruments that are not DICOM compatible. The storage requirements are very similar to Acquisition Modalities; however it may not be possible to obtain the acquisition modality's internal data and may be necessary to interface via framegrabbers, printer ports and other mechanisms (this is not defined in IHE). Thus, they may also support DICOM SOP Classes that "capture" data from other devices.

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Acquisition Modality Importer Actors shall support at least one of the SOP Classes defined in Tables 4.2.5-1 and/or 4.2.7-1 and/or 4.2.11-1.

Table 4.2.11-1: Acquisition Modality Importer Actor Capture SOP Classes

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Storage
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.2	Multi-frame Grayscale Byte Secondary Capture Image Storage

1.2.840.10008.5.1.4.1.1.7.3	Multi-frame Grayscale Word Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage

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Eye care modalities typically create three types of storage objects: image, measurement, and/or report-based.

- IHE recommends that the Acquisition Modality Importer support a SOP Class from Table 4.2.5-1 for image-based objects and Table 4.2.7-1 for measurement-based objects.

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- When this is not feasible, IHE recommends supporting one of the Secondary Capture Image Storage SOP Classes (see Table 4.2.11-1) for image-based objects and the Encapsulated PDF Storage SOP Class for measurement/report/text-based objects. When supporting Encapsulated PDF, it is highly recommended that the format of the document is PDF/A.

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4.3 Retrieve Images and Measurements [EYECARE-3]

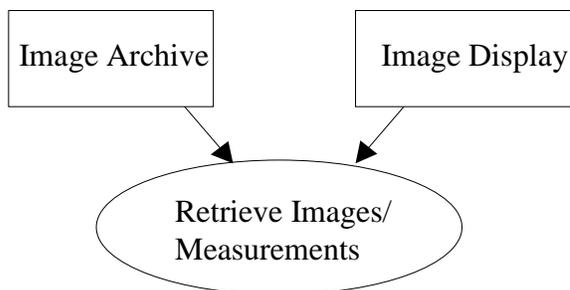
This transaction is identical to Retrieve Images [RAD-16] (see RAD TF-2: 4.16), with the addition of also retrieving refractive measurements.

4.3.1 Scope

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After the Image Display request for retrieval, the requested DICOM Images and/or measurements are transferred from the Image Archive to the Image Display for viewing.

4.3.2 Use Case Roles



Actor: Image Archive:

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Role: Sends requested images to the Image Display.

Actor: Image Display

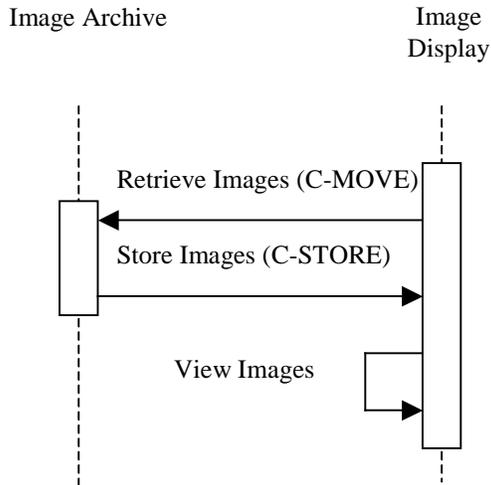
Role: Receives requested images and/or measurements from the Image Archive.

4.3.3 Referenced Standards

DICOM PS 3.4: Storage Service Class

775 DICOM PS 3.4: Query/Retrieve Service Class

4.3.4 Interaction Diagram



4.3.4.1 Retrieve Images

780 The Retrieve (Study Root – MOVE and optionally Patient Root – MOVE) SOP Classes shall be supported. The DICOM Image Storage SOP Classes will be supported by the Image Archive as an SCU. Refer to DICOM PS 3.4, Annex C, for detailed descriptive semantics.

4.3.4.1.1 Trigger Events

Images and/or measurements are selected for viewing at the Image Display.

785 **4.3.4.1.2 Message Semantics**

The message semantics are defined by the DICOM Query/Retrieve SOP Classes and the DICOM Image and Measurements Storage SOP Classes.

A C-MOVE Request from the DICOM Study Root Query/Retrieve Information Model – MOVE SOP Class or the DICOM Patient Root Query/Retrieve Information Model – MOVE SOP Class shall be sent from the Image Display to the Image Archive.

4.3.4.1.3 Expected Actions

795 The Image Archive receives the C-MOVE request, establishes a DICOM association with the Image Display and uses the C-STORE request (for the appropriate DICOM Image and/or Measurements Storage SOP Classes) to transfer the requested images. The Image Display is expected to support at least one of the SOP Classes specified in Table 4.2.5-1 and/or 4.2.7-1. Support of retrieval for a SOP Class also means support for display.

4.3.5 Eye Care Image Option

800 Image Display Actors that support the EYE CARE Image Option shall support one or more of the SOP classes listed in Table 4.2.5-1 and/or 4.2.7-1. Other specialties, such as radiology, may obtain images of the eye. Examples include CTs, MR, X-Rays, etc. IHE EYECARE does not list these possibilities but recommends that Image Display Actors be able to display such images. All Storage SOP classes supported by Image Display Actors shall be documented in the DICOM conformance statement.

805 Note: A few examples are X-rays of an eye for foreign body, X-ray angiography to assess vascular orbital lesions, CT or MR of orbits, etc.

Image Display Actors that support the Eye Care Image Option shall be able to negotiate, offer and accept the transfer syntaxes defined in Table 4.2.5-3 when supporting SOP Classes in Table 4.2.5-2.

810 When the Image Display supports retrieval of DICOM Encapsulated PDF SOP Classes it shall support PDF/A ISO 19005-1. Document management – Electronic document file format for long-term preservation- Part 1: Use of PDF (PDF/A).

The Image Display shall conform to the PDF/A reader requirements for the display of DICOM Encapsulated PDF documents that are conformant to the PDF/A standard. This is intended to ensure the correct visual rendering of these documents.

815 4.3.6 Relative Image Position Coding Option

When a healthcare provider is reading fundus photos it is occasionally difficult to determine what location in the retina, or even which eye, he or she is viewing. Laterality (right vs left eye) is a required attribute in DICOM Ophthalmic Photography Image SOP Classes, enabling image display vendors to display this information. However, the DICOM attribute Relative Image
820 Position Code Sequence is an optional attribute and is often not conveyed in the OP images.

Image Display Actors that support the Relative Image Position Coding Option shall support the requirements in Tables 4.2.8-1 and 4.2.8-2.

825 Image Display Actors conforming to the Relative Image Position Option shall support explicit and/or implicit display of DICOM Relative Image Position Code Sequence attributes (0022,001D) contained in OP images. For explicit display, the Image Display shall allow displaying the relative image position code meaning(s) for OP images (if any). For implicit display, the Image Display shall allow arranging the display layout of multiple images as a function of their relative image position codes in such a manner as to unambiguously communicate their relative image position to the user.

830 4.3.7 Stereo Relationship Option

Stereo photography such as for the optic disk requires determination of the stereo relationships between two OP images. The DICOM standard provides a mechanism for storing separate stereo relationship objects referencing the left and right images.

835 Image Archive and Image Display Actors supporting the Stereo Relationship Option shall support the DICOM SOP Class defined in Table 4.2.9-1.

An Image Display supporting the Stereo Relationship Option shall support the SOP Class defined in table display of image pairs referenced by DICOM stereo relationship objects. The display of the right image relative to the left shall reflect any horizontal displacement, vertical displacement, and/or rotation of the right image relative to the left for optimal display.

840 The Image Display conforming to this option shall support display of stereo relationships defined for single-frame images, individual frames of multi-frame images, or multiple frames of multi-frame images. The display of multiple pairs of stereo frames may be restricted to display of one stereo pair at a time.

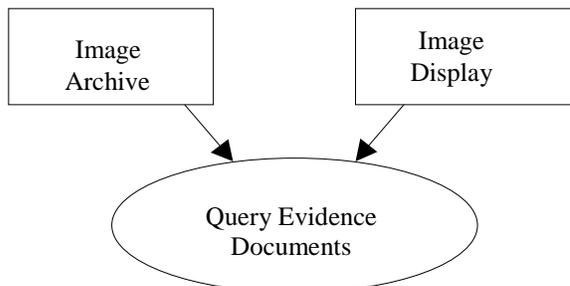
4.4 Query Evidence Documents [EYECARE-4]

845 This transaction is identical to Query Evidence Documents [RAD-44] (see RAD TF-3: 4.44), with the addition of querying for DICOM Encapsulated PDF document.

4.4.1 Scope

This section describes the sequence of Transactions required for the Image Display to query the Image Archive for instances of Evidence Documents.

850 4.4.2 Use Case Roles



Actor: Image Display

Role: Query for Evidence Documents objects (generally in order to retrieve them).

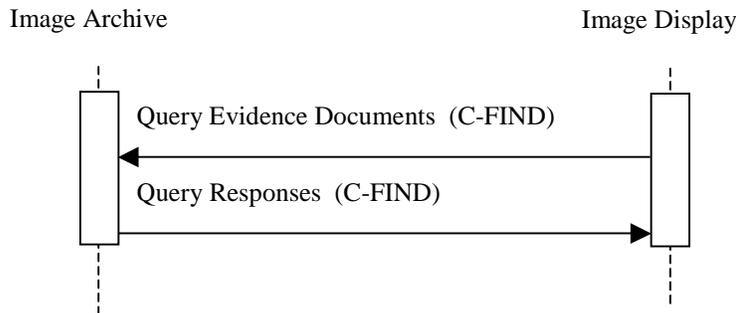
Actor: Image Archive

855 **Role:** Respond to queries from the Image Display for Evidence Documents objects.

4.4.3 Referenced Standards

DICOM PS 3.4: Query/Retrieve Service Class

4.4.4 Interaction Diagram



860 4.4.4.1 Query Evidence Documents

The Query (Study Root – FIND and optionally Patient Root – FIND) SOP Classes shall be supported. Refer to DICOM PS 3.4: Query/Retrieve Service Class for detailed descriptive semantics.

4.4.4.1.1 Trigger Events

865 Image Display needs to obtain information about Evidence Documents.

4.4.4.1.2 Message Semantics

The message semantics are defined by the DICOM Query/Retrieve SOP Classes.

870 A C-FIND Request from the DICOM Study Root Query/Retrieve Information Model – FIND SOP Class or the DICOM Patient Root Query/Retrieve Information Model – FIND SOP Class shall be sent from the Image Display to the Image Archive.

The Image Display uses one or more matching keys as filter criteria to obtain the list of matching entries in the Image Archive at the selected level (Patient & Study/Series/Instance).

875 In addition to the required and unique keys defined by the DICOM Standard, the IHE Technical Framework has defined matching and return keys to be supported by query SCUs and SCPs. The keys are defined in RAD TF-2: 4.14.4.1.2 and RAD TF-2: Table 4.14-1. The conventions for key usage are defined in RAD TF-2: 2.2. For the Image Display (SCU) and the Image Archive (SCP) the additional Evidence Document Instances specific keys are defined in RAD TF-3: Table 4.44-1.

4.4.5 DICOM Encapsulated PDF Query Attributes

880 [RAD-44] defines the ability for Image Display and other actors to query Image Archives for evidence document information. This transaction is a simple extension to [RAD-44] as it adds the support for DICOM Encapsulated PDF query attribute to display the Document Title.

Image Display and Image Archives shall support the transaction as defined by [RAD-44] with the addition of the requirements defined in Table 4.4.5-1.

885

Table 4.4.5-1: Additional Query Matching and Return Keys for DICOM Encapsulated PDF Support

Attribute Name	Tag	Query Keys Matching		Query Keys Return	
		SCU	SCP	SCU	SCP
Encapsulated Document Instance Specific Level					
Document Title	(0042,0010)	O	O	R+	R+

890 Note: A workstation and/or acquisition modality supporting the Eye Care Evidence Document Profile may perform a single query to obtain information about both images and evidence documents (i.e., two queries are not required). Similarly, when retrieving the information one retrieve could be used to obtain both images and evidence documents.

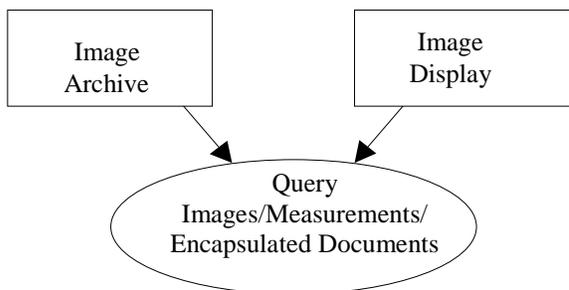
4.5 Query Images, Measurements and Encapsulated Documents [EYECARE-5]

895 This transaction is identical to Query Images [RAD-14] (see RAD TF-2: 4.14), with the additional requirement that the Image Archive support the attribute Issuer of Patient ID.

4.5.1 Scope

The Image Display queries the Image Archive for study, series and image instances for retrieval.

4.5.2 Use Case Roles



900

Actor: Image Archive

Role: Responds to queries for Studies, Series, and Images (SOP Instances)

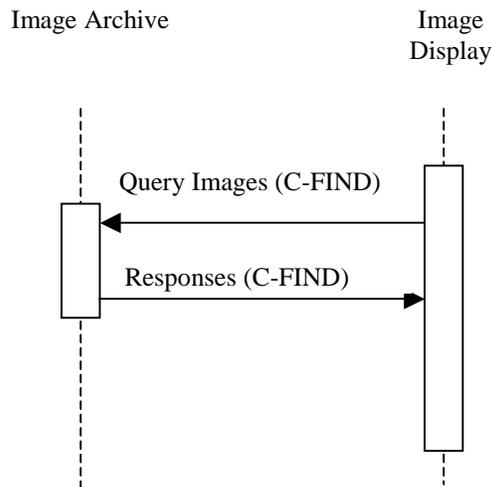
Actor: Image Display

Role: Issues Queries for Studies, Series, Images (SOP Instances)

905 4.5.3 Referenced Standards

DICOM PS 3.4: Query/Retrieve Service Class

4.5.4 Interaction Diagram



4.5.4.1 Query Images, Measurements and Encapsulated Documents

910 The Query (Study Root – FIND and optionally Patient Root – FIND) SOP Classes shall be supported. Refer to DICOM PS 3.4 for detailed descriptive semantics.

4.5.4.1.1 Trigger Events

The user at the Image Display wishes to view selected images.

4.5.4.1.2 Message Semantics

915 The message semantics are defined by the DICOM Query/Retrieve SOP Classes.

A C-FIND Request from the DICOM Study Root Query/Retrieve Information Model – FIND SOP Class or optionally the DICOM Patient Root Query/Retrieve Information Model – FIND SOP Class shall be sent from the Image Display to the Image Archive. Hierarchical Search Method shall be supported.

920 The Image Display uses one or more matching keys as search criteria to obtain the list of matching entries in the Image Archive at the selected level (Patient & Study/Series/Image). Based on this list of entries, the Image Display may select relevant entries to be retrieved.

The matching keys and return keys to be supported by the Image Display (SCU) and the Image Manager (SCP) are defined in the table defined in [RAD-14] (see RAD TF-2: 4.14). The table specifies for both the Query SCU (Image Display) and the Query SCP (Image Archive) if Matching Keys (keys used as matching criteria in the Query request) and Returned Keys (Keys used to request attributes to be returned in the query responses) are Required (R) or Optional (O).

4.5.5 Support Issuer of Patient ID

930 RAD-14 defines the ability for Image Display Actors to query Image Archives for images. This transaction is a simple extension to RAD-14 as it adds the support for the attribute Issuer of Patient ID.

Image Display and Image Archives shall support the transaction as defined by RAD-14 with the addition of the requirements defined in Table 4.5.5-1.

935

Table 4.5.5-1: Images Query Matching and Return Keys

Attributes Name	Tag	Query Keys Matching		Query Keys Return		Notes
		SCU	SCP	SCU	SCP	
Study Level						
Issuer Of Patient ID	(0010,0020)	O	O	O	R+	See Note 1

Note: The Image Display is not required to ask for the Issuer of Patient ID in its query; however, if it does ask for the attribute, the Image Archive is required to return a valid value in the response (if it exists).

940

4.6 Modality Procedure Step Completed/Discontinued [EYECARE-6]

This transaction is identical to Modality Procedure Step Completed [RAD-7] (see RAD TF-2: 4.7), with the additional requirement that that Acquisition Modalities or Acquisition Modality Importers convey the attribute Performed Protocol Code Sequence in the MPPS message. The Department System Scheduler/Order Filler, Image Manager, Performed Procedure Step Manager, Acquisition Modality, and Acquisition Modality Importer Actors use transaction [EYECARE-6].

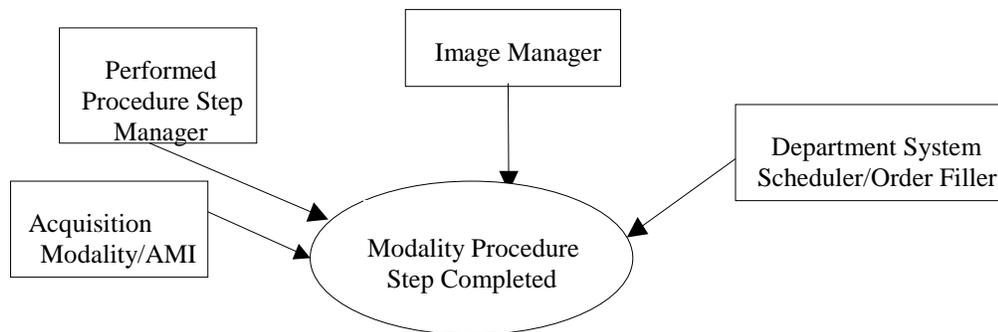
945

4.6.1 Scope

This transaction includes a message from the Acquisition Modality or Acquisition Modality Importer to the Performed Procedure Step Manager, which in turn issues messages to the DSS/Order Filler and the Image Manager that the Performed Procedure Step has been completed. Information is not being released for billing at this point but a code may be assigned. The Image Manager may need the information to co-locate images of the same study. The Modality Procedure Step Completed message does not necessarily mean that the set of images is complete or available for retrieval.

955

4.6.2 Use Case Roles



Actor: Department System Scheduler/Order Filler.

Role: Receives the PPS information forwarded by the PPS Manager.

960 **Actor:** Image Manager.

Role: Receives the PPS information forwarded by the PPS Manager.

Actor: Acquisition Modality or Acquisition Modality Importer.

Role: Informs the Performed Procedure Step Manager that a particular Performed Procedure Step is completed.

965 **Actor:** Performed Procedure Step Manager.

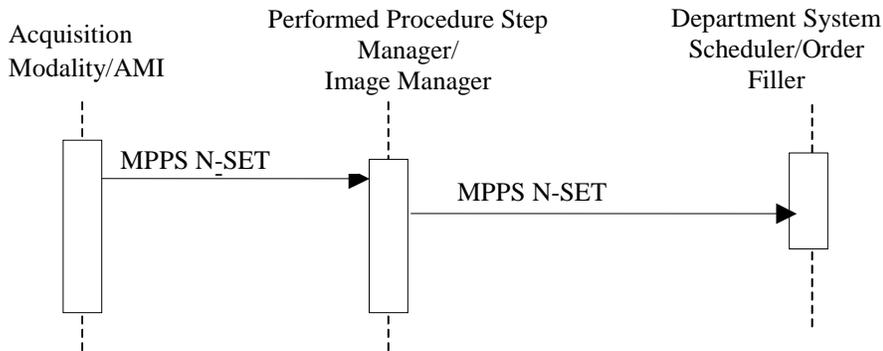
Role: Accepts Performed Procedure Step information from an Acquisition Modality or Acquisition Modality Importer and transmits it to the Department System Scheduler/Order Filler and Image Manager.

4.6.3 Referenced Standards

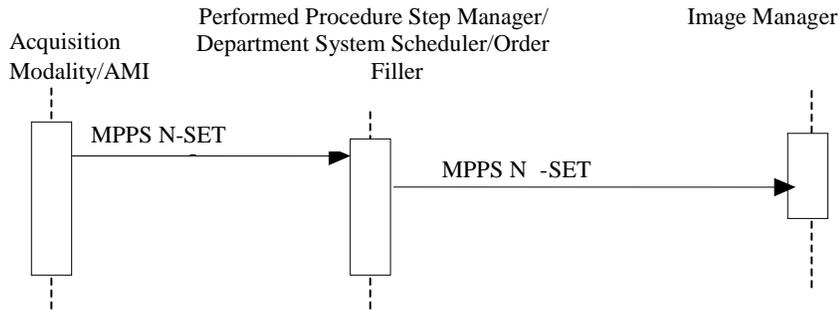
970 DICOM PS 3.4: Modality Performed Procedure Step SOP Class.

DICOM PS 3.16: DCMR Context Groups (Normative)

4.6.4 Interaction Diagram



975



Note: The diagram above shows the sequencing of messages for the Modality Performed Procedure Step SOP Class. Acquisition Modalities and Acquisition Modality Importers 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.

980

4.6.4.1 Modality Procedure Step Completed/Discontinued [EYECARE-6]

[RAD-7] defines the requirements and options for supporting Modality Procedure Step Completed/Discontinued. This transaction is a simple extension to [RAD-7] as it adds the additional requirement that Acquisition Modalities and Acquisition Modality Importers convey the attribute Performed Protocol Code Sequence in the MPPS message.

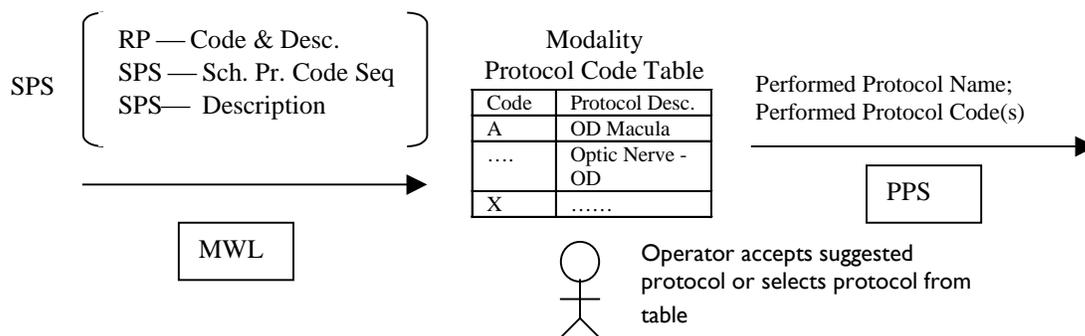
985

Department System Scheduler/Order Filler, Image Manager, Performed Procedure Step Manager, Acquisition Modality, and Acquisition Modality Importer Actors are required to support [RAD-7] as defined in RAD TF-2: 4.7 with the following extensions.

990

4.6.4.2 Performed Protocol Code Sequence

A Modality Protocol Table shall be configured on the Acquisition Modality and Acquisition Modality Importer. This table shall be synchronized with the Image Manager and the Department System Scheduler/Order Filler Actors.



995

Upon obtaining a MWL from the Department System Scheduler/Order Filler the Acquisition Modality or Acquisition Modality Importer is required to display the attributes Scheduled Protocol Code Sequence and Scheduled Procedure Step Description (this requirement is part of [RAD-5] and [EYECARE-1]).

- 1000 For this requirement, the modality operator shall either accept/select the protocol, proposed in attribute Scheduled Protocol Code Sequence, or select an alternative protocol defined in the list of possibilities from Modality Protocol Table. The operator shall not manually enter the attributes (i.e., type in the protocol code) of the acquisition protocol but use the list from the Modality Protocol Table. This simplifies the operator's work on the modality and enables a better management of the protocols used in an imaging department. The Acquisition Modality or Acquisition Modality Importer shall provide the selected protocol code value in the attribute Performed Protocol Code Sequence in addition to the Protocol Name. This feature facilitates the role of the Department System Scheduler/Order Filler within the Charge Posting Integration Profile.
- 1005
- 1010 This feature does not define a specific codification of acquisition protocols. The involved actors, Department System Scheduler, Acquisition Modality, Acquisition Modality Importer and Image Manager/Archive shall be configurable in order to support the codification scheme selected or defined by the healthcare enterprise.

4.6.4.3 Trigger Event

- 1015 Operator completes procedure step from the modality console.

4.6.4.4 Message Semantics

- 1020 The Acquisition Modality or Acquisition Modality Importer uses the Modality Performed Procedure Step SOP Class (N-SET service) to inform the Performed Procedure Step Manager that a specific Performed Procedure Step has been completed or discontinued. The Acquisition Modality or Acquisition Modality Importer may use the MPPS N-SET service to send intermediate updates of the Performed Procedure Step information.

The final N-SET has either the MPPS status of "COMPLETED" or "DISCONTINUED". The Performed Procedure Step Manager sends corresponding N-SETs to the Department System Scheduler/Order Filler and Image Manager.

- 1025 When an N-SET is issued with a "DISCONTINUED" status, one or more Series of Instances may be referenced, if images were created and sent. Those Instances shall be Stored and Storage Committed

- 1030 Along with other information, the Acquisition Modality or Acquisition Modality Importer shall transmit information about the protocol it used to produce the SOP instances to the recipients. See Protocol Handling in RAD TF-2: 4.6.4.1.2.4 for detailed discussion of this issue.

Note: DICOM specifies that when attributes are allowed to be set by an N-SET, the value provided by the last N-SET overrides any value set by an earlier N-CREATE or N-SET.

- 1035 Note: It is difficult for implementations of an Acquisition Modality Importer to manage the transition from starting an MPPS (i.e., MPPS N-CREATE with a status of IN_PROGRESS) to finishing an MPPS (i.e., MPPS N-SET with a status of COMPLETED or DISCONTINUED). This is because these Acquisition Modality Importer Actors often cannot know exactly when the modality starts and ends the procedure. Actually, it may be typical to know only when the procedure

1040

is finished. The DICOM MPPS workflow requires the N-CREATE/N-SET commands be transmitted, thus the Acquisition Modality Importer is required to send both DICOM commands even though it may only know when the procedure step was finished. Implementations receiving these DICOM commands should be aware that the MPPS start and end times may not be accurate.

4.6.4.4.1 Expected Actions

1045

The Image Manager and Department System Scheduler/Order Filler receive information about the Performed Procedure Step being complete or discontinued and link it with the Requested Procedure and Scheduled Procedure Step. The Image Manager and Department System Scheduler are not required to act on intermediate N-SET messages with the MPPS Status "IN PROGRESS".

1050

The Requested Procedure may be considered complete if all Performed Procedure Steps related to all Scheduled Procedure Steps have been completed (or properly discontinued). Additional new (unscheduled) Performed Steps may be performed at any time, even after the Requested Procedure has been assigned complete scanning status. See relationship between Scheduled and Performed Procedure Steps in sec. RAD TF-2: 4.6.4.1.2.3 for detailed discussion of this issue.

4.7 Displayable Report Storage [EYECARE-7]

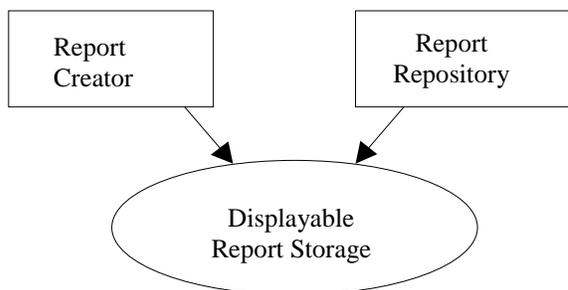
This section corresponds to Transaction EYECARE-7 of the IHE Technical Framework. Transaction EYECARE-7 is used by the Report Creator and Report Repository Actors.

1055

4.7.1 Scope

In the Report Storage transaction, the Report Creator transmits a DICOM Encapsulated Document object to the Report Repository.

4.7.2 Use Case Roles



1060

Actor: Report Creator

Role: Transmit draft or final DICOM Encapsulated document Reports to Report Repository.

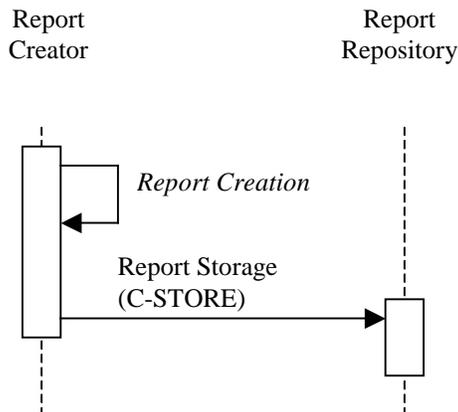
Actor: Report Repository

Role: Receive draft and final DICOM Encapsulated document Reports for storage

1065 **4.7.3 Referenced Standards**

DICOM PS 3.4: Storage SOP Class

4.7.4 Interaction Diagram



4.7.4.1 Report Creation

1070 This transaction relates to the “Report Creation” event in the above interaction diagram.

4.7.4.1.1 Trigger Events

The user at the Report Creator wishes to create a clinical report using DICOM Encapsulated Document.

4.7.4.1.2 Invocation Semantics

1075 This is a local invocation of functions at the Report Creator, and the method used by the Report Creator to obtain report data and create a DICOM Encapsulated document object is outside the scope of the IHE Technical Framework. The Report Creator shall create a report that conforms to the DICOM Encapsulated document defined in Section 4.7.5.

4.7.4.1.3 Expected Actions

1080 Creation of DICOM Encapsulated document objects ready for storage to the Report Repository.

4.7.4.1.3.1 Study Identification and Identical Documents Sequence

1085 A Study Instance UID is required to identify the study to which the report belongs. It is recommended to use the Study Instance UID of the images and/or measurements reported on as the Study Instance UID of the created encapsulated document. If a Report Creator is generating a single report for multiple studies, it shall create multiple copies of the report, with different SOP Instance UIDs for each report and use the Identical Documents Sequence attribute (0040,A525) in each report. The Identical Documents Sequence attribute (0040,A525) in each report shall reference each of the other identical reports in the other studies. The actual content of the report (except the Identical Documents Sequence attribute) shall be the same in each report instance.

1090 The Retrieve AE Title attribute (0008,0054) in the Identical Documents Sequence Items shall not be sent.

4.7.4.2 Report Submission

This transaction relates to the “DICOM C-STORE” event between the Report Creator and Report Repository in the above interaction diagram.

1095 **4.7.4.2.1 Trigger Events**

When report authoring is completed and the Report Creator creates a new DICOM Encapsulated document the Report Creator shall transfer the DICOM Encapsulated document to the Report Repository.

4.7.4.2.2 Message Semantics

1100 The Report Creator uses the DICOM C-STORE message to transfer DICOM Encapsulated document reports. The DICOM Encapsulated document Instance shall include the additional attributes shown in Table 4.7.5-1. The Report Repository shall support Level 2 (Full) storage, which means all DICOM Type 1, 2 and 3 and private attributes are stored.

4.7.4.2.3 Expected Actions

1105 The Report Repository shall store the received DICOM Encapsulated document objects. At this point, the Report Creator relinquishes any responsibility for the report objects and may not change them in any way without creating a new object with a new SOP Instance UID. The Report Repository shall make the Instances available for query and retrieve.

4.7.5 DICOM Encapsulated Document Standard Extended Attributes

1110 The Report Creator and Report Repository shall support the DICOM SOP Classes defined in Table 4.7.5-1 and the Standard Extended Attributes defined in Table 4.7.5-2.

Table 4.7.5-1: SOP Classes for Encapsulated Documents

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF Storage

1115 **Table 4.7.5-2: DICOM Encapsulated Documents Standard Extended Attributes**

Attribute Name	Tag	Type	Attribute Description
----------------	-----	------	-----------------------

Attribute Name	Tag	Type	Attribute Description
Verification Flag	(0040,A493)	1	<p>Indicates whether this Document is Verified. Enumerated Values: UNVERIFIED = Not attested to. VERIFIED = Attested to by a Verifying Observer Name (0040,A075) who is accountable for its content.</p> <p>Note: The intent of this specification is that the "prevailing final version" of an Encapsulated Document is the version having the most recent Verification DateTime (0040,A030), Completion Flag (0040,A491) of COMPLETE and Verification Flag (0040,A493) of VERIFIED.</p> <p>Note: Eye care has made this attribute a Type 1 field, as it is only Type 3 in the Encapsulated IOD definition.</p>
Content Date	(0008,0023)	1	<p>The date the document content creation started.</p> <p>Note: Eye care has made this attribute a Type 1 field, as it is only Type 2 in the Encapsulated IOD definition.</p>
Content Time	(0008,0033)	1	<p>The time the document content creation started.</p> <p>Note: Eye care has made this attribute a Type 1 field, as it is only Type 2 in the Encapsulated IOD definition.</p>
Completion Flag	(0040,A491)	1	<p>The estimated degree of completeness of this Document with respect to externally defined criteria in a manner specified in the Conformance Statement.</p> <p>Note: It may be desirable to make these criteria adaptable to local policies or user decisions.</p> <p>Enumerated Values: PARTIAL = Partial content. COMPLETE = Complete content.</p>
Completion Flag Description	(0040,A492)	3	<p>Explanation of the value sent in Completion Flag (0040,A491).</p>
Verifying Observer Sequence	(0040,A073)	1C	<p>The person or persons authorized to verify documents of this type and accept responsibility for the content of this document. One or more Items may be included in this sequence. Required if Verification Flag (0040,A493) is VERIFIED.</p>
>Verifying Observer Name	(0040,A075)	1	<p>The person authorized by the Verifying Organization (0040,A027) to verify documents of this type and who accepts responsibility for the content of this document.</p>
>Verifying Observer Identification Code Sequence	(0040,A088)	2	<p>Coded identifier of Verifying Observer. Zero or one Items shall be permitted in this sequence.</p>
>>Include 'Code Sequence Macro' Table 8.8-1 (in DICOM Standard Part 3)			<p>No Baseline Context ID defined.</p>

Attribute Name	Tag	Type	Attribute Description
>Verifying Organization	(0040,A027)	1	Organization to which the Verifying Observer Name (0040,A075) is accountable in the current interpretation procedure.
>Verification DateTime	(0040,A030)	1	Date and Time of verification by the Verifying Observer Name (0040,A075).
<i>>Include 'SOP Instance Reference Macro' Table C.17-3 (in DICOM Standard Part3)</i>			
Current Requested Procedure Evidence Sequence	(0040,A375)	3	Full set of Composite SOP Instances, of which the creator is aware, which were created to satisfy the current Requested Procedure(s) for which this Document is generated or that are referenced in the content tree. One or more Items may be included in this sequence.
<i>>Include 'SOP Instance Reference Macro' Table C.17-3</i>			
Pertinent Other Evidence Sequence	(0040,A385)	3	Other Composite SOP Instances that are considered to be pertinent evidence by the creator of this Document. This evidence must have been acquired in order to satisfy Requested Procedures other than the one(s) for which this Document is generated. One or more Items may be included in this sequence.
Identical Documents Sequence	(0040,A525)	1C	Duplicates of this document, stored with different SOP Instance UIDs. One or more Items may be included in this sequence. Required if this document is stored with different SOP Instance UIDs in one or more other Studies.
<i>>Include 'SOP Instance Reference Macro' Table C.17-3 (in DICOM Standard Part 3)</i>			

4.7.5.1 Encapsulated Documents Attributes Extensions

4.7.5.2 Concept Name Code Sequence

1120 The Concept Name Code Sequence is the attribute used to provide standardized coded titles for documents. For this transaction, the Report Creator is required to be able to configure this attribute based upon the clinic requirements or a chosen industry standard.

Note: This requirement allows users and implementations to identify the different types of encapsulated documents.

4.7.5.3 Source Instance Sequence

1125 The Source Instance Sequence is the attribute used to reference derived encapsulated documents. This attribute shall refer to SOP Instances (e.g., prior or provisional reports) whose content has been wholly or partially included in the encapsulated document. This amendment process of a document is not explicitly described, however, the use of this attribute allows tracking back to the previous version of this document.

4.7.5.4 PDF Version Requirements

1130 The DICOM standard does not define use of a specific version of PDF when encapsulated PDF is used. This may result in incorrect display of reports when using a different PDF version of software from that which was used to create the files. Common errors include blank or missing

pages, missing or displaced graphics, or important changes in format, leading to risk for clinical error.

1135 Another difficulty is that PDF files are very large when only pixel data is used in the file. This causes unacceptable clinical impacts such as very slow network transmission speeds. Pixel data PDFs also may cause unreadable display upon zooming in or out, allowing only small portions of a document to be viewed at one time, etc. When searchable PDF is used to store information as text the files are much smaller, solving many of the issues identified. The ability to search the text files is an additional critical benefit, allowing a clinician to locate specific information
1140 quickly.

ISO PDF based standards have been developed in order to address these issues. Report Creator Actors are recommended to support PDF/A ISO 19005-1. Document management – Electronic document file format for long-term preservation- Part 1: Use of PDF (PDF/A).

1145 The PDF contents of the DICOM Encapsulated PDF objects are recommended to conform to PDF/A-1a (level A conformance to the PDF/A Part 1 standard). The advantage of supporting PDF/A-1a is to ensure that the rendered visual appearance of the document is reproducible across computer platforms and over the course of time, and that the document can be displayed in natural reading order on a mobile device (for example, a PDA) or other devices in accordance with Section 508 of the US Rehabilitation Act.

1150 An individual profile may decide to require the PDF/A Standard, such as A-EYECARE.

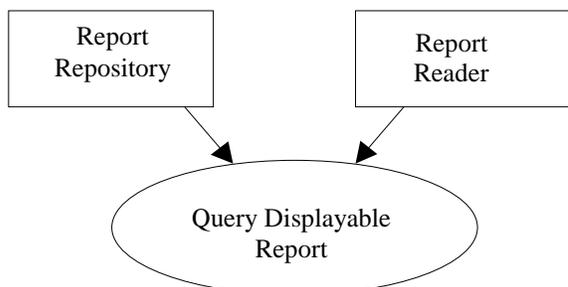
4.8 Query Displayable Report [EYECARE-8]

This section corresponds to Transaction [EYECARE-8] of the IHE Technical Framework. Transaction [EYECARE-8] is used by the Report Reader and Report Repository Actors.

4.8.1 Scope

1155 In the Query Displayable Reports Transaction, the Report Reader queries the Report Repository for draft or final DICOM Encapsulated document.

4.8.2 Use Case Roles



1160 **Actor:** Report Repository

Role: Responds to queries for DICOM Encapsulated document.

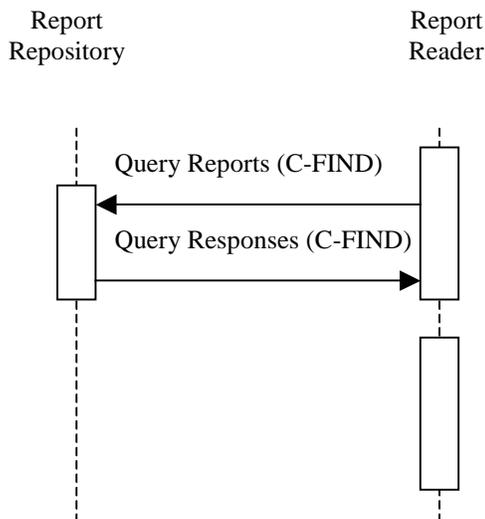
Actor: Report Reader

Role: Queries Report Repository for DICOM Encapsulated documents and makes them available for selection.

1165 **4.8.3 Referenced Standards**

DICOM PS 3.4: Query/Retrieve Service Class

4.8.4 Interaction Diagram



1170 **4.8.4.1 Query Displayable Reports**

This transaction relates to the query section of the above interaction diagram. The Query (Study Root – FIND and optionally Patient Root – FIND) SOP Classes will be supported. Refer to DICOM PS 3.4: Query/Retrieve Service Class for detailed descriptive semantics.

4.8.4.1.1 Trigger Events

1175 The user at the Report Reader wishes to view selected reports.

4.8.4.1.2 Message Semantics

The message semantics are defined by the DICOM Query/Retrieve SOP Classes.

1180 A C-FIND Request from the DICOM Study Root Query/Retrieve Information Model – FIND SOP Class or the DICOM Patient Root Query/Retrieve Information Model – FIND SOP Class shall be sent from the Report Reader to the Report Repository.

The Report Reader uses one or more matching keys as search criteria to obtain the list of matching entries in the Report Repository at the selected level (Patient & Study/Series/Instance).

In addition to the required and unique keys defined by the DICOM Standard, the IHE Technical Framework has defined matching and return keys to be supported by query SCUs and SCPs. The

- 1185 keys are defined in [RAD-14] (see RAD TF-2: 4.14), except that Report Reader and Report Repositories are not required to support PPS Start Date and PPS Start Time. The conventions for key usage are defined in Section 2.2. For the Report Reader (SCU) and the Report Repository (SCP) the additional document Instance specific keys are defined in Table 4.8.4.1.2-1.

1190 **Table 4.8.4.1.2-1. Document Instance Specific Query Matching and Return Keys**

Attribute Name	Tag	Query Keys Matching		Query Keys Return	
		SCU	SCP	SCU	SCP
Instance Specific Level					
Document Title	(0042,0010)	O	O	R+	R+
Completion Flag	(0040,A491)	R+	R+	R+	R+
Verification Flag	(0040,A493)	R+	R+	R+	R+
Content Date	(0008,0023)	O	O	R+	R+
Content Time	(0008,0033)	O	O	R+	R+
Verifying Observer Sequence	(0040,A073)				
>Verifying Organization	(0040,A027)	O	O	R+	R+
>Verification DateTime	(0040,A030)	R+	R+	R+	R+
>Verifying Observer Name	(0040,A075)	R+	R+	R+	R+
>Verifying Observer Identification Code Sequence	(0040,A088)				
>> Code Value	(0008,0100)	O	O	O	R+
>> Coding Scheme Designator	(0008,0102)	O	O	O	R+
>> Coding Scheme Version	(0008,0103)	O	O	O	R+
>> Code Meaning	(0008,0104)	O	O	O	R+
Concept Name Code Sequence	(0040,A043)				
>Code Value	(0008,0100)	R+	R+	R+	R+
>Coding Scheme Designator	(0008,0102)	R+	R+	R+	R+
>Coding Scheme Version	(0008,0103)	O	O	O	R+
>Code Meaning	(0008,0104)	O	O	R+	R+

4.8.4.1.3 Expected Actions

The Report Repository receives the C-FIND request, performs the matching on the provided keys and sends the list of matching records back to the Report Reader via C-FIND responses.

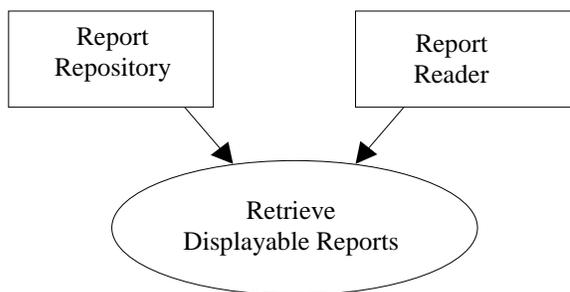
1195 **4.9 Retrieve Displayable Reports [EYECARE-9]**

This section corresponds to Transaction [EYECARE-9] of the IHE Technical Framework. Transaction [EYECARE-9] is used by the Report Reader and Report Repository Actors.

4.9.1 Scope

1200 In the Retrieve Displayable Reports Transaction, the requested DICOM Encapsulated documents are transferred from the Report Repository to the Report Reader for viewing.

4.9.2 Use Case Roles



Actor: Report Repository

1205 **Role:** Sends requested DICOM Encapsulated document to Report Reader.

Actor: Report Reader

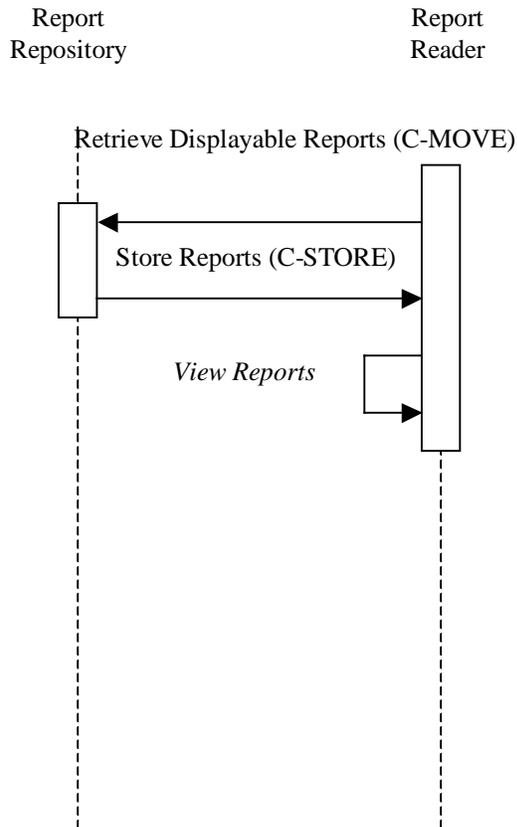
Role: Retrieves DICOM Encapsulated document from Report Repository and makes them available for viewing.

4.9.3 Referenced Standards

1210 DICOM PS 3.4: Query/Retrieve Service Class

DICOM PS 3.4: Storage SOP Class

4.9.4 Interaction Diagram



1215

4.9.4.1 Retrieve Reports

This transaction relates to the retrieve section of the above interaction diagram. The Retrieve (Study Root – MOVE and optionally Patient Root – MOVE) SOP Classes shall be supported. The Report Reader as an SCP shall support the DICOM Encapsulated Document Storage SOP Class. The Report Repository as an SCU shall support DICOM Encapsulated Document Storage SOP Class. Refer to DICOM PS 3.4, Annex C, for detailed descriptive semantics.

1220

4.9.4.1.1 Trigger Events

The user at the Report Reader selects specific reports to view.

4.9.4.1.2 Message Semantics

The DICOM Query/Retrieve SOP Classes and the DICOM Encapsulated Document Storage SOP Classes define the message semantics.

1225

A C-MOVE Request from the DICOM Study Root Query/Retrieve Information Model – MOVE SOP Class or the DICOM Patient Root Query/Retrieve Information Model – MOVE SOP Class shall be sent from the Report Reader to the Report Repository.

1230 **4.9.4.1.3 Expected Actions**

The Report Repository receives the C-MOVE request, establishes a DICOM association with the Report Reader and uses the appropriate DICOM Encapsulated Document Storage SOP Classes to transfer the requested reports.

1235 Report Repository responds to the queries with the information from the DICOM instances it received from the Report Creator.

The Report Repository and Report Reader shall support the SOP Class(es) defined in Table 4.7.5-1.

4.9.4.2 View Reports

This transaction relates to the “View Reports” event of the above interaction diagram.

1240 **4.9.4.3 Trigger Events**

The Report Reader receives reports from the Report Repository.

4.9.4.4 Invocation Semantics

1245 This is a local invocation of functions at the Report Reader, and the method used by the Report Reader to interpret and display the report data in a meaningful way is outside the scope of the IHE Technical Framework.

4.9.4.5 Expected Actions

The Report Reader presents to the user a DICOM Encapsulated document.

4.9.4.6 PDF Version Requirements

1250 The DICOM standard does not define use of a specific version of PDF when encapsulated PDF is used. This may result in incorrect display of reports when using a different PDF version of software from that which was used to create the files. Common errors include blank or missing pages, missing or displaced graphics, or important changes in format, leading to risk for clinical error.

1255 ISO PDF based standards have been developed in order to address these issues. Report Reader Actors shall support PDF/A ISO 19005-1. Document management – Electronic document file format for long-term preservation- Part 1: Use of PDF (PDF/A).

The Report Display shall conform to the PDF/A reader requirements for the display of DICOM Encapsulated PDF documents that are conformant to the PDF/A standard. This is intended to ensure the correct visual rendering of these documents.

1260

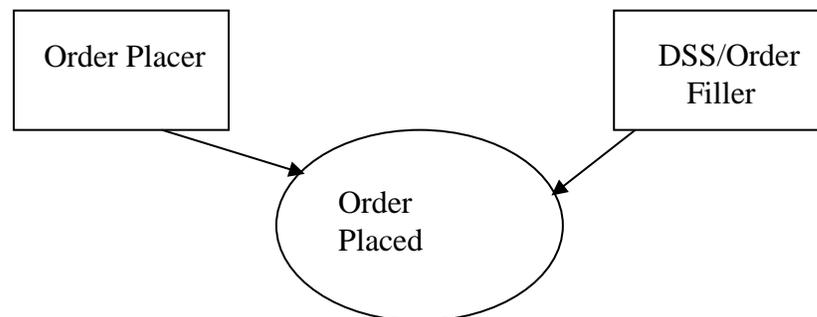
4.10 Instructions for Performing a Procedure- Placer Order Management [EYECARE-10]

1265 This transaction is based upon Placer Order Management [RAD-2] (see RAD TF-2: 4.2), with the extension to transmit health care provider instructions to the technician prior to performing a procedure.

4.10.1 Scope

1270 This transaction is used by the Order Placer to place a new order to the DSS/Order Filler (it also supports the ability to cancel an order). During the creation of a new order, a health care provider may wish to include instructions to the technician. For example there might be instructions to tape the eyelids while performing a visual field or to concentrate on a specific region of the eye during the early stage of an angiogram, etc.

4.10.2 Use Case Roles



1275

Actor: Order Placer

Role: Places orders. Cancels orders as necessary.

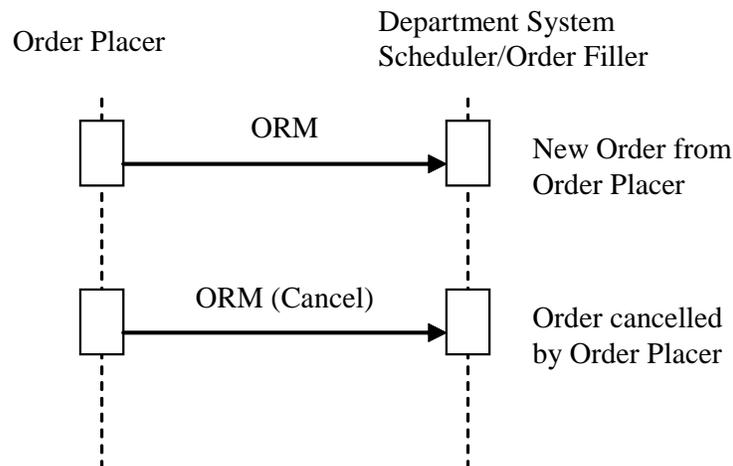
Actor: DSS/OF

1280 **Role:** Receives and processes (fills) orders. Receives order cancelations.

4.10.3 Referenced Standards

HL7 v2.3.1 Chapter 4

4.10.4 Interaction Diagrams



1285 **4.10.4.1 Order Management – New Order from Order Placer**

4.10.4.1.1 Trigger Events

ORM – The Order Placer places a new order for the DSS/Order Filler that may contain specific procedure instructions to the technician performing the procedure.

4.10.4.1.2 Message Semantics

1290 When an order is created, the Order Placer provides a mechanism for the health care provider to enter free text instructions to the technician who will be performing the procedure. The Order Placer transmits these instructions using the NTE segment of the ORM HL7 message to the DSS/OF (i.e., the NTE segment becomes mandatory when instructions are provided).

1295 The message semantics are as defined in [RAD-2] (see RAD TF-2 4.2) with the extension for supporting the HL7 NTE segment to provide textual instructions.

For this [EYECARE-10] extension, the table in RAD TF-2: 4.2.4.1.2 shall be extended as defined by Table 4.10.4.1.2-1 below.

Table 4.10.4.1.2-1: HL7 ORM Message

ORM	General Order Message	Chapter in HL7 v2.3.1
NTE	Notes and Comments (for Detail)	2 Required if instructions are provided. It may be present otherwise.

1300

4.10.4.1.2.1 NTE - Notes and Comments Segment

The NTE segment is a common format for sending notes and comments. The element Source of Comment shall contain “LPI” to denote that the instruction is a Limited Procedure Instruction.

1305 Although the NTE Comment Element allows for 64K, the length shall be limited to 10,240 characters to accommodate the DICOM Modality Worklist Requested Procedure Comments attribute length to which this value maps (see Procedure Instructions Option in [EYECARE-1]).

Note: DICOM, HL7 and IHE length limit is characters, but many implementations make the mistake of using bytes. For example the UTF-8 encodings of characters are frequently multiple bytes; therefore if UTF-8 was used the actual length in bytes could be as much as 20,480 bytes.

1310

Table 4.10.4.1.2.1-1: NTE attributes

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
1	4	SI	O			00096	Set ID - NTE
2	8	ID	R2		0105	00097	Source of Comment
3	10,240	FT	R2	Y		00098	Comment
4	60	CE	O			01318	Comment Type

Modified Table 0105 Source of comment

Table	Code	Code Meaning
0105	LPI	Limited Procedure Instruction

1315 **4.10.4.1.3 Expected Actions**

The expected actions are defined in RAD TF-2: 4.2, with the following extension.

The Order Placer shall provide a mechanism to convey procedure instructions and if provided, these instructions shall be included in the ORM Message, within the NTE segment directly following each relative procedure detail (OBR) segment. The DSS/OF shall be able to process the NTE segment for use in further transactions.

1320

Note: The DSS/Order Filler uses the Procedure Instructions Option in [EYECARE-1] to convey the instructions to the Acquisition Modality or Acquisition Modality Importer using DICOM Modality Worklist.

4.11 Instructions for Performing a Procedure- Filler Order Management [EYECARE-11]

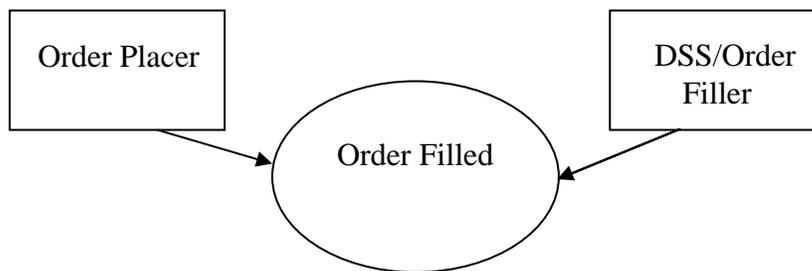
1325 This transaction is based upon Filler Order Management [RAD-3] (see RAD TF-2: 4.3), with the extension to transmit health care provider instructions to the technician prior to performing a procedure.

4.11.1 Scope

1330 This transaction is used by the Order Filler to inform the Order Placer about the orders it creates and cancels, including the status of the orders it is fulfilling. If the Order Filler needs to change an order, it has to do so as a combination of Order Cancel followed by New Order.

During the creation of a new order, a health care provider may wish to include instructions to the technician. For example, there might be instructions to tape the eyelids while performing a visual field or to concentrate on a specific region of the eye during the early stage of an angiogram, etc.

1335 4.11.2 Use Case Roles



Actor: Order Placer

1340 **Role:** Receives new order and order cancellation requests from Order Filler. Receives Order Status updates from Order Filler.

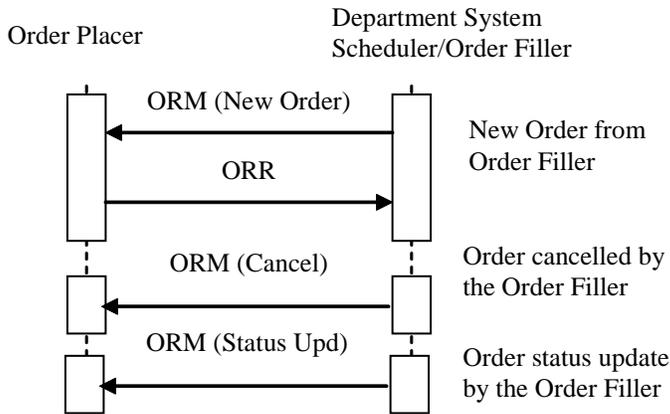
Actor: Department System Scheduler/Order Filler

Role: Creates new or cancels existing orders; sends notifications of order status to the Order Placer.

1345 4.11.3 Referenced Standards

HL7 v2.3.1 Chapters 4

4.11.4 Interaction Diagrams



1350

4.11.4.1 Filler Order Management – New Order from Order Filler

4.11.4.1.1 Trigger Events

ORM - Department System Scheduler/Order Filler places an order that may contain specific procedure instructions to the technician performing the procedure.

1355 4.11.4.1.2 Message Semantics

When an order is created, the DSS/Order Filler provides a mechanism for the health care provider to enter free text instructions to the technician who will be performing the procedure. The DSS/Order Filler transmits these instructions using the NTE segment of the ORM HL7 message to the Order Placer (i.e., the NTE segment becomes mandatory when instructions are provided).

1360

The message semantics are as defined in [RAD-3] (see RAD TF-2 4.3) with the extension for supporting the HL7 NTE segment to provide textual instructions.

For this [EYECARE-11] extension, the table in RAD TF-2: 4.3.4.1.2 shall be extended as defined by Table 4.11.4.1.2-1 below.

1365

Table 4.11.4.1.2-1: HL7 ORM Message

ORM	General Order Message	Chapter in HL7 v2.3.1
NTE	Notes and Comments (for Detail)	2 Required if instructions are provided. It may be present otherwise.

4.11.4.1.2.1 NTE - Notes and Comments Segment

1370 The NTE segment is a common format for sending notes and comments. The element Source of Comment shall contain “LPI” to denote that the instruction is a Limited Procedure Instruction.

Although the NTE Comment Element allows for 64K, the length shall be limited to 10,240 characters to accommodate the DICOM Modality Worklist Requested Procedure Comments attribute length to which this value maps (see Procedure Instructions Option in [EYECARE-1]).

1375

Table 4.11.4.1.2.1-1: NTE attributes

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME
1	4	SI	O			00096	Set ID - NTE
2	8	ID	R2		0105	00097	Source of Comment
3	10,240	FT	R2	Y		00098	Comment
4	60	CE	O			01318	Comment Type

Modified Table 0105 Source of comment

Table	Code	Code Meaning
0105	LPI	Limited Procedure Instruction

4.11.4.1.3 Expected Actions

1380 The expected actions are defined in RAD TF-2: 4.3, with the following extension.

The DSS/Order Filler shall provide a mechanism to convey procedure instructions and if provided, these instructions shall be included in the ORM Message, within the NTE segment directly following each relative procedure detail (OBR) segment. The Order Placer shall be able to process the NTE segment.

1385 Note: The DSS/Order Filler uses the Procedure Instructions Option in [EYECARE-1] to convey the instructions to the Acquisition Modality or Acquisition Modality Importer using DICOM Modality Worklist. The Acquisition Modality or Acquisition Modality Importer will then display the instruction to the technician.

4.12 Not Currently Used

1390 This transactions is reserved for use when (or if) specific IHE Eye Care supplements become final text.

4.13 Not Currently Used

This transactions is reserved for use when (or if) specific IHE Eye Care supplements become final text.

4.14 Not Currently Used

1395 This transactions is reserved for use when (or if) specific IHE Eye Care supplements become final text.

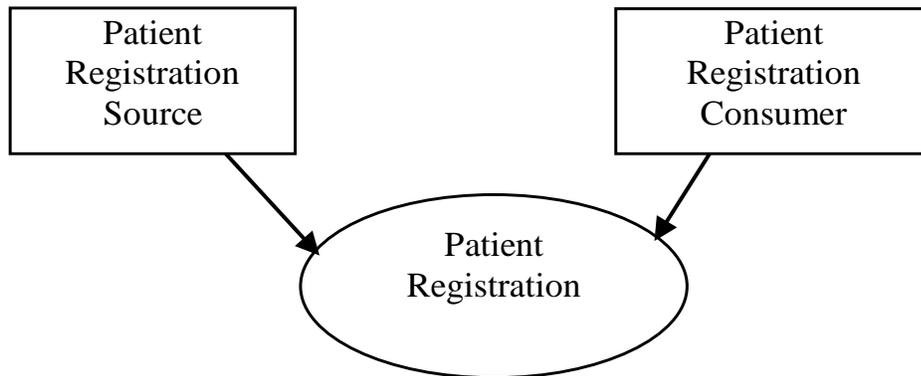
4.15 Eye Care Patient Registration [EYECARE-15]

1400 This section corresponds to the IHE Eye Care Patient Registration [EYECARE-15] transaction. It defines a basic set of HL7 ADT transactions tailored towards an eye care outpatient registration scenario.

4.15.1 Scope

This transaction enables systems to register and update patient information within an ambulatory (i.e., outpatient) setting (such as an eye care clinic).

4.15.2 Use Case Roles



1405

Actor: Patient Registration Source

Role: Registers and updates of patient

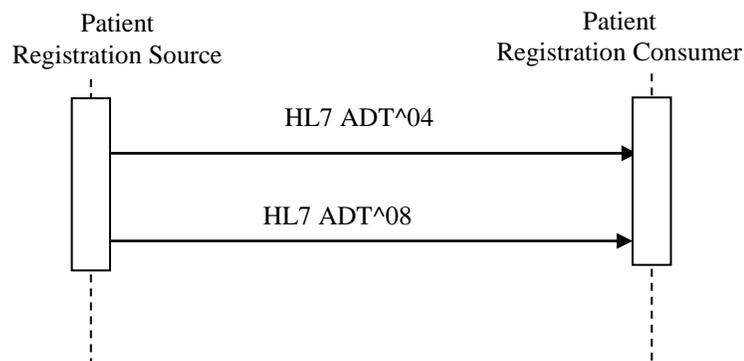
Actor: Patient Registration Consumer

Role: Receives patient registration and update messages, and takes the appropriate actions.

1410 4.15.3 Referenced Standards

HL7 v2.5.1 Chapters 2, 3, 15

4.15.4 Interaction Diagram



4.15.4.1 Patient Registration – Register Patient

1415 4.15.4.1.1 Trigger Events

The following event triggers the ADT message to register the patient.

- A04: Register a Patient – registration of an outpatient for a visit to the facility

4.15.4.1.2 Message Semantics

1420 The Patient Registration – Register Patient message is performed by the HL7 ADT message. The Patient Registration Source SHALL generate the message to register a patient. This message SHALL be used for an event that a new patient will be seen as an outpatient at some time in the future (such as a patient phoning into the clinic to schedule an appointment) or if the patient arrives without being previously registered.

Required segments are defined below. Other segments are optional.

1425

Table 4.15.4.1.2-1: ADT A04 Required Segments

ADT	Patient Registration Message	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
EVN	Event Type	R	3
PID	Patient Identification	R	3
PV1	Patient Visit	R	3
[{ROL}]	Role	R2	15
{IN1}	Insurance	R2	7

R – Required, R2 – Required if known

Adapted from the HL7 Standard, version 2.5.1

1430 4.15.4.1.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.1 MSH – Header Segment.

1435 Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of ADT; the second component SHALL have values of A04. The third component SHALL have a value of ADT_A01.

4.15.4.1.2.2 EVN Segment

The EVN segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.2 EVN – Event Type Segment. With the following exceptions:

Field *EVN-1 Event Type Code* is B for backward compatibility.

1440 Fields *EVN-3-Date/Time Planned Event*, *EVN-6 Event Occurred* and *EVN-7 Event Facility* are optional.

4.15.4.1.2.3 PID - Patient Identification segment

1445 The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently. Fields not listed are optional.

Table 4.15.4.1.2.3-1: PID – Patient Identification segment

SEQ	LEN	DT	Usage	RP/#	TBL#	ITEM#	Element name
2	20	CX	X			00105	Patient ID
3	250	CX	R	Y		00106	Patient Identifier List
4	20	CX	B			00107	Alternate Patient ID - PID
5	250	XPN	R	Y		00108	Patient Name
7	26	TS	R2			00110	Date/Time of Birth
8	1	IS	R2		0001	00111	Administrative Sex
9	250	XPN	X			00112	Patient Alias
10	250	CE	O		0005	00113	Race
11	250	XAD	R2	Y		00114	Patient Address
12	4	IS	X		0289	00115	County Code
13	250	XTN	R2	Y		00116	Phone Number - Home
18	250	CX	C			00121	Patient Account Number
19	16	ST	B			00122	SSN Number - Patient
20	25	DLN	B			00123	Driver's License Number - Patient
22	250	CE	O		0189	00125	Ethnic Group
28	250	CE	B		0212	00739	Nationality

Adapted from the HL7 Standard, version 2.5.1

1450

Note: In accord with the HL7 Version 2.5 usage of this segment, fields PID-2 (Patient ID), PID-4 (Alternate Patient ID), PID-19 (SSN patient number) and PID-20 (Driver's license number) are superseded by field PID-3. PID-2 Patient ID is not allowed to be present in the message.

1455

Note: PID-4 Alternate Patient ID is allowed for backward compatibility only. One example of usage for backward compatibility is the scenario where actors have legacy paper charts and it is desired to convey the "chart number" of the paper. IHE highly recommends to not use this field except for the expectation noted.

PID-3 – Patient Identifier List contains a list of identifiers (one or more) used by the healthcare facility to uniquely identify a patient.

1460

This field may be populated with various identifiers assigned to the patient by various assigning authorities.

Component-1 “ID number” and Component-4 “Assigning authority” are required for each identifier. When conveying more than one identifier Component-5 “Identifier Type Code” is required.

1465 The values for subfield Component-5 “Identifier Type Code” are given in HL7 Table 0203 (HL7 Version 2.5, Chapter 2A - Section 2A.14.5).

Values commonly used for Identifier Type Code in the context of PID-3 are as follows:

BC	Bank card number. Assigning authority is the bank.
BR	Birth Certificate number. Assigning authority is the birth state or national government that issues the Birth Certificate.
DL	Driver’s license number. Assigning authority is the state.
NH	National Health Plan Identifier. Assigning authority at the national level.
PE	Living Subject Enterprise Number. Assigning authority is the enterprise.
PI	Patient Internal Identifier assigned by the healthcare organization.
PPN	Passport number.
PRC	Permanent Resident Card Number.
SS	Social Security Number.

For example:

1470 Patient Smith’s medical record number is 99887766. This number is assigned by the clinic named “Best Eye Center”. Best Eye Center incorporates the Namespace ID 99BEC for the medical record numbers it assigns.

The ADT system sends the medical record number at registration, in an occurrence of PID-3-Patient Identifier List that looks like this:

1475 **999099497^^^99BEC**

If more than one ID is provided, then it may be **999099497^^^99BEC^PI** (i.e., includes the required 5th component to identify the type of ID when multiple IDs are use)

Patient Smith’s Social Security number is **999-99-4452**. This number is assigned by the U.S. Social Security Administration.

1480 The Patient Registration Source system sends the Social Security number at registration, in an occurrence of *PID-3-Patient Identifier List* that looks like this:

999- 99- 4452^^^USSSA^SS

1485 *PID-5 – Patient Name* contains one or more names for the patient. At least one name SHALL be provided, with at least Component 1 “Family Name” valued. Components 2 (Given Name) and 3 Middle Name are R2 (required if known).

PID-8 – Administrative Sex:

The values are taken from HL7 User-defined Table 0001.

1490 *PID-10 – Race* may be further constrained in national extensions. For instance, in the US it is recommended to be required if known using the CDC Concept Code for Race 2.16.840.1.114222.4.11.3405 value set. A France extension may not allow the use of the field (usage code X).

PID-13 – Home Phone Number (XTN):

1495 Component 1 – Telephone Number is B for backward compatible only
 Component 2 – Telephone Use Code is R2 using the HL7 User-defined Table 0201
 Component 3 – Telephone Equipment Type is R2 using the HL7 User-defined Table 0202
 Component 4 – E-mail Address is R2
 Components 5 (Country Code), 6 (Area/City Code) and 7 (Local Number) are R2

1500 *PID-18 – Patient Account Number* contains the patient account number assigned by accounting to which all charges, payments, etc., are recorded. It is used to identify the patient’s account.

1505 Relationship to encounter: A patient account can span more than one enterprise encounter. At least one of the fields PID-18 “Patient Account Number” or PV1-19 “Visit Number” SHALL be valued. Additional requirements for the presence of value in these fields may be documented in national extensions of this transaction.

PID-22 – Ethnicity may be further constrained in national extensions. For instance, in the US it is recommended to be required if known using the CDC Concept Code for Ethnicity 2.16.840.1.114222.4.11.877 value set.

4.15.4.1.2.4 PV1 - Patient Identification segment

1510 The PV1 segment is used by applications to communicate information on an account or visit-specific basis. Fields not listed are optional.

Table 4.15.4.1.2.4-1: PV1 - Patient Visit segment

SEQ	LEN	DT	Usage	RP/#	TBL#	ITEM#	ELEMENT NAME
2	1	IS	R		0004	00132	Patient Class
8	250	XCN	R2	Y	0010	00138	Referring Doctor
19	250	CX	C			00149	Visit Number

Adapted from the HL7 Standard, version 2.5.1

1515

PV1-2 – Patient Class is used by systems to categorize patients by site. The values are taken from HL7 User-defined Table 0004.

PV1-19 – Visit Number contains the unique identifier assigned to the encounter. At least one of the fields PID-18 “Patient Account Number” or PV1-19 “Visit Number” SHALL be valued.

1520

Note: *PV1-19 – Referring Doctor* is a repeating field, so multiple doctors may be conveyed.

4.15.4.1.2.5 ROL - Role segment

The ROL segment communicates information about providers related to the patient.

Table 4.15.4.1.2.5-1: ROL Segment

SEQ	LEN	DT	Usag e	Rep/ #	TBL#	ITEM #	ELEMENT NAME
1	60	EI	C			01206	Role Instance ID
2	2	ID	R		0287	00816	Action Code
3	250	CE	R		0443	01197	Role-ROL
4	250	XCN	R	Y		01198	Role Person

1525

Adapted from the HL7 Standard, version 2.5.1

ROL-1 – Role Instance ID is optional in the context of ADT messages.

ROL-3 – Role-ROL defines the functional involvement of the person. HL7 Table 0443 SHALL be used and has been extended by IHE to support the additional provider role codes listed below.

1530

The extensions are shown in bold.

User-defined Table 0443: Provider role

Value	Description	Used with
AD	Admitting	PV1-17 Admitting doctor
AT	Attending	PV1-7 Attending doctor
CP	Consulting Provider	
FHCP	Family Health Care Professional	
PP	Primary Care Provider	
PECP	Primary Eye Care Provider	
RP	Referring Provider	PV1-8 Referring doctor
RT	Referred to Provider	

Adapted from the HL7 Standard, version 2.5.1

1535

ROL-4 – Role Person provides identification of the person playing the role. IHE highly recommends not only conveying the provider’s name but also the provider’s ID. This could be a national provider identifier (NPI) or a local ID.

4.15.4.1.2.6 IN1 - Insurance segment

1540 The IN1 segment is used by applications to communicate insurance information on an account or visit-specific basis. Fields not listed are optional.

Table 4.15.4.1.2.6-1: IN1 - Insurance segment

SEQ	LEN	DT	Usage	RP/#	TBL#	ITEM#	ELEMENT NAME
1	4	ISI	R			00426	Set ID – IN1
2	250	CE	R		00072	00368	Insurance Plan ID
3	250	CX	R	Y		00428	Insurance Company ID
4	250	XON	R2	Y		00429	Insurance Company Name
8	12	ST	R2			00433	Group Number
36	15	ST	R2			00461	Policy Number

Adapted from the HL7 Standard, version 2.5.1

1545 The HL7 Standard does not identify if an insurance plan is primary or secondary, therefore, the field *INI-1 – Set ID – INI* is used to convey this information. The primary insurance plan SHALL be identified with *INI-1 Set ID – INI* set to the value 1. Other secondary insurance plans SHALL be identified with incrementing *INI-1 Set ID- INI* values, 2, 3, 4....

IHE highly recommends only insurances that are active be sent.

1550 4.15.4.1.2.7 Expected Action

After receiving patient registration HL7 ADT A04 message, the Patient Registration Consumer SHALL create a new patient record for the patient identified if there is no current record for the Patient ID (defined by the field *PID-3*).

4.15.4.2 Patient Registration – Update Patient**1555 4.15.4.2.1 Trigger Events**

The following event triggers the ADT message update patient demographic information.

- A08: Update Patient Information – conveys a change is patient demographic information

4.15.4.2.2 Message Semantics

1560 The Patient Registration – Update Patient message is performed by the HL7 ADT message. The Patient Registration Source SHALL generate the message whenever an error is resolved or a change occurs in patient demographics.

A Patient Registration Source SHALL send all of the required (R and R2) information for a patient record in an A08 message.

1565 An A08 message is the only method a Patient Registration Source may use to update patient demographic and visit information. However a Patient Registration Source shall not use an A08 message to update Patient ID.

1570 Note: As part of the reconciliation of two patient records, the Patient ID needs to also be merged. This is accomplished by supporting the HL7 ADT A40 (Merge Patient ID) message. This is an advanced feature that is not easy to accomplish, therefore, it has been omitted from this transition. Other transactions in IHE Eye Care do require the HL7 ADT A40 message.

Required segments are defined below. Other segments are optional.

Table 4.15.4.2.2-1: ADT A08 Required Segments

ADT	Patient Registration Message	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
EVN	Event Type	R	3
PID	Patient Identification	R	3
PV1	Patient Visit	R	3
{IN1}	Insurance	R2	7

R – Required, R2 – Required if known

1575

Adapted from the HL7 Standard, version 2.5.1

4.15.4.2.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b:3.30.5.1 MSH – Header Segment.

1580 Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of ADT; the second component SHALL have values of A08. The third component SHALL have a value of ADT_A01.

4.15.4.2.2.2 EVN Segment

See Section 4.15.4.1.2.2.

4.15.4.2.2.3 PID - Patient Identification segment

1585 The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently.

See Section 4.15.4.1.2.3 for field requirements.

1590 At least one of the fields *PID-18-Patient Account Number* or *PV1-19-Visit Number* SHALL be valued.

4.15.4.2.2.4 PV1 - Patient Identification segment

The PV1 segment is used by applications to communicate information on an account or visit-specific basis.

See Section 4.15.4.1.2.4 for field requirements.

1595 At least one of the fields *PID-18-Patient Account Number* or *PVI-19-Visit Number* SHALL be valued.

4.15.4.2.2.5 ROL Role Segment

The ROL segment is used by applications to communicate information about providers related to the patient.

1600 See Section 4.15.4.1.2.5 for field requirements.

4.15.4.2.2.6 IN1 - Insurance segment

The IN1 segment is used by applications to communicate insurance information on an account or visit-specific basis.

See Section 4.15.4.1.2.6 for field requirements.

4.15.4.2.2.7 Expected Action

The Patient Registration Consumer SHALL update its local patient demographic, visit and/or insurance information based on the values received in the ADT A08 message.

See Section 4.15.4.2.2 for the Message Semantics of the A08 message.

1610 If an attribute received has a NULL value (i.e., is transmitted as two double quote marks "") in the A08 message SHALL be removed from the Patient Registration Consumer's database for that patient record.

If an attribute received has no value (i.e., is omitted) in the A08 message, the old value should remain unchanged in the receiving system's database for that patient record.

4.15.5 Common HL7 Message Implementation Requirements

1615 The IHE Infrastructure Technical Framework has defined general HL7 implementation notes for HL7 v2 messages, for example:

- Using the Minimal Lower Layer Protocol (MLLP) over TCP/IP to transmit messages
- Using HL7 Original Acknowledgement Mode versus the Enhanced Acknowledgment Mode

1620

- Rules for the MSA Segment, ERR Segment
- Empty Field convention
- Other

IHE Actors performing this transaction SHALL comply with requirements defined in IHE ITI TF-2x: C.2 HL7 Implementation Notes (Appendix C).

1625 For HL7 Messages, the term "B" means backwards compatible.

Note: IHE recognizes that certain deployments may require the use of Network Share Files as the transport mechanism. Although this is considered to be outside the scope of this profile, we do advise to not include MLLP framing characters in Network Share File implementations.

1630 Note: Receiving TCP Socket Based Implementations that allow senders to remain connected and leave the socket open should ensure that their system properly handles a forcibly disconnected TCP session. TCP sessions can be forcibly disconnected by firewalls, routers, or switches because of congestion, inactivity, or firewall policy violations. Systems should reset the socket and be ready to establish a new session when these situations are encountered.

1635 **4.15.6 Security Considerations**

No additional security considerations for the Patient Registration transaction, beyond those described in EYECARE TF-1: Appendix E were deemed necessary.

4.15.6.1 Security Audit Considerations

1640 There are no specific ATNA security audit events associated with the Patient Registration transaction nor requirements on the encoding of that audit event.

4.16 Appointment Scheduling Management [EYECARE-16]

This transaction facilitates the management of a patient's appointment. It includes scheduling the appointment and status updates, such as modifying the date, cancel or deleting an appointment, patient no show, etc. It is based upon HL7 Appointment Notification messages.

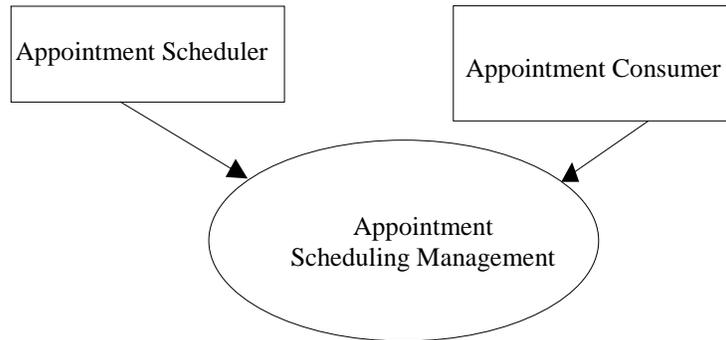
- 1645
- S12 - Notification of New Appointment Booking
 - S14 - Notification of Appointment Modification
 - S15 - Notification of Appointment Cancellation
 - S17 - Notification of Appointment Deletion
 - S26 - Notification That Patient Did Not Show Up for Scheduled Appointment

1650 **4.16.1 Scope**

In the Appointment Scheduling Management Transaction, the Appointment Scheduler conveys appointment notifications to the Appointment Consumer for new appointment bookings and updates to the notifications. These notifications contain the date(s) and time(s) of resource scheduling information.

1655 Note: Many systems in the network may wish this type of information so IHE advises that an Appointment Scheduler is able to communicate these notifications to multiple systems.

4.16.2 Use Case Roles



1660

Actor: Appointment Scheduler

Role: Sends appointment notifications to Appointment Consumer

Actor: Appointment Consumer

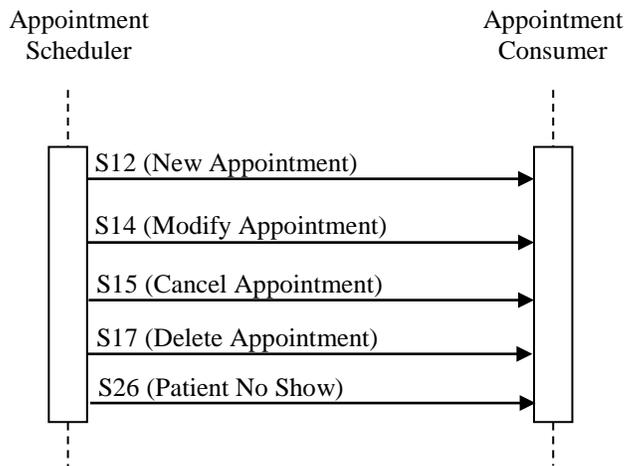
Role: Receives appointment notifications from Appointment Scheduler

1665

4.16.3 Standards Referenced

HL7 v2.5.1 Chapters 2, 3, 4 and 10

4.16.4 Interaction Diagram



1670

4.16.4.1 Appointment Scheduling Management – New Appointment

4.16.4.1.1 Trigger Events

The Appointment Scheduler creates a new appointment booking. The Appointment Scheduler broadcasts an SIU^S12 message to subscribed Appointment Consumers.

1675 4.16.4.1.2 Message Semantics

The New Appointment message is performed by the HL7 SIU message. The Appointment Scheduled SHALL generate the message to book a new appointment. The message semantics follow the SIU^S12 message as specified in HL7 v2.5.1 Chapter 10. Refer to HL7 Standard for general message semantics.

1680 Required segments are defined below. Other segments are optional.

Table 4.16.4.1.2-1: HL7 SIU^S12 Message

SIU^S12	Schedule information new booking	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
SCH	Schedule Activity Information	R	10
{TQ1}	Timing and Quality	R	4
[[NTE]]	Note and comments for the SCH	R2	2
PID	Patient Identification	R	3
{RGS	Resource Group	R	10
[[AIG]]	Appointment Information – General	O	10
{AIL}	Appointment Information – Location	R	10
[[AIP]]	Appointment Information – Personnel Resource	R2	10

Adapted from the HL7 Standard, version 2.5.1

Note: The AIG segment is optional but IHE recommends using this segment if the system manages general resources.

1685 4.16.4.1.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b:3.30.5.1 MSH – Header Segment.

Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of SIU; the second component SHALL have values of S12. The third component SHALL have a value of SIU_S12.

4.16.4.1.2.2 SCH Segment

The SCH segment is used by applications to communicate general information about the scheduled appointment. Fields not listed are optional.

1695

Table 4.16.4.1.2.2-1: SCH Segment

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	75	EI	C			00860	Placer Appointment ID
2	75	EI	R			00861	Filler Appointment ID
3	5	NM	C			00862	Occurrence Number
6	250	CE	R			00883	Event Reason
9	20	NM	B			00868	Appointment Duration
10	250	CE	B			00869	Appointment Duration Units
11	200	TQ	B	Y		00884	Appointment Timing Quantity
16	250	XCN	R	Y		00885	Filler Contact Person
20	250	XCN	R	Y		00878	Entered by Person
24	75	EI	C			00882	Parent Filler Appointment ID
25	250	CE	R		0278	00889	Filler Status Code
26	22	EI	C	Y		00216	Placer Order Number
27	22	EI	C	Y		00217	Filler Order Number

Adapted from the HL7 Standard, version 2.5.1

Note: The term “Placer” in the HL7 Table is used to represent a system that may have requested the appointment. If no system requested the appointment then it is not sent. The term “Filler” in the HL7 Table is used to represent the IHE Actor Appointment Scheduler.

1700

Field *SCH-1 Placer Appointment ID* is used when a system “requests” the appointment such as an HL7 Appointment Request (SRM) message. This may occur but is outside the scope of this transaction; therefore, this transaction does not place any requirements on this field beyond those specified by HL7.

1705

Field *SCH-2 Filler Appointment ID* is required sent by the Appointment Scheduler. This field SHALL contain the Appointment Scheduler’s unique ID related to this specific appointment.

Fields *SCH-6 Event Reason* is required for HL7 backwards compatibility. IHE recommends inserting a NULL value if backwards compatibility is not required for a given implementation.

1710

Fields *SCH-11 Appointment Timing Quantity* has been deprecated. The TQ1 segment is better suited to convey appointment timing and quality related to the specified appointment. It is maintained here for backwards compatibility.

Fields *SCH-25 Filler Status Codes* is required to convey the current status of the appointment. HL7 Table 0278 SHALL be used and has been extended by IHE to support the additional appointment status codes listed below. **The extensions are shown in bold.**

1715

Table 4.16.4.1.2.2-2: HL7 Table 0278 and IHE Extension to Filler Status Codes

Value	Description
Pending	Appointment has not yet been confirmed
Waitlist	Appointment has been placed on a waiting list for a particular slot, or set of slots

Value	Description
Booked	The indicated appointment is booked
Confirmed	The patient was contacted (i.e., called, SMS) and the appointment was confirmed.
Arrived	The patient has arrived at the facility.
Checked In	The patient has completed checked in documents and is ready to be seen by clinical staff.
Started	The indicated appointment has begun and is currently in progress
Complete	The indicated appointment has completed normally (was not discontinued, canceled, or deleted)
Cancelled	The indicated appointment was stopped from occurring (canceled prior to starting)
Dc	The indicated appointment was discontinued (DC'ed while in progress, discontinued parent appointment, or discontinued child appointment)
Deleted	The indicated appointment was deleted from the filler application
Blocked	The indicated time slot(s) is(are) blocked
Overbook	The appointment has been confirmed; however it is confirmed in an overbooked state
No Show	The patient did not show up for the appointment

4.16.4.1.2.3 TQ1 Segment

1720

Table 4.16.6.1.1.3-1: TQ1 Segment

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
7	26	TS	R			01633	Start date/time
8	26	TS	R2			01634	End date/time
12	10	ID	C		0472	01638	Conjunction

Adapted from the HL7 Standard, version 2.5.1

Field *TQ1-7* – *Start date/time* SHALL contain the scheduled start date and time of the appointment.

4.16.4.1.2.4 RGS Segment

1725

Table 4.16.4.1.2.4-1: RGS Segment

SEQ	LEN	DT	OPT	RP/#	TBL #	ITEM#	ELEMENT NAME
1	4	SI	R			01203	Set ID - RGS
2	3	ID	R		0206	00763	Segment Action Code

Adapted from the HL7 Standard, version 2.5.1

Field *RGS-2 – Segment Action Code* SHALL contain the action code and use values from HL7 Table 0206.

1730 **4.16.4.1.2.5 AIL Segments**

The AIL segment is used by applications to communicate information about location resources that can be scheduled. IHE does not place any additional requirements on the segment fields beyond the HL7 Standard.

4.16.4.1.2.6 AIP Segments

1735 The AIP segment is used by applications to communicate information about personal types that can be scheduled. IHE does not place any additional requirements on the segment fields beyond the HL7 Standard.

4.16.4.1.2.7 Expected Action

1740 The Appointment Consumer SHALL create a new patient appointment in its system after receiving the new appointment HL7 SIU^12 message.

4.16.4.2 Appointment Scheduling Management – Modify Appointment

4.16.4.2.1 Trigger Events

The appointment for a patient is modified (updated) and Appointment Scheduler broadcasts an SIU^S14 message to subscribed Appointment Consumers.

1745 **4.16.4.2.2 Message Semantics**

The Modification Appointment message is performed by the HL7 SIU message. The Appointment Scheduled SHALL generate update messages when changes to the appointment have been made. Typically changes would be in the statuses, such as booked, confirmed, arrived, checked in, etc. It also may include appointment date/time changes, etc. *This message is NOT used for Cancel, Delete or No Show, as these updates are performed using other SIU messages.*
 1750 The message semantics follow the SIU^S14 message as specified in HL7 v2.5.1 Chapter 10. Refer to HL7 Standard for general message semantics.

Required segments are defined below. Other segments are optional.

1755 **Table 4.16.4.2.2-1: HL7 SIU^S14 Message**

SIU^S14	Schedule information new booking	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
SCH	Schedule Activity Information	R	10
{TQ1}	Timing and Quality	R	4
[{NTE}]	Note and comments for the SCH	R2	2
PID	Patient Identification	R	3

SIU^S14	Schedule information new booking	REQ	Chapter in HL7 v2.5.1
{RGS}	Resource Group	R	10
[[AIG]]	Appointment Information – General	O	10
{AIL}	Appointment Information – Location	R	10
[[AIP]]	Appointment Information – Personnel Resource	R2	10

Adapted from the HL7 Standard, version 2.5.1

4.16.4.2.2.1 MSH Segment

1760 The MSH segment SHALL be constructed as defined in ITI TF-2b:3.30.5.1 MSH – Header Segment.

Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of SIU; the second component SHALL have values of S14. The third component SHALL have a value of SIU_S12.

4.16.4.2.2.2 SCH Segment

1765 See Section 4.16.4.1.2.2 for the requirements for the SCH segment.

4.16.4.2.2.3 TQ1 Segment

See Section 4.16.4.1.2.3 for the requirements for the TQ1 segment.

4.16.4.2.2.4 RGS Segment

See Section 4.16.4.1.2.4 for the requirements for the RGS segment.

1770 4.16.4.2.2.5 AIL Segment

See Section 4.16.4.1.2.5 for the requirements for the AIL segment.

4.16.4.2.2.6 AIP Segment

See Section 4.16.4.1.2.6 for the requirements for the AIP segment.

4.16.4.2.2.7 Expected Action

1775 After receiving a modify appointment HL7 SIU^14 message, the Appointment Consumer SHALL update the patient's appointment in its system.

4.16.4.3 Appointment Scheduling Management – Cancel Appointment

4.16.4.3.1 Trigger Events

1780 The appointment for a patient is cancelled and the Appointment Scheduler broadcasts an SIU^S15 message to subscribed Appointment Consumers.

4.16.4.3.2 Message Semantics

1785 The Cancel Appointment message is performed by the HL7 SIU message. The Appointment Scheduled SHALL generate the message when the patient's appointment has been cancelled. The message semantics follow the SIU^S15 message as specified in HL7 v2.5.1 Chapter 10. Refer to HL7 Standard for general message semantics.

Required segments are defined below. Other segments are optional.

Table 4.16.4.3.2-1: HL7 SIU^S15 Message

SIU^S15	Schedule information new booking	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
SCH	Schedule Activity Information	R	10
{TQ1}	Timing and Quality	R	4
[[NTE]]	Note and comments for the SCH	R2	2
PID	Patient Identification	R	3
{RGS	Resource Group	R	10
[[AIG]]	Appointment Information – General	O	10
{AIL}	Appointment Information – Location	R	10
[[AIP]]]	Appointment Information – Personnel Resource	R2	10

Adapted from the HL7 Standard, version 2.5.1

1790

4.16.4.3.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.1 MSH – Header Segment.

1795 Field *MSH-9-Message Type* shall have three components. The first component SHALL have a value of SIU; the second component SHALL have values of S15. The third component SHALL have a value of SIU_S12.

4.16.4.3.2.2 SCH Segment

See Section 4.16.4.1.2.2 for the requirements for the SCH segment.

1800 Fields *SCH-25 Filler Status Codes* is required to convey the current status of the appointment. The value SHALL be set to “Cancelled” as defined by HL7 Table 0278.

4.16.4.3.2.3 TQ1 Segment

See Section 4.16.4.1.2.3 for the requirements for the TQ1 segment.

4.16.4.3.2.4 RGS Segment

See Section 4.16.4.1.2.4 for the requirements for the RGS segment.

1805 **4.16.4.3.2.5 AIL Segment**

See Section 4.16.4.1.2.5 for the requirements for the AIL segment.

4.16.4.3.2.6 AIP Segment

See Section 4.16.4.1.2.6 for the requirements for the AIP segment.

4.16.4.3.2.7 Expected Action

1810 After receiving an HL7 SIU^15 message, the Appointment Consumer SHALL cancel the patient’s appointment in its system.

4.16.4.4 Appointment Scheduling Management – Delete Appointment

4.16.4.4.1 Trigger Events

1815 The appointment for a patient is deleted and the Appointment Scheduler broadcasts an SIU^S17 message to subscribed Appointment Consumers.

4.16.4.4.2 Message Semantics

1820 The Delete Appointment message is performed by the HL7 SIU message. The Appointment Scheduled SHALL generate the message when the patient’s appointment has been deleted. The message semantics follow the SIU^S17 message as specified in HL7 v2.5.1 Chapter 10. Refer to HL7 Standard for general message semantics.

Required segments are defined below. Other segments are optional.

Table 4.16.4.4.2-1: HL7 SIU^S17 Message

SIU^S17	Schedule information new booking	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
SCH	Schedule Activity Information	R	10
{TQ1}	Timing and Quality	R	4
[[NTE]]	Note and comments for the SCH	R2	2
PID	Patient Identification	R	3
{RGS	Resource Group	R	10
[[AIG]]	Appointment Information – General	O	10
{AIL}	Appointment Information – Location	R	10
[[AIP]]	Appointment Information – Personnel Resource	R2	10

Adapted from the HL7 Standard, version 2.5.1

1825

4.16.4.4.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.1 MSH – Header Segment.

1830 Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of SIU; the second component SHALL have values of S17. The third component SHALL have a value of SIU_S12.

4.16.4.4.2.2 SCH Segment

See Section 4.16.4.1.2.2 for the requirements for the SCH segment.

1835 Fields *SCH-25 Filler Status Codes* is required to convey the current status of the appointment. The value SHALL be set to “Deleted” as defined by HL7 Table 0278.

4.16.4.4.2.3 TQ1 Segment

See Section 4.16.4.1.2.3 for the requirements for the TQ1 segment.

4.16.4.4.2.4 RGS Segment

See Section 4.16.4.1.2.4 for the requirements for the RGS segment.

1840 4.16.4.4.2.5 AIL Segment

See Section 4.16.4.1.2.5 for the requirements for the AIL segment.

4.16.4.4.2.6 AIP Segment

See Section 4.16.4.1.2.6 for the requirements for the AIP segment.

4.16.4.4.2.7 Expected Action

1845 After receiving an HL7 SIU^17 message, the Appointment Consumer SHALL delete the patient’s appointment in its system.

4.16.4.5 Appointment Scheduling Management – Patient No Show

4.16.4.5.1 Trigger Events

1850 The patient did not show up for the appointment and the Appointment Scheduler broadcasts an SIU^S26 message to subscribed Appointment Consumers.

4.16.4.5.2 Message Semantics

1855 The Patient No Show message is performed by the HL7 SIU message. The Appointment Scheduled SHALL generate the message when the patient’s appointment has been deleted. The message semantics follow the SIU^S26 message as specified in HL7 v2.5.1 Chapter 10. Refer to HL7 Standard for general message semantics.

Required segments are defined below. Other segments are optional.

Table 4.16.4.5.2-1: HL7 SIU^S26 Message

SIU^S26	Schedule information new booking	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
SCH	Schedule Activity Information	R	10
{TQ1}	Timing and Quality	R	4
[[NTE]]	Note and comments for the SCH	R2	2
PID	Patient Identification	R	3
{RGS	Resource Group	R	10
[[AIG]]	Appointment Information – General	O	10
{AIL}	Appointment Information – Location	R	10
[[AIP]]	Appointment Information – Personnel Resource	R2	10

Adapted from the HL7 Standard, version 2.5.1

1860

4.16.4.5.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.1 MSH – Header Segment.

1865

Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of SIU; the second component SHALL have values of S26. The third component SHALL have a value of SIU_S26.

4.16.4.5.2.2 SCH Segment

See Section 4.16.4.1.2.2 for the requirements for the SCH segment.

1870

Fields *SCH-25 Filler Status Codes* is required to convey the current status of the appointment. The value SHALL be set to “No Show” as defined by HL7 Table 0278.

4.16.4.5.2.3 PID Segment

The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently.

1875

See Section 4.15.4.1.2.3 for field requirements.

At least one of the fields *PID-18-Patient Account Number* or *PV1-19-Visit Number* SHALL be valued.

4.16.4.5.2.4 TQ1 Segment

See Section 4.16.4.1.2.3 for the requirements for the TQ1 segment.

1880

4.16.4.5.2.5 RGS Segment

See Section 4.16.4.1.2.4 for the requirements for the RGS segment.

4.16.4.5.2.6 AIL Segment

See Section 4.16.4.1.2.5 for the requirements for the AIL segment.

4.16.4.5.2.7 AIP Segment

1885 See Section 4.16.4.1.2.6 for the requirements for the AIP segment.

4.16.4.5.2.8 Expected Action

After receiving an HL7 SIU^26 message, the Appointment Consumer SHALL set the status of the patient's appointment to no show.

4.16.5 Common HL7 Message Implementation Requirements

1890 The IHE Infrastructure Technical Framework has defined general HL7 implementation notes for HL7 v2 messages, for example:

- Using the Minimal Lower Layer Protocol (MLLP) over TCP/IP to transmit messages
- Using HL7 Original Acknowledgement Mode versus the Enchanted Acknowledgment Mode

1895 • Rules for the MSA Segment, ERR Segment

- Empty Field convention

- Other

IHE actors performing this transaction SHALL comply with requirements defined in IHE ITI TF-2x: C.2 HL7 Implementation Notes (Appendix C).

1900 Note: IHE recognizes that certain deployments may require the use of Network Share Files as the transport mechanism. Although this is considered to be outside the scope of this profile, we do advise to not include MLLP framing characters in Network Share File implementations.

1905 Note: Receiving TCP Socket Based Implementations that allow senders to remain connected and leave the socket open should ensure that their system properly handles a forcibly disconnected TCP session. TCP sessions can be forcibly disconnected by firewalls, routers, or switches because of congestion, inactivity, or firewall policy violations. Systems should reset the socket and be ready to establish a new session when these situations are encountered.

4.16.6 Security Considerations

No additional security considerations for the Appointment Scheduling Management transaction, beyond those described in EYECARE TF-1: Appendix E, were deemed necessary.

4.16.6.1 Security Audit Considerations

1910 There are no specific ATNA security audit events associated with the Appointment Scheduling Management transaction nor requirements on the encoding of that audit event.

4.17 Eye Care Charge Posted [EYECARE-17]

This section addresses the IHE Eye Care Charge Posted [EYECARE-17] transaction.

1915 Transaction EYECARE-17 is used by the Department System Scheduler/Order Filler and Charge Processor Actors.

4.17.1 Scope

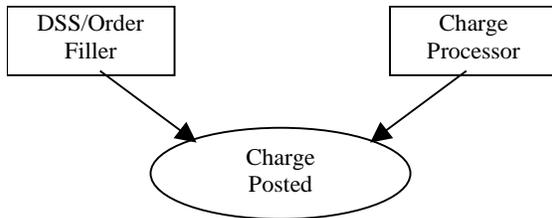
1920 The Eye Care Charge Posted Transaction specifies a message from the Department System Scheduler/Order Filler to the Charge Processor. This HL7 Detailed Financial Transaction message contains procedure data typically needed to generate a claim.

1925 The Department System Scheduler/Order Filler provides the procedure and other billing charges data that is used by the Charge Processor. The Charge Processor may or may not expect the actual transaction fees associated with the procedures included in the transaction. In some situations, the Department System Scheduler/Order Filler is best able to match the procedure details to the appropriate fees. In other situations, the Charge Processor performs this function. In either case, the Charge Processor can override the fees provided by the Department System Scheduler/Order Filler.

1930 The ways and means of ensuring the required data is complete is the responsibility of the Charge Processor and is outside the scope of IHE.

Note: Although IHE specifies real-time charge posted transactions, batch processing can be accommodated as per the batch specifications defined in HL7 Chapter 2, sec. 2.23.2.

4.17.2 Use Case Roles



Actor: Department System Scheduler/Order Filler

1935 **Role:** Collects information relevant to the posting of charges and submits it to the Charge Processor.

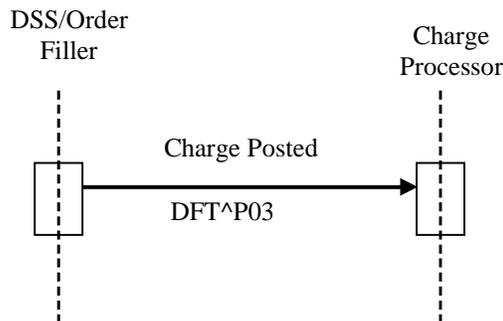
Actor: Charge Processor

Role: Receives the information from the Department System Scheduler/Order Filler. Processes and combines charges in order to issue an insurance claim or patient's billing statement.

1940 4.17.3 Referenced Standards

HL7 v2.5.1: Chapter 6 - Financial Management

4.17.4 Interaction Diagram



1945 4.17.1.1 Financial Transaction Message

The Detailed Financial Transaction (DFT) message is used to describe a financial transaction transmitted between the Department System Scheduler/Order Filler and the Charge Processor. Note that sometimes the DFT does not actually result in a financial transaction.

4.17.1.1.1 Trigger Events

1950 The Department System Scheduler/Order Filler determines when the charge posted transactions are to be sent to the Charge Processor. There are two types of financial billing transactions – Technical and Professional. Each can be triggered at a separate time or both can be sent at the same time - depending on the site configuration.

- Technical Billing

1955 Charge posting of the Technical Billing for a procedure is typically triggered when the procedure is completed. How the Department System Scheduler/Order Filler is aware that the procedure has been complete is outside the scope of this transaction. Examples include support for the DICOM Modality Performed Procedure Step SOP class, or manual or automated entry on the Department System Scheduler/Order Filler.

- Professional Billing

1960 Charge posting of the Professional Billing is triggered when an examination or other healthcare services are completed/verified by the eye care physician. When the Department System Scheduler/Order Filler is aware that the service is completed it sends the professional charge information to the Charge Processor.

1965 4.17.1.1.2 Message Semantics

The Department System Scheduler/Order Filler uses the DFT message to convey necessary charge posting information to the Charge Processor. The Charge Processor is expected to know about Patient Demographic information either from internal means or consuming HL7 ADT Patient Registration messages.

1970 The Eye Care Charge Posted Transaction will transmit Detailed Financial Transactions (DFT) messages using the P03 event.

Required segments are defined below. Other segments are optional

Table 4.17.1.1.2-1: DFT Message Segments

DFT Segment	Detailed Financial Transaction Message	Chapter in HL7 v2.5.1
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
[PV1]	Patient Visit	3 (see note)
{FT1}	Financial Transaction	6

1975 Note: PV1 is required if use of PVI-19 Visit Number is required per the applicable regional or national appendices to the IHE Technical framework (See RAD TF-4)

4.17.1.1.2.1 MSH Segment

1980 The MSH segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.1 MSH – Header Segment.

Field *MSH-9 Message Type* shall have at least two components. The first component shall have a value of “DFT”; the second component shall have value of P03. The third component SHALL have a value of DFT_P03.

4.17.1.1.2.2 EVN Segment

1985 See Section 4.15.4.1.2.2.

4.17.1.1.2.3 PID Segment

The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently.

1990 See Section 4.15.4.1.2.3 for field requirements.

At least one of the fields *PID-18-Patient Account Number* or *PVI-19-Visit Number* SHALL be valued.

4.17.1.1.2.4 PV1 Segment

1995 The PV1 segment is used by applications to communicate information on an account or visit-specific basis.

See Section 4.15.4.1.2.4 for field requirements.

At least one of the fields *PID-18-Patient Account Number* or *PVI-19-Visit Number* SHALL be valued.

4.17.1.1.2.5 FT1 Segment

2000 The FT1 segment is used to post charges, credits, payments, and adjustments to patient accounting records.

Table 4.17.1.1.2.5-1: IHE Profile - FT1 Segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	O		00355	Set ID - FT1
2	12	ST	O		00356	Transaction ID
3	10	ST	O		00357	Transaction Batch ID
4	53	DR	R		00358	Transaction Date
5	26	TS	R2		00359	Transaction Posting Date
6	8	IS	R	0017	00360	Transaction Type
7	250	CE	R	0132	00361	Transaction Code
8	40	ST	O		00362	Transaction Description
9	40	ST	O		00363	Transaction Description - Alt
10	6	NM	O		00364	Transaction Quantity
11	12	CP	O		00365	Transaction Amount - Extended
12	12	CP	O		00366	Transaction Amount - Unit
13	250	CE	O	0049	00367	Department Code
14	250	CE	O	0072	00368	Insurance Plan ID
15	12	CP	O		00369	Insurance Amount
16	80	PL	O		00133	Assigned Patient Location
17	1	IS	O	0024	00370	Fee Schedule
18	2	IS	O	0018	00148	Patient Type
19	250	CE	O	0051	00371	Diagnosis Code - FT1
20	250	XCN	R	0084	00372	Performed By Code
21	250	XCN	R		00373	Order By Code
22	12	CP	O		00374	Unit Cost
23	427	EI	R		00217	Filler Order Number
24	250	XCN	O		00765	Entered By Code
25	250	CE	R	0088	00393	Procedure Code
26	250	CE	O	0340	01316	Procedure Code Modifier
27	250	CE	O	0339	01310	Advanced Beneficiary Notice Code
28	250	CWE	O	0476	01646	Medically Dependent Duplicate Procedure Reason
29	250	CNE	O	0549	01845	NDC Code
30	250	CX	O		01846	Payment Reference ID
31	4	SI	O		01847	Transaction Reference Key

Adapted from the HL7 standard, version 2.5.1

2005 Note: The ability to send both ICD9 and ICD10 codes is becoming increasingly important in certain organizations. Sending dual codes can be accomplished by using the code and alternative code components from field FT1-19 Diagnosis Code. Following is an example providing both ICD9 (main code) and ICD10 (alternative code) for the same diagnosis:
 “361.32^Retina Defect-Horseshoe Tear^I9^H33.312^Retina Defect-Horseshoe Tear^I10”.

4.17.1.1.2.6 Expected Actions

2010 It is expected that the Department System Scheduler/Order Filler will be sending the Charge Posted Transaction to the Charge Processor when one of the trigger events has occurred. This can be either the technical billing or the professional billing financial transaction. The Charge Processor determines the appropriate time to post the charges.

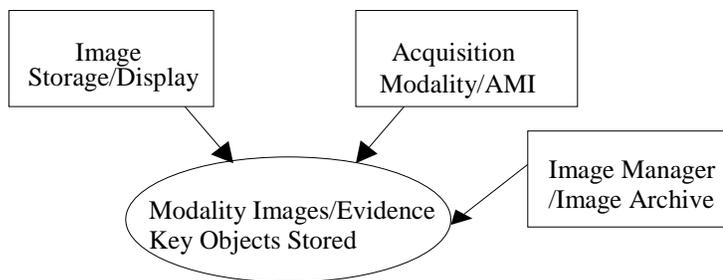
4.18 Modality Images/Evidence Key Objects Stored [EYECARE-18]

2015 This transaction is identical to Modality Images/Evidence Stored [EYECARE-2] (see Section 4.2) except for the behavior requirements of the systems transmitting and receiving the images/evidence objects. The behavior is based upon requirements where the images/evidence objects are NOT stored on an image archive system and therefore only key objects are transmitted.

2020 **4.18.1 Scope**

In the Modality Images/Evidence Key Objects Stored transaction, the Acquisition Modality or Acquisition Modality Importer is able to select and send key images and evidence objects to the Image Storage/Display. The information provided from the Modality Worklist transaction (see RAD TF-2: 4.5) SHALL be included in the headers of the generated images.

2025 **4.18.2 Use Case Roles**



Actor: Acquisition Modality, Acquisition Modality Importer or Image Manager/Image Archive

Role: Transmit key selected image/evidence objects

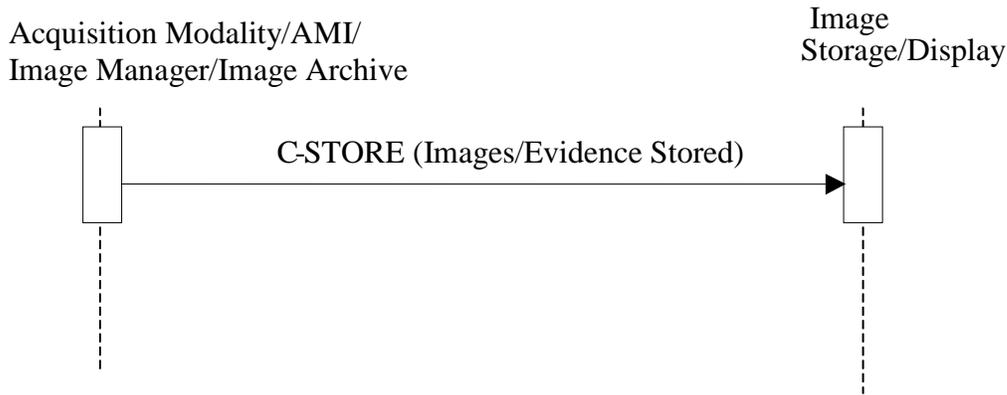
Actor: Image Storage/Display

2030 **Role:** Accept and store images/evidence objects

4.18.3 Referenced Standards

DICOM PS 3.4: Storage Service Class.

4.18.4 Interaction Diagram



2035

4.18.4.1 Modality Images/Evidence Key Objects Stored

4.18.4.1.1 Trigger Events

2040 The Acquisition Modality, Acquisition Modality Importer or Image Manager/Image Archive transmits key selected images/evidence objects to the Image Storage/Display.

4.18.4.1.2 Message Semantics

2045 The Acquisition Modalities, Acquisition Modality Importers and Image Manager/Image Archives use the DICOM C-STORE message to transmit the selected images and evidence documents, etc. The Acquisition Modality, Acquisition Modality Importer or Image Manager/Image Archive is the DICOM Storage SCU and the Image Archive is the DICOM Storage SCP.

The Acquisition Modalities, Acquisition Modality Importers SHALL enable users to selectively transmit all the individual DICOM SOP Classes supported by the actor. The only exceptions are the DICOM Raw Data SOP Classes.

2050 For example, a Visual Field instrument supports the DICOM Ophthalmic Visual Field Static Perimetry Measurements Storage and supports the DICOM Encapsulated PDF SOP class (for reports). This instrument would be required to be able to selectively send the individual SOP Instances from both SOP Classes (i.e., the VF SOP Instances and/or Encapsulated PDF Instances) to a SCP. It is the choice of the user to determine which DICOM SOP Instances are selected and considered “key”.

2055

The information provided from the Modality Worklist transaction (see RAD TF-2: 4.5) SHALL be included in the headers of the generated images. The user validates the available information for the patient and the Scheduled Procedure Step/Requested Procedure. The Acquisition Modality and Acquisition Modality Importers SHALL record certain information in the object

2060 header of the image/evidence document. The details of the mapping to DICOM image/evidence documents instances are specified in RAD TF-2: Appendix A. Effectively, this appendix strengthens the type definition of some DICOM attributes for the IHE Technical Framework.

4.18.4.1.3 Issuer of Patient ID into Stored Images or Evidence Documents

See Section 4.2.4.1.3.

2065 4.18.4.1.4 Study UIDs and Series UIDs

See Section 4.2.4.1.1.1.

4.18.4.1.5 Expected Actions

4.18.4.1.5.1 Acquisition Modality Actor Requirements

2070 This transaction does not define an Image Archive or an Image Display as a receiving system (i.e., no PACS systems); therefore, these additional requirements are specified for the Acquisition Modality:

1. The Acquisition Modality SHALL offer the ability to send individual DICOM SOP Instances within an imaging study. These DICOM SOP Instances to be sent SHALL be user selectable.

2075 Note: It is expected the user will select “key images” to be viewed by the physicians. Such as when performing a IVFA imaging study many of the images are not in focus or not relevant, the user is expected to perform a QA process to choose the key images.

2080 2. The Acquisition Modality SHALL provide a mechanism for the safe keeping of the images and/or measurements created upon its system. How this is accomplished is outside the scope of IHE. Centralized long-term storage is not part of this transaction and may be handled by the Image Manager/ Image Archive which is implemented in the other Eye Care Workflow transactions.

2085 3. The mechanisms to ensure safe-keeping of the images and/or measurements SHALL be documented in the Acquisition Modality product’s IHE Integration Statement. Examples include increased disk space, disaster recovery, the ability to generate media (CD-R, DVD, and external hard disk), etc. The Acquisition Modality SHALL have the ability to view all DICOM SOP Instances for which it provides a mechanism for safekeeping. This does not include DICOM SOP Instances based upon the Raw Data Storage SOP Classes.

2090 Note: Although DICOM Raw Data Storage SOP Classes are not required to be displayed, systems may have the ability to display the information from these SOP Classes.

4.18.4.1.5.2 Acquisition Modality Importer Actor Requirements

This transaction does not define an Image Archive or an Image Display as a receiving system (i.e., no PACS systems); therefore, these additional requirements are specified for the Acquisition Modality Importer:

2095 1. The Acquisition Modality Importer SHALL offer the ability to send individual DICOM SOP Instances within an imaging study. These DICOM SOP Instances to be sent SHALL be user selectable.

Note: An Acquisition Modality Importer connecting to a non-DICOM ophthalmic device should also be able to provide a mechanism for safe keeping of the images and/or measurements it imports.

2100 **4.18.4.1.5.3 Image Manager/Image Archive Actor Requirements**

This Image Manager/Image Archive SHALL have the ability to send individual DICOM SOP Instances within an imaging study. These DICOM SOP Instances to be sent SHALL be user selectable. How this is accomplished is outside the scope of IHE.

Note: This is an optional feature that may be used in Real World Model I.

2105 **4.18.4.1.5.4 Image Storage/Display Actor Requirements**

This transaction does not define an Image Archive or an Image Display (i.e., no PACS systems); therefore, these additional requirements are specified for the Image Storage/Display:

- 2110
1. The Image Storage/Display SHALL have the ability to access and display all DICOM SOP Instances that it is able to locally store and receive. This does not include DICOM SOP Instances based upon the Raw Data Storage SOP Classes.

Note: Although DICOM Raw Data Storage SOP Classes are not required to be displayed, systems may have the ability to display the information from these SOP Classes.

4.18.5 Eye Care Image Option

See Section 4.2.5.

2115 **4.18.6 Radiological Studies of the Eye**

See Section 4.2.5.1.

4.18.7 Encapsulated PDF Option for Evidence Documents

See Section 4.2.6 and all sub-sections of 4.2.6.

4.18.8 Eye Care Measurements Option

2120 See Section 4.2.7.

4.18.9 Relative Image Position Coding Option

See Section 4.2.8.

4.18.10 Stereo Relationship Option

See Section 4.2.9.

2125 **4.18.11 Contrast Start Time Reporting in OP Images**

See Section 4.2.10.

4.18.12 Acquisition Modality Importer Actor Storage

See Section 4.2.11.

4.18.13 Security Considerations

2130 There are no additional security considerations for the Modality Images/Evidence Key Objects Stored transaction, beyond those described in EYECARE TF-1: Appendix E.

4.18.13.1 Security Audit Considerations

2135 The ATNA Profile defines security audit events when using a DICOM Storage message. There are no specific updates beyond what is defined in ATNA associated with the Modality Images/Evidence Key Objects Stored transaction nor requirements on the encoding of that audit event.

4.19 Patient Demographics Update [EYECARE-19]

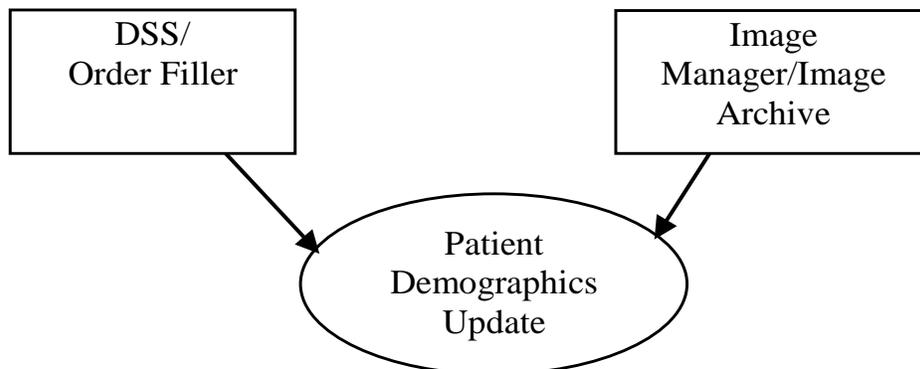
This section corresponds to the IHE Eye Care Patient Demographics Update [EYECARE-19] transaction. It defines the HL7 ADT 08 transaction tailored updating patient demographic data.

2140 Note: It does not include the ability to merge patient IDs; this feature is defined in [EYECARE-20] Merge Patient IDs.

4.19.1 Scope

This transaction enables systems to update patient demographic information within an ambulatory (i.e., outpatient, such as a small eye care clinic) or an in-patient setting.

4.19.2 Use Case Roles



2145

Actor: DSS/Order Filler

Role: Updates patient information

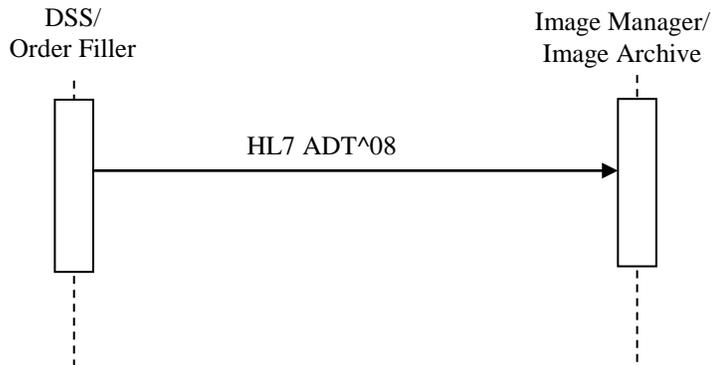
Actor: Image Manager/Image Archive

Role: Receives a patient update message and updates the information into its database

2150 4.19.3 Referenced Standards

HL7 v2.5.1 Chapters 2, 3

4.19.4 Interaction Diagram



4.19.4.1 Patient Demographics Update

2155 4.19.4.1.1 Trigger Events

The following event triggers the ADT message to update patient information.

- A08: Update Patient Information – used when any patient information has changed but when no other trigger event has occurred.

4.19.4.1.2 Message Semantics

2160 The Patient Demographics Update – Update Patient Information message is performed by the HL7 ADT 08 message. The DSS/Order Filler SHALL generate the message whenever an error is resolved or a change occurs in patient demographics.

A DSS/Order Filler SHALL send all of the required (R and R2) information for a patient record in an A08 message.

2165 An A08 message is the only method a DSS/Order Filler may use to update patient demographic and visit information. However, a DSS/Order Filler SHALL not use an A08 message to update Patient ID.

Note: As part of the reconciliation of two patient records, the Patient IDs need to be merged. This is accomplished by supporting the HL7 ADT A40 (Merge Patient ID) message and is defined in transaction Merge Patient IDs [EYECARE-20]. Other transactions in IHE Eye Care may require the HL7 ADT A40 message.

2170

Required segments are defined below. Other segments are optional.

Table 4.19.4.1.2-1: ADT A08 Required Segments

ADT	Patient Registration Message	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
EVN	Event Type	R	3
PID	Patient Identification	R	3
PV1	Patient Visit	R	3
{IN1}	Insurance	R2	7

R – Required, R2 – Required if known

2175

Adapted from the HL7 Standard, version 2.5.1

Each message SHALL be acknowledged by the HL7 ACK message sent by the receiver of the ADT message to its sender.

4.19.4.1.2.1 MSH Segment

2180

The MSH segment SHALL be constructed as defined in ITI TF-2b:3.30.5.1 MSH – Header Segment.

Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of ADT; the second component SHALL have values of A08. The third component SHALL have a value of ADT_A01.

4.19.4.1.2.2 EVN Segment

2185

See Section 4.15.4.1.2.2.

4.19.4.1.2.3 PID - Patient Identification segment

The PID segment is used by applications to communicate patient demographic and insurance information.

See Section 4.15.4.1.2.3 for field requirements.

2190

At least one of the fields *PID-18-Patient Account Number* or *PVI-19-Visit Number* SHALL be valued.

4.19.4.1.2.4 PV1 - Patient Identification segment

The PV1 segment is used by applications to communicate information on an account or visit-specific basis.

2195

See Section 4.15.4.1.2.4 for field requirements.

At least one of the fields *PID-18-Patient Account Number* or *PVI-19-Visit Number* SHALL be valued.

4.19.4.1.2.5 ROL - Role segment

2200

The ROL segment is used by applications to communicate information about providers related to the patient.

See Section 4.15.4.1.2.5 for field requirements.

The ROL segment communicates information about providers related to the patient.

4.19.4.1.2.6 IN1 - Insurance segment

2205

The IN1 segment is used by applications to communicate insurance information on an account or visit-specific basis.

See Section 4.15.4.1.2.6 for field requirements.

4.19.4.1.2.7 Expected Action

The Image Manager SHALL update its local patient demographic, visit and/or insurance information based on the values received in the ADT A08 message.

2210 See Section 4.15.4.2.2 for the Message Semantics of the ADT A08 message.

If an attribute received has a NULL value (i.e., is transmitted as two double quote marks "") in the A08 message it SHALL be removed from the Image Manager's database for that patient record.

2215 If an attribute received has no value (i.e., is omitted) in the A08 message, the old value should remain unchanged in the receiving system's database for that patient record.

It is the responsibility of the Image Manager to ensure that the patient information has been updated (e.g., images, Key Image Notes, Grayscale Softcopy Presentation States, Evidence Documents, PDF Encapsulated Documents, etc.) when they are displayed in the Image Manager and retrieved by other systems (i.e., when a DICOM Query and Query/Retrieve is performed).

2220 4.19.5 Common HL7 Message Implementation Requirements

The IHE IT Infrastructure Technical Framework has defined general HL7 implementation notes for HL7 v2 messages, for example:

- Using the Minimal Lower Layer Protocol (MLLP) over TCP/IP to transmit messages
- Using HL7 Original Acknowledgement Mode versus the Enhanced Acknowledgment Mode
- Rules for the MSA Segment, ERR Segment
- Empty Field convention
- Other

2225 IHE Actors performing this transaction SHALL comply with requirements defined in IHE ITI TF-2x: C.2 HL7 Implementation Notes (Appendix C).

For HL7 Messages, the term "B" means backwards compatible.

Note: IHE recognizes that certain deployments may require the use of Network Share Files as the transport mechanism. Although this is considered to be outside the scope of this profile, we do advise to not include MLLP framing characters in Network Share File implementations.

2235 Note: Receiving TCP Socket Based Implementations that allow senders to remain connected and leave the socket open should ensure that their system properly handles a forcibly disconnected TCP session. TCP sessions can be forcibly disconnected by firewalls, routers, or switches because of congestion, inactivity, or firewall policy violations. Systems should reset the socket and be ready to establish a new session when these situations are encountered.

4.19.6 Security Considerations

2240 There are no additional security considerations for the Patient Demographics Update transaction, beyond those described in of EYECARE TF-1: Appendix E.

4.19.6.1 Security Audit Considerations

There are no specific ATNA security audit events associated with the Patient Demographics Update transaction nor requirements on the encoding of that audit event.

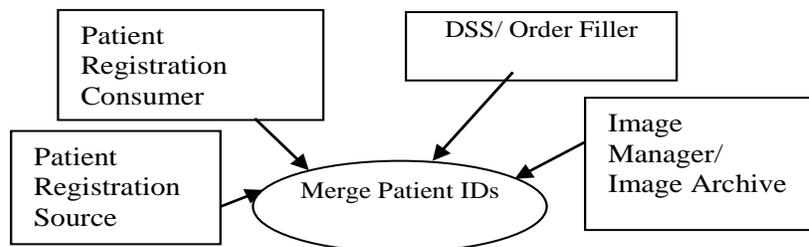
2245 4.20 Merge Patient IDs [EYECARE-20]

This transaction facilitates the merging of multiple IDs for a single patient. It defines the use of the HL7 ADT A40 message.

4.20.1 Scope

2250 This transaction involves merging patient IDs. These changes may occur at any time for a patient record. This transaction is used for both inpatients (i.e., those who are assigned a bed at the facility) and outpatients (i.e., such as an ambulatory eye care clinic) if the patient has been previously registered.

4.20.2 Use Case Roles



2255

Actor: Patient Registration Source

Role: Sends a merge patient ID message

Actor: Patient Registration Consumer

Role: Receives merge patient ID message and merges the two patient IDs into one record in its database

2260

Actor: DSS/Order Filler

Role: Sends a merge patient ID message

Actor: Image Manager/Image Archive

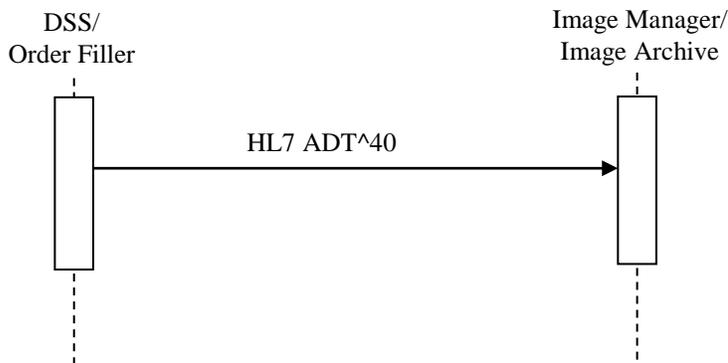
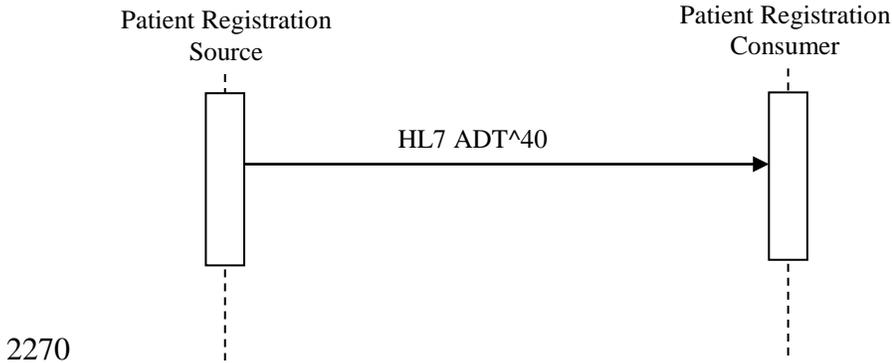
Role: Receives merge patient ID message and merges the two patient IDs into one record in its database of images and other evidence documents.

2265

4.20.3 Standards Referenced

HL7 v.2.5.1 Chapters 2, 3

4.20.4 Interaction Diagram



4.20.4.1 Merge Patient IDs

2275 **4.20.4.1.1 Trigger Events**

The following event triggers the ADT message to merge patient IDs.

- A40 Merge Patient – Patient Identifier List - used to signal a merge of records for a patient that was incorrectly filed under two different identifiers. That is, PID-3-patient ID identifier has been merged with MRG-1 Patient ID.

2280 **4.20.4.1.2 Message Semantics**

The Update Patient transaction is an HL7 ADT A40 message. The message SHALL be generated by the system that performs the update whenever Patient ID changes or two records are found to reference the same person.

Required segments are defined below. Other segments are optional.

2285

Table 4.20.4.1.2-1: ADT A40 Required Segments

ADT A40	Patient Administration Message	Chapter in HL7 v2.5.1
MSH	Message Header	2
EVN	Event Type	3

ADT A40	Patient Administration Message	Chapter in HL7 v2.5.1
PID	Patient Identification	3
MRG	Merge Information	3

Adapted from the HL7 Standard, version 2.5.1

2290 Each message SHALL be acknowledged by the HL7 ACK message sent by the receiver of the ADT message to its sender.

4.20.4.1.2.1 MSH Segment

The MSH segment SHALL be constructed as defined in ITI TF-2b:3.30.5.1 MSH – Header Segment.

2295 Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of ADT; the second component SHALL have values of A40. The third component SHALL have a value of ADT_A39.

4.20.4.1.2.2 EVN Segment

See Section 4.15.4.1.2.2.

4.20.4.1.2.3 PID Segment

2300 Most of the fields in the PID segment are optional, except those listed in Table 4.20.4.1.2.3-1.

Table 4.20.4.1.2.3-1: PID Segment

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R	Y		00106	Patient Identifier List
5	250	XPN	R	Y		00108	Patient Name

Adapted from the HL7 Standard, version 2.5.1

2305 **4.20.4.1.2.4 MRG Segment**

The PID segment contains the dominant patient information, including Patient ID (and Issuer of Patient ID). The MRG segment identifies the “old” or secondary patient records to be de-referenced. HL7 does not require that the 'old' record be deleted; it does require that the "incorrect" identifier not be referenced in future messages following the merge.

2310

Table 4.20.4.1.2.4-1: MRG Segment

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	250	CX	R	Y		00211	Prior Patient Identifier List
2	250	CX	B	Y		00212	Prior Alternate Patient ID
3	250	CX	O			00213	Prior Patient Account Number

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
4	250	CX	R2			00214	Prior Patient ID
5	250	CX	O			01279	Prior Visit Number
6	250	CX	O			01280	Prior Alternate Visit ID
7	250	XPN	R2	Y		01281	Prior Patient Name

Adapted from the HL7 Standard, version 2.5.1

2315 A separate merge message SHALL be sent for each patient record to be merged. For example, if Patients A, B, and C are all to be merged into Patient B, two MRG messages would be sent. In the first MRG message patient B would be identified in the PID segment and Patient A would be identified in the MRG segment. In the second MRG message, patient B would be identified in the PID segment, and Patient C would be identified in the MRG segment. The visits and accounts of patients A and C will now belong to patient B's record along with B's original visits and accounts.

2320 Modification of any patient demographic information SHALL be done by sending a Patient Update Information (ADT^A08^ADT_A01) message for the current Patient ID. An A40 message is the only method that may be used to update a Patient ID.

4.20.4.1.2.5 Expected Action

2325 After receiving a Patient Merge message (A40) the receiving system SHALL perform updates to reflect the fact that two patient records have been merged into a single record. If the correct target patient was not known to the receiving system, the receiving system shall create a patient record using the patient identifiers and demographics from the available PID segment data.

2330 The Image Manager SHALL ensure that the patient information has been updated in the diagnostic images and evidence objects (e.g., images, Key Image Notes, Grayscale Softcopy Presentation States, Evidence Documents, etc.) they manage when they are retrieved.

4.20.5 Common HL7 Message Implementation Requirements

The IHE IT Infrastructure Technical Framework has defined general HL7 implementation notes for HL7 v2 messages, for example:

- 2335
 - Using the Minimal Lower Layer Protocol (MLLP) over TCP/IP to transmit messages
 - Using HL7 Original Acknowledgement Mode versus the Enchanted Acknowledgment Mode
 - Rules for the MSA Segment, ERR Segment
 - Empty Field convention
- 2340
 - Other

IHE actors performing this transaction SHALL comply with requirements defined in IHE ITI TF-2x: C.2 HL7 Implementation Notes (Appendix C).

2345 Note: IHE recognizes that certain deployments may require the use of Network Share Files as the transport mechanism. Although this is considered to be outside the scope of this profile, we do advise to not include MLLP framing characters in Network Share File implementations.

Note: Receiving TCP Socket Based Implementations that allow senders to remain connected and leave the socket open should ensure that their system properly handles a forcibly disconnected TCP session. TCP sessions can be forcibly disconnected by firewalls, routers, or switches because of congestion, inactivity, or firewall policy violations. Systems should reset the socket and be ready to establish a new session when these situations are encountered.

2350 **4.20.6 Security Considerations**

There are no additional security considerations for the Merge Patient IDs transaction, beyond those described in EYECARE TF-1: Appendix E.

4.20.6.1 Security Audit Considerations

2355 There are no specific ATNA security audit events associated with the Merge Patient IDs transaction nor requirements on the encoding of that audit event.

4.21 Procedure Scheduled [EYECARE-21]

This section corresponds to the IHE Eye Care Procedure Scheduled [EYECARE-21] transaction. It defines the HL7 OMG v2.5.1 transaction used by the DSS/Order Filler and Image Manager/Image Archive Actors.

2360 **4.21.1 Scope**

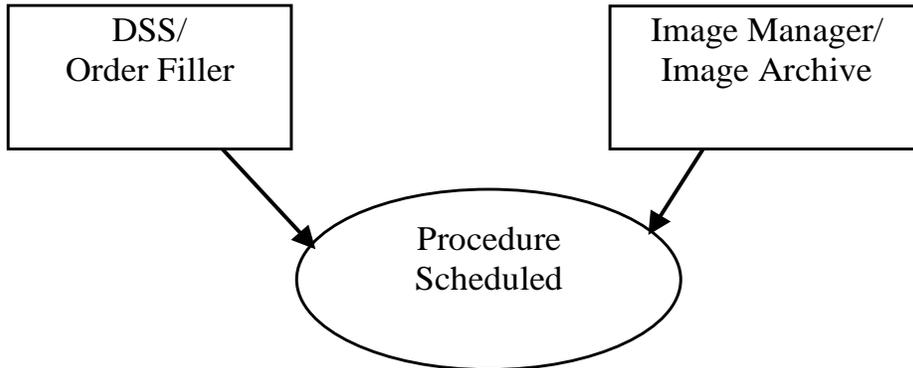
This transaction specifies a message from the DSS/Order Filler to notify the Image Manager/Image Archive that a procedure has been scheduled.

2365 Scheduling does not necessarily mean precise time assignment for the particular procedures. The DSS/Order Filler must provide the date and time when the procedure is to be performed, although precision of the time portion of that information is allowed to be implementation dependent.

2370 This message serves as a trigger event for the Image Manager/Image Archive to obtain necessary information and apply rules to ensure the availability of relevant information to the end user. For certain workflows, it is used to enable the Image Manager/Image Archive to support DICOM Modality Worklist queries.

The organization operating the DSS/OF and the Image Manager/Image Archive is responsible for synchronizing Procedure and Protocol Codes between all the systems that use such codes. IHE does not yet define a common mechanism for code synchronization or access.

4.21.2 Use Case Roles



2375

Actor: DSS/Order Filler

Role: Updates patient and procedure information

2380

Role: Enters, modifies and stores information about patients, generates orders, schedules Procedures (exams), modifies information about them (rescheduling, cancellations, code changes, etc.).

Actor: Image Manager/Image Archive

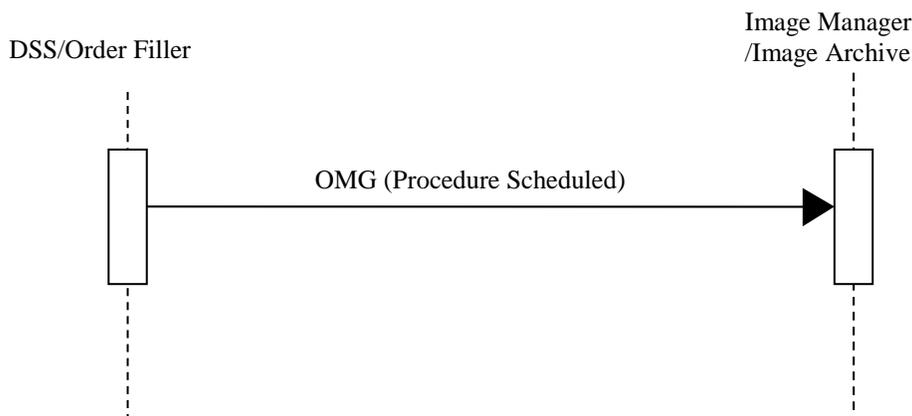
Role: Receives information about Patients, Orders, and schedules, and uses this information to assist in image management and/or DICOM Modality Worklist.

2385

4.21.3 Referenced Standards

HL7 v2.5.1 Chapters 2-4, 7

4.21.4 Interaction Diagram



4.21.4.1 Procedure Scheduled Message

2390 4.21.4.1.1 Trigger Events

The DSS/Order Filler determines procedures which need to be performed to fill the order, what Procedure Steps need to be performed for each Procedure, and timing and necessary resources.

4.21.4.1.2 Message Semantics

2395 The DSS/Order Filler uses an OMG message to convey necessary procedure and scheduling information.

2400 The Procedure Scheduled Transaction will perform the additional task of providing patient demographic information to the Image Manager/Image Archive. The Image Manager/Image Archive does not receive Patient Registration (A04) messages therefore the Image Manager/Image Archive SHALL obtain the patient demographic information from the Procedure Scheduled OMG message, specifically the PID and PV1 segments. For this reason, the DSS/Order Filler must complete these segments as described in Section 4.15, Patient Registration [EYECARE-15].

Segments listed below are required, required if known, conditional or optional. Other segments are optional.

2405

Table 4.21.4.1.2-1: OMG Message Segments

OMG	General Order Message	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
PID	Patient Identification	R	3
PV1	Patient Visit	R	3
{ORC	Common Order	R	4
{TQ1}	Timing and Quality	R	4
OBR	Order Detail	R	7
[[NTE]]	Notes and Comments (for Detail)	O	4
[[ZDS]] }	Additional identification information (custom for IHE)	C*	

R – Required, R2 – Required if known, C= Conditional, O = Optional

Adapted from the HL7 Standard, version 2.5.1

2410 *The ZDS segment SHALL be required when this transaction is used for U-EYECARE Integration Profile Real World Models I and II. It is optional for other models or profiles unless stated differently by the specific profile.

Each message SHALL be acknowledged by the HL7 ACK message sent by the receiver of the OMG message to its sender.

2415 **4.21.4.1.2.1 MSH Segment**

The MSH segment SHALL be constructed as defined in ITI TF-2b:3.30.5.1 MSH – Header Segment.

2420 Field *MSH-9-Message Type* SHALL have three components. The first component SHALL have a value of OMG; the second component SHALL have values of O19. The third component SHALL have a value of OMG_O19.

4.21.4.1.2.2 PID - Patient Identification segment

The PID segment is used by applications to communicate patient demographic and insurance information.

See Section 4.15.4.1.2.3 for field requirements.

2425 For the scenario where the DSS/Order Filler obtains the “Patient ID” from a system that does not provide a value for *PID-3-Patient Identifier List, component-4 “Assigning authority”*, (such as a system not IHE compliant), the DSS/Order Filler SHALL convey the value “PMS” in the Assigning Authority component. Else it SHALL use the value provided in the Assigning authority component by the Patient Registration Source.

2430 At least one of the fields *PID-18-Patient Account Number* or *PV1-19-Visit Number* SHALL be valued.

4.21.4.1.2.3 PV1 - Patient Identification segment

The PV1 segment is used by applications to communicate information on an account or visit-specific basis.

2435 See Section 4.15.4.1.2.4 for field requirements.

At least one of the fields *PID-18-Patient Account Number* or *PV1-19-Visit Number* SHALL be valued.

4.21.4.1.2.4 ORC – Common Order segment

All of the fields in the ORC segment are optional, except those listed in Table 4.21.4.1.2.4-1.

2440

Table 4.21.4.1.2.4-1: IHE Profile - ORC Segment

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
1	2	ID	R	0119	00215	Order Control
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
5	2	ID	R	0038	00219	Order Status
7	200	TQ	X		00221	Quantity/Timing
10	250	XCN	R2		00224	Entered By
12	250	XCN	R2		00226	Ordering Provider
13	80	PL	R2		00227	Enterer’s Location

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
14	250	XTN	R2		00228	Call Back Phone Number
17	250	CE	R2		00231	Entering Organization

R – Required, R2 – Required if known

Adapted from the HL7 Standard, version 2.5.1

2445 Deprecated component *ORC-7.4-Start Date/Time* SHALL not be populated. The TQ1 segment SHALL be used to carry the start date and time of the procedure.

Required fields in the ORC segment SHALL be filled by the DSS/Order Filler as given in Table 4.21.4.1.2.4-2.

2450

Table 4.21.4.1.2.4-2: DSS Mappings of the ORC Segment

Element Name	Seq.	Element Shall Contain:	Notes
Order Control Code	ORC-1	“NW”	New order
Placer Order Number	ORC-2	Placer Order Number received from Order Placer	In the event that the Order Filler places the order and the Order Filler is not connected to an Order Placer, this field SHALL be empty. If the Order Filler places the order and is connected to an Order Placer, the Order Filler SHALL NOT send the scheduling OMG message until it has received the Placer Order Number from the Order Placer (through an ORR message).
Filler Order Number	ORC-3	Filler Order Number	Number generated internally by the Department System Scheduler
Order Status	ORC-5	“SC”	Scheduled

4.21.4.1.2.5 TQI – Timing/Quantity segment

All of the fields in the TQ1 segment are optional, except those listed in Table 4.21.4.1.2.5-1.

2455

Table 4.21.4.1.2.5-1: IHE Profile – TQ1 Segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
7	26	TS	R		01633	Start date/time
9	250	CWE	R2	0485	01635	Priority
12	10	ID	C	0472	01638	Conjunction

R – Required, R2 – Required if known, C= Conditional

Adapted from the HL7 Standard, version 2.5.1

Field *TQ1-7 – Start date/time* SHALL contain the scheduled start date and time of the procedure.

2460 Scheduling does not necessarily mean precise time assignment for the particular procedures. However, the DSS/Order Filler SHALL handle all orders in such a way that it is capable of informing the Image Manager/Image Archive about procedure timing and resources used to perform a procedure. It must provide the date and time when the procedure is to be performed, although precision of the time portion of that information is allowed to be implementation
2465 dependent.

4.21.4.1.2.6 OBR – Order Details segment

All of the fields in the OBR segment are optional, except those listed in Table 4.21.4.1.2.6-1.

Table 4.21.4.1.2.6-1: IHE Profile - OBR Segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	R		00237	Set ID – OBR
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
4	250	CE	R		00238	Universal Service ID
5	2	ID	X		00239	Priority
12	250	CE	R2		00246	Danger Code
13	300	ST	R2		00247	Relevant Clinical Info.
16	250	XCN	R2		00226	Ordering Provider
17	250	XTN	R2		00250	Order Callback Phone Number
18	60	ST	R		00251	Placer field 1
19	60	ST	R		00252	Placer field 2
20	60	ST	R		00253	Filler Field 1
24	10	ID	R		00257	Diagnostic Serv Sect ID
27	200	TQ	X		00221	Quantity/Timing
30	20	ID	R2	0124	00262	Transportation Mode
31	250	CE	R2		00263	Reason for Study
44	250	CE	R2		00393	Procedure Code
46	250	CE	R2	0411	01474	Placer Supplemental Service Information

2470 *R – Required, R2 – Required if known*

Adapted from the HL7 Standard, version 2.5.1

2475 One ORC-OBR with the optional ZDS segment group SHALL correspond to each Requested Procedure. If a Requested Procedure is comprised of multiple Scheduled Procedure Steps and/or if a Scheduled Procedure Step is comprised of multiple Protocol Codes, each applicable Scheduled Procedure Step / Protocol Code combination SHALL be included in a separate ZDS segment if the optional segment is supported following the ORC-OBR segment group that contains the Requested Procedure.

- 2480
- Field OBR-46-Placer Supplemental Service Information SHALL contain the laterality (Left/Right/Both) indicator (when applicable). Field OBR-15-Specimen Source, which had formerly been adapted for this use by the IHE Technical Framework and has been deprecated in HL7 v 2.5.1, SHALL NOT be present.
 - Per the HL7 Standard, IHE recommends that some fields in the ORC and OBR segments contain the same information.
- 2485

Table 4.21.4.1.2.6-2: Identical Element Mappings between ORC and OBR Segments

Element Name	ORC Segment Element	OBR Segment Element
Placer Order Number	ORC-2	OBR-2
Filler Order Number	ORC-3	OBR-3
Parent	ORC-8	OBR-29

Non-optional fields in the OBR segment that are not identical to those from the ORC segment SHALL be filled by the DSS/Order Filler as defined in the following table.

2490

Table 4.21.4.1.2.6-3: DSS Mappings of the OBR Segment

Element Name	Seq.	Shall Contain:	Notes
Placer Field 1	OBR-18	Accession Number	Length of the value in this field SHALL NOT exceed 16 characters
Placer Field 2	OBR-19	Requested Procedure ID	All OBR segments within a single ORM message SHALL have the same value in this field.
Filler Field 1	OBR-20	Scheduled Procedure Step ID	If a Scheduled Procedure Step has multiple Protocol Codes associated with it, several ORC segments within a single ORM message may have the same value in this field.
Universal Service ID	OBR-4	The Universal Service ID of the Order.	Components 1-3 of OBR-4 in all OBR segments of SHALL have the same value. The related Requested Procedure Code/Description are sent in OBR-44. As the Order Filler may expand a single order into multiple Requested Procedures, multiple ORM messages may be sent for a single Order (with the same value for Components 1-3 of OBR-4).
Diagnostic Service Section ID	OBR-24	DICOM Modality	The Modality attribute of DICOM consists of Defined Terms that SHALL be used in this element.
Procedure Code	OBR-44	Requested Procedure Code and Requested Procedure Description.	Components 1-3 SHALL contain the Requested Procedure Code for this ORM message. Optionally, component 5 may contain the Requested Procedure

Element Name	Seq.	Shall Contain:	Notes
			Description.
Placer Supplemental Service Information	OBR-46	This element shall be used for the L/R/B (laterality) indicator, if applicable. The L/R/B value shall be appended to the Requested Procedure Description (0032,1060).	This element SHALL only be used if the coding scheme that is employed does not contain laterality within the coding scheme itself. If laterality is inherent in the coding scheme, this element SHALL NOT be sent.

The ZDS Segment is defined to convey information generated by the DSS/Order Filler and not currently defined in the HL7 standard and is given in the following table.

2495

Table 4.21.4.1.2.6-4: IHE Profile - ZDS Segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	200	RP	R		Z0001	Study Instance UID

Components of the Study Instance UID field SHALL be encoded as given in Table 4.21.4.1.2.6-5.

2500

Table 4.21.4.1.2.6-5: ZDS Segment Study Instance UID Element Components

Component Number	Component Name	Shall Contain:
1	Reference Pointer	DICOM compliant Study Instance UID value
2	Application ID	Implementation specific
3	Type of Data	“Application”
4	Subtype	“DICOM”

4.21.4.1.2.7 NTE – Notes and Comments (for Details) segment

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The NTE segment is a common format for sending notes and comments. It is provided in this transaction for a mechanism to convey procedure instructions to the Image Manager/Image Archive. For example there might be instructions to tape the eyelids while performing a visual field or to concentrate on a specific region of the eye during the early stage of an angiogram, etc.

The Image Manager/Image Archive may convey this information to Acquisition Modality and Acquisition Modality Importer Actors using DICOM Modality Worklist.

2510

NTE-2 Source of Comment SHALL contain “LPI” to denote that the instruction is a Limited Procedure Instruction.

Although the NTE Comment Element allows for 64K, the length SHALL be limited to 10,240 characters to accommodate the DICOM Modality Worklist Requested Procedure Comments

2515 attribute length to which this value maps (see Imaging Procedure Instructions Status Option in [EYECARE-1]), see Section 4.1.6.

All of the fields in the NTE segment are optional, except those listed in Table 4.21.4.1.2.7-1.

Table 4.21.4.1.2.7-1: IHE Profile - NTE Segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	O		00096	Set ID - NTE
2	8	ID	R2	0105	00097	Source of Comment
3	10,240	FT	R		00098	Comment
4	60	CE	O		01318	Comment Type

R – Required, R2 – Required if known, O - Optional

2520

Adapted from the HL7 Standard, version 2.5.1

Modified Table 0105 Source of comment

Table	Code	Code Meaning
0105	LPI	Limited Procedure Instruction

4.21.4.1.2.8 Expected Action

2525 The Image Manager/Image Archive SHALL update its local patient demographic, visit and order information based on the values received in the OMG message. If it supports DICOM Modality Worklist, it SHALL use the OMG message and internal mechanisms to populate the worklist message. See Table 4.21.4.1.2.8-1 which is a modification of RAD TF-2: Table B-1, HL7 Order Mapping to DICOM MWL.

2530 The Image Manager/Image Archive processes field *PID-3-Patient Identifier List* to obtain the Patient ID. Since PID-3 may contain multiple IDs (e.g., master Patient ID, internal ID from Order Filler, social security number, etc.), the Image Manager/Image Archive SHALL use the Assigning Authority component of PID-3 to determine which ID is the master Patient ID. This typically would be accomplished by the Image Manager/Image Archive configuring the

2535 Assigning Authority to the system that supports the Patient Registration Source (e.g., PMS).

Note: It is the responsibility of the Image Manager/Image Archive to generate a valid DICOM formatted worklist. Therefore, the ability to properly convert HL7 formatted data into DICOM formatted data is critical. One such example is that certain PMS systems will use a “\” in their patient IDs (which is provided in PID-3). This is an illegal DICOM character (as it is used as a multi field delimiter) but allowed by HL7, so the Image Manager/Image Archive must have the capability to strip out this illegal character.

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Table 4.21.4.1.2.8-1: HL7 Order Mapping to DICOM MWL for Image Managers

DICOM Description / Module	DICOM Tag	DICOM SCP Matching Key Type	DICOM SCP Return Key Type	HL7 Description	HL7 v2.5.1 Segment	Notes
SOP Common						
Specific Character Set	(0008, 0005)	O	1C	Character Set	OMG MSH:18	
Scheduled Procedure Step						
Scheduled Procedure Step Sequence	(0040, 0100)	R	1			
>Scheduled station AE title	(0040, 0001)	R	1			Generated by the Image Manager See Note 9
>Scheduled Procedure Step Start Date	(0040, 0002)	R	1		OMG TQ1:7	
>Scheduled Procedure Step Start Time	(0040, 0003)	R	1		OMG TQ1:7	
>Modality	(0008, 0060)	R	1	Diagnostic Service Section ID	OMG OBR:24	
>Scheduled Performing Physician's Name	(0040, 0006)	R	2	Technician	OMG OBR:34	See note 5
>Scheduled Procedure Step Description	(0040, 0007)	O	1C	Universal Service ID	OMG OBR:-4 Component 2	
>Scheduled Station Name	(0040, 0010)	O	2			Generated by the department Image Manager
>Scheduled Protocol Code Sequence	(0040, 0008)	O	1C			
>>Code Value	(0008, 0100)	O	1C		OMG OBR:4 Component 1	
>>Coding Scheme Designator	(0008, 0102)	O	1C		OMG OBR:4 Component 3	

DICOM Description / Module	DICOM Tag	DICOM SCP Matching Key Type	DICOM SCP Return Key Type	HL7 Description	HL7 v2.5.1 Segment	Notes
>>Code Meaning	(0008, 0104)	O	3		OMG OBR:4 Component 2	
>Scheduled Procedure Step ID	(0040, 0009)	O	1	Filler Field 1	OMG OBR:20	
>Scheduled Procedure Step Status	(0040, 0020)	O	3	N/A		Generated by the Image Manager
>All other Attributes from the Scheduled Procedure Step Module		O	3			
Requested Procedure						
Requested Procedure ID	(0040, 1001)	O	1	Placer Field 2	OMG OBR:19	
Reason for the Requested Procedure	(0040, 1002)	O	3	Reason for Study	OMG OBR:31	OBR:31 may be either a code or text value; if a code, then the code meaning (display name) should be used; see also (0040,100A)
Reason for Requested Procedure Code Sequence	(0040, 100A)	O	3	Reason for Study	OMG OBR:31	OBR:31 may be either a code or text value; if a text value, then the DSS may map it to a code to use in the DICOM attribute; see also (0040,1002)
>Code Value	(0008, 0100)	O	1C			
>Coding Scheme Designator	(0008, 0102)	O	1C			
>Code Meaning	(0008, 0104)	O	3			
Requested Procedure Description	(0032, 1060)	O	1C	Procedure Code	OMG OBR:44 Component 5	See note 1
Requested Procedure Code Sequence	(0032, 1064)	O	1C			

DICOM Description / Module	DICOM Tag	DICOM SCP Matching Key Type	DICOM SCP Return Key Type	HL7 Description	HL7 v2.5.1 Segment	Notes
>Code Value	(0008, 0100)	O	1C	Procedure Code	OMG OBR:44 Component 1	See note 1
>Coding Scheme Designator	(0008, 0102)	O	1C	Procedure Code	OMG OBR:44 Component 3	See note 1
>Code Meaning	(0008, 0104)	O	3	Procedure Code	OMG OBR:44 Component 2	See note 1
Study Instance UID	(0020, 000D)	O	1		ZDS segment	SHALL use the value conveyed in the ZDS segment (if the optional segment is provided), Else, generated by the Image Manager
Requested Procedure Priority	(0040, 1003)	O	2	Quantity/ Timing	OMG TQ1:9	See note 2
All other Attributes from the Requested Procedure Module		O	3			
Imaging Service Request						
Accession Number	(0008, 0050)	O	2	Placer Field 1	OMG OBR:18	
Requesting Physician	(0032, 1032)	O	2	Ordering Provider	OMG OBR:16	
Referring Physician's Name	(0008, 0090)	O	2	Referring Doctor	OMG PV1:8	
Placer Issuer and Number	(0040, 2016)	O	2	Placer Order #	OMG ORC:2	See note 3
Filler Issuer and Number	(0040, 2017)	O	2	Filler Order #	OMG ORC:3	See note 3

DICOM Description / Module	DICOM Tag	DICOM SCP Matching Key Type	DICOM SCP Return Key Type	HL7 Description	HL7 v2.5.1 Segment	Notes
Reason for Imaging Service Request	(0040, 2001)	O	2	Reason for Study	OMG OBR:31	The attribute (0040,2001) was retired by DICOM in 2004 in favor of (0040,1002) and (0040,100A). Accordingly, the DICOM return key may be empty, or a duplicate of (0040,1002) and/or the code meaning of (0040,100A).
Entered by....	(0040, 2008)	O	3	Entered by....	OMG ORC:10	
Order Entering Location	(0040, 2009)	O	3	Entering Organization	OMG ORC:17	
Order Callback Phone Number	(0040, 2010)	O	3	Order Callback Phone Number	OMG ORC:14	
All other Attributes from the Scheduled Procedure Step Module		O	3			
Visit Identification						
Admission ID	(0038, 0010)	O	2	Patient Account Number or Visit Number	OMG PID:18 or PV1:19	See note 4
Issuer of Admission ID	(0038, 0011)	O	2	Patient Account Number or Visit Number	OMG PID:18 or PV1:19	See note 4
All other Attributes from the Visit Identification Module		O	3			
Patient						
Patient's Name	(0010, 0010)	R	1	Patient Name	OMG PID:5	See note 6
Patient ID	(0010, 0020)	R	1	Patient Identifier List	OMG PID:3 (first ID provided)	

DICOM Description / Module	DICOM Tag	DICOM SCP Matching Key Type	DICOM SCP Return Key Type	HL7 Description	HL7 v2.5.1 Segment	Notes
Issuer of Patient ID	(0010, 0021)	O	3	Patient Identifier List	OMG PID:3 (component -4 Assigning Authority)	See Note 8
Ethnic Group	(0010, 2160)	O	3	Ethnic Group	OMG PID:22	
All other Attributes from the Patient Identification Module		O	3			
Patients Birth Date	(0010, 0030)	O	2	Date/ Time of Birth	OMG PID:7	
Patient's Sex	(0010, 0040)	O	2	Sex	OMG PID:8	See Note 7
All other Attributes from the Patient Medical Module		O	3			

Adapted from DICOM PS 3.4

2545 Notes from Table 4.21.4.1.2.8-1:

- **Note 1:** Universal Service ID and Specimen Source decoding:
 - In order to fulfill an accepted order, the Department System Scheduler generates one or more Requested procedures, to which it assigns IDs and proper codes, taken from either local or universal coding scheme (such as CPT-4 or LOINC).
 - If laterality is not specified in the Universal Service ID then it is recommended to use HL7 v2.5.1 Placer Supplemental Information (01474) or HL7 v2.3.1 Specimen Source (00249) to further clarify the free format text descriptions of the Order.
- **Note 2:** Only the suggested values of the HL7 Priority component of Quantity/Timing shall be used for IHE. These values shall be mapped to the DICOM enumerated fields for Priority as:

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HL7 Status	DICOM Status
S - STAT	STAT
A - ASAP	HIGH

HL7 Status	DICOM Status
R - Routine	ROUTINE
P - Pre-op	HIGH
C - Callback	HIGH
T - Timing	MEDIUM

- 2560 • **Note 3:** Attributes (0040,2016) and (0040, 2017) are designed to incorporate the HL7 components of Placer Issuer and Number, and Filler Issuer and Number. In a healthcare enterprise with multiple issuers of patient identifiers, both the issuer name and number are required to guarantee uniqueness.
- 2565 • **Note 4:** Either field PID-18 Patient Account Number or field PV1-19 Visit Number or both may be valued depending on the specific national requirements. Whenever field PV1-19 Visit Number in an order message is valued, its components shall be used to populate Admission ID (0038,0010) and Issuer of Admission ID (0038,0011) attributes in the MWL responses. In the case where field PV1-19 Visit Number is not valued, these attributes shall be valued from components of field PID-18 Patient Account Number. This requires that Visit Numbers be unique across all account numbers.
- 2570 • **Note 5:** Field OBR-34 *Technician* in ORM or OMG message is repeatable. Its data type is CM, with the following components: <name (CN)> ^ <start date/time (TS)> ^ <end date/time (TS)> ^ <point of care (IS)> ^ <room (IS)> ^ <bed (IS)> ^ <facility (HD)> ^ <location status (IS)> ^ <patient location type (IS)> ^ <building (IS)> ^ <floor (IS)>
 - 2575 • Thus, in mapping value to the DICOM attribute Scheduled Performing Physician (0040,0006), only sub-components of the first component of the first repetition of that field shall be used.
- **Note 6:** The encoding of the patient’s name in the HL7 ORM or OMG PID:5 components is mapped without changes into the DICOM components in the Patient’s Name (0010,0010) attribute as follows:

	HL7	DICOM
2580	<family_name&last_name_prefix>	=> <family_name_complex>
	<given_name>	=> <given_name_complex>
	<middle_initial_or_name>	=> <middle_name>
	<suffix><degree>	=> <name_suffix>
	<prefix>	=> <name_prefix>

2585

Note: The HL7 “degree” component is absorbed as a second element in the “name_suffix” component in DICOM.

- 2590 • **Note 7:** The DICOM Patient’s Sex (0010,0040) attribute can have only the values M, F or O (for other), or be zero length if unknown. These are enumerated values and hence any other values would be illegal. The HL7 v2 description also uses M, F and O, but suggests a value of U for unknown, which needs to be mapped to zero length. In HL7 these are only suggested values however, and care should be taken to map any other

2630 Example 1: The DICOM MWL SCU (AE1) queries the DICOM MWL SCP with the modality data element set to “OPV” and includes the Scheduled Station AE Title encoded as “zero length” (return key only).

Valid Response 1: A possible response is for the DICOM MWL SCP to return all the matches for orders with the modality set to OPV and to send the value “AE1” for the Scheduled Station AE Title data element. Two MWL entries would be displayed to the user:

2635

Order #	Modality	Scheduled Station AE Title
Order 1	OPV	AE1
Order 3	OPV	AE1

2640 Valid Response 2: A possible response is for the DICOM MWL SCP to return all the matches for orders with the modality set to OPV and to send the value “AE1” and “AE2” for the Scheduled Station AE Title data element. Four MWL entries would be displayed to the user:

2645

Order #	Modality	Scheduled Station AE Title
Order 1	OPV	AE1
Order 1	OPV	AE2
Order 3	OPV	AE1
Order 3	OPV	AE2

2650 **4.21.5 Common HL7 Message Implementation Requirements**

The IHE IT Infrastructure Technical Framework has defined general HL7 implementation notes for HL7 v2 messages, for example:

- Using the Minimal Lower Layer Protocol (MLLP) over TCP/IP to transmit messages
- Using HL7 Original Acknowledgement Mode versus the Enhanced Acknowledgment Mode
- Rules for the MSA Segment, ERR Segment
- Empty Field convention
- Other

2660 IHE actors performing this transaction SHALL comply with requirements defined in IHE ITI TF-2x: C.2 HL7 Implementation Notes (Appendix C).

For HL7 Messages, the term “B” means backwards compatible.

Note: IHE recognizes that certain deployments may require the use of Network Share Files as the transport mechanism. Although this is considered to be outside the scope of this profile, we do advise to not include MLLP framing characters in Network Share File implementations.

2665 Note: Receiving TCP Socket Based Implementations that allow senders to remain connected and leave the socket open should ensure that their system properly handles a forcibly disconnected TCP session. TCP sessions can be forcibly disconnected by firewalls, routers, or switches because of congestion, inactivity, or firewall policy violations. Systems should reset the socket and be ready to establish a new session when these situations are encountered.

4.21.6 Security Considerations

2670 There are no additional security considerations for the Procedure Scheduled transaction, beyond those described in EYECARE TF-1: Appendix E.

4.21.6.1 Security Audit Considerations

There are no specific ATNA security audit events associated with the Procedure Scheduled transaction nor requirements on the encoding of that audit event.

2675 4.22 Procedure Status Update [EYECARE-22]

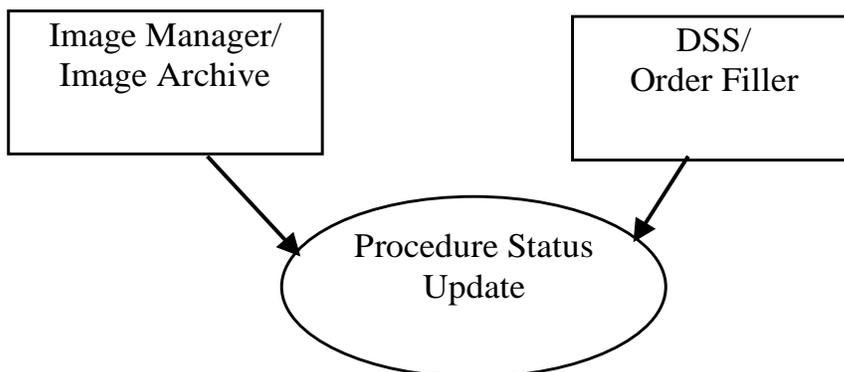
This section corresponds to the IHE Eye Care Procedure Status Update [EYECARE-22] transaction.

4.22.1 Scope

2680 It defines the HL7 OMG message used by the Image Manager/Image Archive to notify the DSS/Order Filler about changes in the status for the fulfillment of an eye care order such as order completed (i.e., images and/or measurements have been archived and are available for interpretation).

It also provides an optional ability to convey a reference pointer (i.e., URL) to one or more images/measurements.

2685 4.22.2 Use Case Roles



Actor: Image Manager/Image Archive

Role: Updates order status information

2690 **Role:** Provides updates to orders that have been created by the DSS/Order Filler such as completed (all image/measurements available), or results available (at least one image/measurement is available), etc.

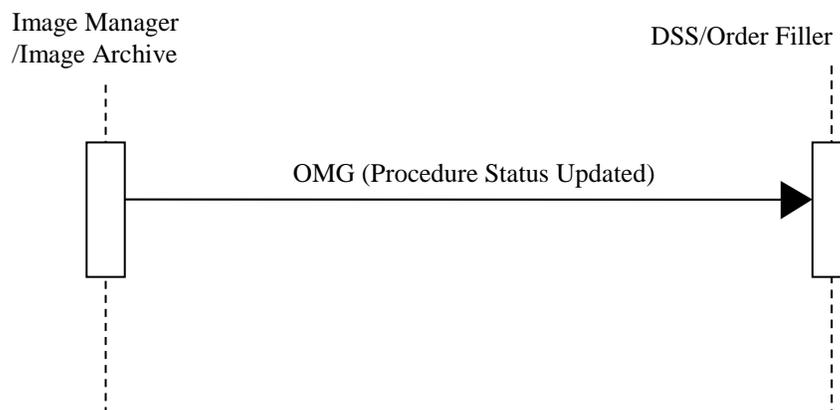
Actor: DSS/Order Filler

Role: Receives updates about the orders it has created and processes the updates (such as informing a user images/measurements are available for interpretation).

2695 4.22.3 Referenced Standards

HL7 v2.5.1 Chapters 2-4, 7

4.22.4 Interaction Diagram



4.22.4.1 Procedure Status Updated Message

2700 4.22.4.1.1 Trigger Event

An Image Manager/Image Archive wants to notify the DSS/Order Filler about changes in the status for the fulfillment of an eye care order such as order completed (i.e., images and/or measurements have been archived and are available for interpretation).

4.22.4.1.2 Message Semantics

2705 The Image Manager/Image Archive and DSS/Order Filler are required to support the HL7 v2.5.1 interface requirements described in the referenced volumes and sections.

HL7 v2.5.1 Chapter 4 OMG message. Refer to HL7 Standard for general message semantics.

Segments listed below are required or optional. Other segments are optional.

2710

Table 4.22.4.1.2-1: OMG Message Segments

OMG	General Order Message	REQ	Chapter in HL7 v2.5.1
MSH	Message Header	R	2
ORC	Common Order	R	4
TQ1	Timing and Quality	R	4
OBR	Order Details	R	4
[OBX]	Observation/Result	O	4

R – Required, O = Optional

Adapted from the HL7 Standard, version 2.5.1

4.22.4.1.1.1 MSH Segment

2715

The MSH segment SHALL be constructed as defined in ITI TF-2b: 3.30.5.1 MSH – Header Segment.

Field MSH-9-Message Type SHALL have three components. The first component SHALL have a value of OMG; the second component shall have a value of O19; the third component shall have a value of OMG_O19.

4.22.4.1.1.2 ORC Segment

2720

All of the fields in the ORC segment are optional, except those listed in Table 4.22.4.1.2.2-1.

Table 4.22.4.1.2.2-1: IHE Profile - ORC Segment

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
1	2	ID	R	0119	00215	Order Control
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number
5	2	ID	R	0038	00219	Order Status
7	200	TQ	X		00221	Quantity/Timing

R – Required, R2 – Required if known

Adapted from the HL7 Standard, version 2.5.1

2725

Deprecated component *ORC-7.4-Start Date/Time* SHALL not be populated. The TQ1 segment SHALL be used to carry the start date and time of the procedure.

ORC-2 Order Control SHALL contain “SC”

2730

ORC-5 Order Status SHALL contain a value from Table 4.22.4.1.2.2-2. The Image Manager/Image Archive SHALL support at least one of the Order Status Codes with the value of “CM” or “A”.

The DSS/Order Filler SHALL be able to process all Order Status Codes.

Table 4.22.4.1.2.2-2: Order Status Codes

Value	Description	Meaning
CM	Order is completed	Image Manager/Image Archive determines it has all the images/measurements for the procedure. How this is accomplished is outside the scope of IHE.
DC	Order was discontinued	IHE does not define the trigger for the discontinued status.
IP	In progress, unspecified	IHE does not define the trigger for the in progress status.
A	Some, but not all results available	Image Manager/Image Archive determines it has at least one of the images/measurements for the procedure. How this is accomplished is outside the scope of IHE.

2735

Adapted from the HL7 Standard, version 2.5.1

4.22.4.1.1.3 TQ1 Segment

All of the fields in the TQ1 segment are optional, except those listed in Table 4.22.4.1.2.3-1.

Deprecated components *ORC-7.4-Start Date/Time* or *OBR-27.4-Start Date/Time* SHALL NOT be populated. The TQ1 segment SHALL be used to carry the start date and time of the procedure.

2740

Table 4.22.4.1.2.3-1: IHE Profile – TQ1 Segment

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
7	26	TS	R		01633	Start Date/Time
12	10	ID	C	0427	01638	Conjunction

R – Required, C= Conditional

Adapted from the HL7 Standard, version 2.5.1

2745

Field *TQ1-7-Start Date/Time* SHALL contain the date and time of the procedure.

4.22.4.1.1.4 OBR Segment

All of the fields in the OBR segment are optional, except those listed in Table 4.22.4.1.2.4-1.

2750

Table 4.22.4.1.2.4-1: IHE Profile - OBR Segment

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
2	22	EI	R2		00216	Placer Order Number
3	22	EI	R		00217	Filler Order Number

R – Required, R2 – Required if known

2755

Adapted from the HL7 Standard, version 2.5.1

Deprecated component *OBR-27.4-Start Date/Time* SHALL NOT be populated. The TQ1 segment SHALL be used to carry the start date and time of the procedure.

4.22.4.1.1.5 OBX Segment

2760 The OBX segment is an optional segment which may be used to provide information about many different types of observations.

For the scenario where the Image Manager/Image Archive wishes to provide a reference pointer to an image/measurement or a set of images/measurements that it has stored, it SHALL implement the OBX segment as defined below.

2765

Table 4.22.4.1.2.5-1: IHE Profile – OBX Segment

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
2	2	ID	R	0125	00570	Value Type
3	250	CE	R		00571	Observation Identifier
4	20	ST	C		00572	Observation Sub-ID
5	99999	varies	R		00573	Observation Value
11	1	ID	R	0085	00579	Observe Result Status

R – Required, R2 – Required if known, C= Conditional

Adapted from the HL7 Standard, version 2.5.1

2770 *OBX-2-Value Type* SHALL contain the value “RP” (for Reference Pointer).

OBX-5- Observation Value SHALL contain the URL for where the image/measurement or the set of images/measurements can be accessed. The method to access the image/measurements is outside the scope of IHE.

2775 The OBX segment may be used to provide other observation information that is outside the scope of IHE.

4.22.4.1.1.6 Expected Actions

The Image Manager/Image Archive SHALL provide the DSS/Order Filler with one or more status updates on the order.

2780 The DSS/Order Filler processes the order status based upon the internal application (such as the procedure is completed and is ready for interpretation). The DSS/Order Filler is recommended to convey the order status to the user of the system.