

Integrating the Healthcare Enterprise



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**IHE Radiology (RAD)
Technical Framework**

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**Volume 3
IHE RAD TF-3
Cross-Transaction Specifications
and Content Specifications**

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CONTENTS

30	1	Introduction	3
	1.1	Introduction to IHE	3
	1.2	Intended Audience	3
	1.3	Overview of Technical Framework Volume 3	3
	1.4	Comment Process.....	4
35	1.5	Copyright Licenses	4
	1.5.1	Copyright of Base Standards.....	4
	1.5.1.1	DICOM (Digital Imaging and Communications in Medicine)	4
	1.5.1.2	HL7 (Health Level Seven).....	4
	1.5.1.3	LOINC (Logical Observation Identifiers Names and Codes)	5
40	1.5.1.4	SNOMED CT (Systematized Nomenclature of Medicine -- Clinical Terms)	5
	1.6	Trademark.....	5
	1.7	Disclaimer Regarding Patent Rights.....	5
	1.8	History of Document Changes.....	6
	2	Conventions	7
45	2.1	Content Module Modeling and Profiling Conventions.....	7
	2.2	Additional Standards Profiling Conventions	7
	3	Content Modules Overview and Terminology.....	8
	4	IHE Namespaces, Concept Domains and Vocabularies	9
	4.1	IHE Namespaces	9
50	4.2	IHE Radiology Concept Domains.....	9
	4.3	IHE Radiology Format Codes, Vocabularies, and Value Sets.....	9
	4.3.1	IHE Radiology Format Codes	9
	4.3.2	IHE Radiology Vocabularies	10
	4.3.2.1	Codes for the SOLE Profile.....	10
55	4.3.3	IHE Radiology Value Sets	10
	4.3.3.1	Value Set Name/Concept Domain Name <oid>	10
	5	Transaction Options on Other Domain Profiles.....	11
	5.1	Record Audit Event [ITI-20].....	11
	5.1.1	Trigger Events and Message semantics.....	11
60	6	IHE Radiology Content Specifications	17
	6.1	XDR-I Imaging Document Set	17
	6.2	Medical Health Documents - Imaging (deprecated)	17
	6.3	SOLE Event Definitions	17
	6.4	Clinical Decisions Support (CDS) Information	17
65	6.5	Imaging Analysis Result Content.....	17
	6.6	Report Template Structure	17
		Appendices to Volume 3.....	18
		Appendix A – Example Analysis Result Encodings.....	18

1 Introduction

70 This document, Volume 3 of the IHE Radiology (RAD) Technical Framework, defines content modules used in the Radiology profiles.

1.1 Introduction to IHE

75 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.

80 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.

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 3 is:

- 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 3

90 Volume 3 is comprised of several distinct sections:

- Section 1 provides background and reference material.
- Section 2 presents the conventions used in this volume to define the content modules.
- Section 3 provides an overview of Content Modules and the terminology used.
- 95 • Section 4 lists the namespaces and identifiers defined or referenced and the vocabularies defined or referenced herein.
- Section 5 specifies IHE Radiology options on other domain's profiles.
- Section 6 contains IHE Radiology content specifications

100 The appendices in Volume 3 provide clarification of technical details of the IHE data model and transactions.

For a brief overview of additional Technical Framework Volumes (TF-1, TF-2, TF-4), please see the [IHE Technical Frameworks General Introduction](#), Section 5.

105 A glossary of terms and acronyms used in the IHE Technical Framework, including those from relevant standards, is provided in [Appendix D](#) to the *IHE Technical Frameworks General Introduction*.

1.4 Comment Process

110 IHE International welcomes comments on this document and the IHE initiative. Comments on the IHE initiative can be submitted by sending an email to the co-chairs and secretary of the Radiology domain committees at rad@ihe.net. Comments on this document can be submitted at https://www.ihe.net/Radiology_Public_Comments/.

1.5 Copyright Licenses

115 IHE International hereby grants to each Member Organization, and to any other user of these documents, an irrevocable, worldwide, perpetual, royalty-free, nontransferable, nonexclusive, non-sublicensable license under its copyrights in any IHE profiles and Technical Framework documents, as well as any additional copyrighted materials that will be owned by IHE International and will be made available for use by Member Organizations, to reproduce and distribute (in any and all print, electronic or other means of reproduction, storage or transmission) such IHE Technical Documents.

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1.5.1 Copyright of Base Standards

125 IHE technical documents refer to and make use of a number of standards developed and published by several standards-development organizations. All rights for their respective base standards are reserved by these organizations. This agreement does not supersede any copyright provisions applicable to such base standards. Copyright license information for frequently referenced base standards is provided below.

1.5.1.1 DICOM (Digital Imaging and Communications in Medicine)

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

1.5.1.2 HL7 (Health Level Seven)

HL7[®], Health Level Seven[®], CDA[®], and FHIR[®] are registered trademarks of Health Level Seven International.

135 Health Level Seven, Inc. has granted permission to IHE to reproduce tables from the HL7 standard. The HL7 tables in this document are copyrighted by Health Level Seven, Inc. All rights reserved. Material drawn from these documents is credited where used.

1.5.1.3 LOINC (Logical Observation Identifiers Names and Codes)

LOINC[®] is registered United States trademarks of Regenstrief Institute, Inc.

1.5.1.4 SNOMED CT (Systematized Nomenclature of Medicine -- Clinical Terms)

Some IHE Profiles incorporate SNOMED[®] CT, which is used by permission of the International Health Terminology Standards Development Organisation. SNOMED CT[®] was originally created by the College of American Pathologists. SNOMED CT is a registered trademark of the International Health Terminology Standards Development Organisation, all rights reserved.

145 Please note that in April 2019, IHE International and SNOMED[®] International formally announced a license agreement encouraging data consistency and interoperability across international boundaries, with benefits for clinical care, research and operational efficiency. Further details about this licensing agreement are available on the [IHE Wiki](#).

1.6 Trademark

150 IHE[®] and the IHE logo are trademarks of the Healthcare Information Management Systems Society in the United States and trademarks of IHE Europe in the European Community. They may only be used with the written consent of the IHE International Board Operations Committee, which may be given to a Member Organization in broad terms for any use that is consistent with the IHE mission and operating principles.

1.7 Disclaimer Regarding Patent Rights

155 Attention is called to the possibility that implementation of the specifications in this document may require use of subject matter covered by patent rights. By publication of this document, no position is taken with respect to the existence or validity of any patent rights in connection therewith. IHE International is not responsible for identifying Necessary Patent Claims for which
160 a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of the specifications in this document are expressly advised that
165 determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information about the IHE International patent disclosure process including links to forms for making disclosures is available at http://www.ihe.net/Patent_Disclosure_Process. Please address questions about the patent disclosure process to the secretary of the IHE International Board: secretary@ihe.net.

1.8 History of Document Changes

170 This section provides a brief summary of changes and additions to this version of the IHE Radiology Technical Framework.

Date	Document Revision	Change Summary
2020-09-18	19.0	Integrate Scheduled Workflow.b as a Final Text Profile. Integrate the DBT Extensions Supplement into Final Text. Incorporate Change Proposals from 2019 CP Ballots. Refer to IHE RAD CP Tracking for details. Update TF Volumes to move all transaction definitions to Volume 2 and align Volume 3 with the current template, where feasible.

2 Conventions

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

2.1 Content Module Modeling and Profiling Conventions

180 In order to maintain consistent documentation, modeling methods for IHE content modules and profiling conventions, for frequently used standards, are maintained as [Appendix E](#) to the *IHE Technical Frameworks General Introduction*. Methods described include the standards conventions DICOM, HL7 v2.x, HL7 Clinical Document Architecture (CDA) Documents, etc. These conventions are critical to understanding this volume and should be reviewed prior to reading this text.

2.2 Additional Standards Profiling Conventions

185 This section defines profiling conventions for standards which are not described in the [IHE Technical Frameworks General Introduction](#).

No additional conventions.

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3 Content Modules Overview and Terminology

In the future, an appendix to the *IHE Technical Frameworks General Introduction* will provide and an overview of Content Modules. In the interim, information may be available on the IHE wiki at <http://wiki.ihe.net/index.php?title=Profiles>

195 **4 IHE Namespaces, Concept Domains and Vocabularies****4.1 IHE Namespaces**

The IHE registry of root OIDs is located at

http://wiki.ihe.net/index.php/OID_Registration#IHE_Domain_Namespaces

Additions to the IHE Radiology OID Registry are:

200

Table 4.1-1: OIDs for IHE Radiology Profiles

Profile	code	codingScheme	Description	Reference
The Clinical Decision Support – Order Appropriateness Tracking TI Supplement adds codes to this table.				
The Cross-Enterprise Remote Reading Workflow Definition TI Supplement adds codes to this table.				

4.2 IHE Radiology Concept Domains

Reserved for future use.

conceptDomain	conceptDomainName	Description
<oid or uid>	<code system name>	<short description or pointer to more detailed description>
<oid or uid>	<code system name>	<short description or pointer to more detailed description>
<oid or uid>	<code system name>	<short description or pointer to more detailed description>

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4.3 IHE Radiology Format Codes, Vocabularies, and Value Sets**4.3.1 IHE Radiology Format Codes****Table 4.3.1-1: Format Codes for IHE Radiology Profiles**

Profile	Format Code	Coding Scheme	Description	Reference
Cross-Enterprise Document	1.2.840.10008.5.1.4.1.1.88.5 9	1.2.840.10008.2.6.1	Key Object Selection Document	RAD TF-2: Table 4.68.4.1.2.3-1

Profile	Format Code	Coding Scheme	Description	Reference
Sharing for Imaging (XDS-I.b) and Cross-Community Access for Imaging (XCA-I)	urn:ihe:rad:TEXT	1.3.6.1.4.1.19376.1.2.3	CDA Wrapped Text Report	RAD TF-2: Table 4.68.4.1.2.3-1
	urn:ihe:rad:PDF	1.3.6.1.4.1.19376.1.2.3	PDF Report	RAD TF-2: Table 4.68.4.1.2.3-1
	urn:ihe:rad:CDA:ImagingReportStructuredHeadings:2013	1.3.6.1.4.1.19376.1.2.3	CDA Imaging Report with Structured Headings	RAD TF-2: Table 4.68.4.1.2.3-1

210 **4.3.2 IHE Radiology Vocabularies**

4.3.2.1 Codes for the SOLE Profile

This vocabulary is currently in Section 7.1 of the [Standardized Operational Log of Events \(SOLE\)](#) Trial Implementation Supplement.

4.3.3 IHE Radiology Value Sets

215 Reserved for future use.

4.3.3.1 Value Set Name/Concept Domain Name <oid>

Reserved for future use.

5 Transaction Options on Other Domain Profiles

225 This section lists all the IHE Radiology options on transactions of other domains' integration profiles. Transactions from other domains that are reused in Radiology integration profiles are not listed here, but rather referenced within those profiles. References to the other domains' technical frameworks we are creating options on are listed here as well.

References:

IT Infrastructure Technical Framework, Volume 2a, Section 3.20 (ITI TF-2a: 3.20)

5.1 Record Audit Event [ITI-20]

230 The Radiology Audit Trail Option defines the specific requirements of the IHE Radiology transactions for supporting the IHE ITI Audit Trail and Node Authentication Profile. This option deals largely with the details of the Record Audit Event transaction in the IHE ITI Technical Framework. The option details the required audit events for each of the IHE Radiology transactions, based on the different trigger events. See ITI TF-2a: 3.20 for the full definition of this transaction.

235 Note: No new triggers have been added beyond those previously defined in the Radiology Basic Security Integration Profile. No new coded values have been added to extend the IHE Audit Message dictionary.

5.1.1 Trigger Events and Message semantics

240 An Audit Log is a record of actions performed on data by users. Actions are queries, views, additions, deletions and changes. The IHE actor shall be able to create an Audit Record when an IHE transaction-related event occurs or when a non-IHE transaction (e.g., application functionality outside the IHE scope) event occurs.

245 IHE specifies that events defined in Table 5.1-1 shall be reportable by means of the IHE Audit Trail. The deprecated SEC Provisional Audit Message name is only included here for reference, as well as the new IHE Audit Message EventId (code meaning) along with the specialized EventTypeCode (code meaning) as needed.

Table 5.1-1 lists all the trigger events for the generation of Audit Records. This is the table of trigger events specified in ITI TF-2a: 3.20.4.1.1.1, with the exceptions noted below, and is included here to further define the specific Audit Message contents.

250 The following trigger events from ATNA are not applicable to the Radiology actors and transactions so they are not included in Table 5.1-1.

- Health-service-event
- Medication
- Patient-care-assignment
- 255 • Patient-care-episode

- Patient-care-protocol

The “Actor-config” trigger event is an extension of the ATNA triggers to provide continued support for Basic Security.

Table 5.1-1: Audit Record Trigger Events

Trigger Event	Description	IHE Audit Message Audit EventID (EventCodeType(s))	Provisional Audit Message – Deprecated
Actor-config	Generated for any configuration change related to the actor. Applies to all actors.	Security Alert (Software Configuration)	ActorConfig
Actor-start-stop	Startup and shutdown of any actor. Applies to all actors. Is distinct from hardware powerup and shutdown.	Application Activity (Application Start, Application Stop)	ActorStartStop
Audit-Log-Used	The audit trail repository has been accessed or modified by something other than the arrival of audit trail messages.	Audit Log Used	AuditLogUsed
Begin-storing-instances	Begin storing SOP Instances for a study. This may be a mix of instances. Involved actors: Acquisition Modality, Evidence Creator.	Begin Transferring DICOM Instances	BeginStoringInstances
Images Availability Query	Image availability query is received.	Query	DICOMQuery
Instances-deleted	SOP Instances are deleted from a specific study.	DICOM Study Deleted	DICOMInstancesDeleted
Instances-Stored	Instances for a particular study have been stored on this system.	DICOM Instances Transferred	InstancesStored
Mobile-machine-event	Mobile machine joins or leaves secure domain.	Network Entry (Attach, Detach)	NetworkEntry
Node-Authentication-failure	A secure node authentication failure has occurred during TLS negotiation, e.g., invalid certificate.	Security Alert (Node Authentication)	SecurityAlert
Order-record-event	Order record created, accessed, modified or deleted. Involved actors: Order Placer, Order Filler.	Order Record	OrderRecord
Patient-record-event	Patient record created, modified, or accessed. Involved actors: ADT Patient Registration.	Patient Record	PatientRecord
PHI-export	Any export of PHI on media, either removable physical media such as CD-ROM or electronic transfer of files such as email. Any printing activity, paper or film, local or remote that prints PHI. Applies to all actors.	Export	Export
PHI-import	Any import of PHI on media, either removable physical media such as CD-ROM or electronic transfers of files such as email. Applies to all actors.	Import	Import

Trigger Event	Description	IHE Audit Message Audit EventID (EventCodeType(s))	Provisional Audit Message – Deprecated
Procedure-record-event	Procedure record created, modified, accessed or deleted. Involved actors: Department System Scheduled/Order Filler.	Procedure Record	ProcedureRecord
Query Information	A query has been received, either as part of an IHE transaction, or as part other products functions. For example: 1. Modality Worklist Query	Query	DICOMQuery
Security Administration	Administrative actions create, modify, delete, query, and display the following: (from ITI TF-2a: Table 3.20.4.1.1.1-1 – not all numbered items included here.) 10. User authentication, authentication failure, authentication revocation, or signoff. Security administration events should always be audited.	User Authentication (Login, Logout)	UserAuthenticated
Study-Object-Event	Study is created, modified, or accessed. This reports on addition of new instances to existing studies as well as creation of new studies.	DICOM Instances Accessed	DICOMInstancesUsed
Study-used	SOP Instances from a specific study are created, modified or accessed. One event covers all instances used for the particular study.	DICOM Instances Accessed	DICOMInstancesUsed

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Table 5.1-2 lists all the Radiology transactions which cause the corresponding Trigger Events found in Table 5.1-1. The last column specifies whether the sender or receiver side of the transaction is required to audit this transaction.

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Note: There are a number of trigger events in Table 5.1-1 that are not related to an IHE transaction in Table 5.1-2. Trigger events like “Actor-config” or “Actor-start-stop” are application activities. The audit of these events is required when these types of triggers occur within your application.

Note: No status notifications are audited (PPS messages, Status Updates), since both the sender and receiver have an established trust relationship and they contain minimal amount of PHI.

270

Note: The Acquisition Modality and the Evidence Creator shall be able to report the Instances-deleted event when they delete instances after Storage Commitment.

Note: The receiver node of the query request, not the initiator of the request, shall be able to report any of the Query transactions. The audit message records the query request not the query results.

Table 5.1-2: IHE Radiology transactions and resulting ATNA trigger events

IHE Radiology Transaction	ATNA Trigger Event(s)	Actor(s) that shall be able to record audit event
Patient Registration [RAD-1]	Patient-record-event	ADT Order Placer, DSS/OF - when PHI is presented

IHE Radiology Technical Framework, Vol. 3 (RAD TF-3): Content Modules

IHE Radiology Transaction	ATNA Trigger Event(s)	Actor(s) that shall be able to record audit event
Placer Order Management [RAD-2]	Order-record-event	Order Placer DSS/OF - when PHI is presented
Filler Order Management [RAD-3]	Order-record-event	DSS/OF
Procedure Scheduled [RAD-4]	Procedure-record-event	DSS/OF
Query Modality Worklist [RAD-5]	Query Information	DSS/OF
Modality Procedure Step In Progress [RAD-6]	None	
Modality Procedure Step Completed [RAD-7]	None	
Modality Images Stored [RAD-8]	Begin-storing-instances	Acquisition Modality
	Instances-Stored	Image Manager/Image Archive
Modality Presentation State Stored [RAD-9]	Begin-storing-instances	Acquisition Modality
	Instances-Stored	Image Manager/Image Archive
Storage Commitment [RAD-10]	None	
Images Availability Query [RAD-11]	Images Availability Query	Image Manager/Image Archive
Patient Update [RAD-12]	Patient-record-event	ADT Order Placer, DSS/OF - when PHI is presented
Procedure Update [RAD-13]	Procedure-record-event	DSS/OF
Query Images [RAD-14]	Query Information	Image Manager/Image Archive
Query Presentation States [RAD-15]	Query Information	Image Manager/Image Archive
Retrieve Images [RAD-16]	Instances-Stored	Image Manager/Image Archive, Imaging Document Source
	Study-used	Image Display, Imaging Document Consumer
Retrieve Presentation States [RAD-17]	Instances-Stored	Image Manager/Image Archive
	Study-used	Image Display
Creator Images Stored [RAD-18]	Begin-storing-instances	Evidence Creator
	Instances-Stored	Image Manager/Image Archive
Creator Presentation State Stored [RAD-19]	Begin-storing-instances	Evidence Creator
	Instances-Stored	Image Manager/Image Archive
Creator Procedure Step In Progress [RAD-20]	None	
Creator Procedure Step Completed [RAD-21]	None	
Print Request with Presentation LUT [RAD-23]	PHI-export	Print Composer
Report Submission [RAD-24]	Begin-storing-instances	Report Creator
	Instances-Stored	Report Manager
Report Issuing [RAD-25]	Begin-storing-instances	Report Manager
	Instances-Stored	Report Repository
Query Reports [RAD-26]	Query Information	Report Repository/External Report Repository
Retrieve Reports [RAD-27]	Instances-Stored	Report Repository/External Report Repository
	Study-used	Report Reader

IHE Radiology Technical Framework, Vol. 3 (RAD TF-3): Content Modules

IHE Radiology Transaction	ATNA Trigger Event(s)	Actor(s) that shall be able to record audit event
Structured Report Export [RAD-28]	Instances-Stored	Report Manager
Key Image Note Stored [RAD-29]	Begin-storing-instances	Evidence Creator, Acquisition Modality
	Instances-Stored	Image Manager/Image Archive
Query Key Image Notes [RAD-30]	Query Information	Image Manager/Image Archive
Retrieve Key Image Notes [RAD-31]	Instances-Stored	Image Manager/Image Archive
	Study-used	Image Display
Authenticate Node [ITI-19]	Node-Authentication-failure	Any Secure Node
Maintain Time [ITI-1]	None	
Record Audit Event [ITI-20]	None	
Charge Posted [RAD-35]	PHI-export	DSS/OF
Account Management [RAD-36]	PHI-export	ADT
Query Post-Processing Worklist [RAD-37]	Query Information	Post-Processing Manager
Workitem Claimed [RAD-38]	None	
Workitem PPS In-Progress [RAD-39]	None	
Workitem PPS Completed [RAD-40]	None	
Workitem Completed [RAD-41]	None	
Performed Work Status Update [RAD-42]	None	
Evidence Document Stored [RAD-43]	Begin-storing-instances	Acquisition Modality/Evidence Creator
	Instances-Stored	Image Manager/Image Archive
Query Evidence Documents [RAD-44]	Query Information	Image Manager/Image Archive
Retrieve Evidence Documents [RAD-45]	Instances-Stored	Image Manager/Image Archive
	Study-used	Image Display
Query Reporting Worklist [RAD-46]	Query Information	Report Manager
Distribute Imaging Information on Media [RAD-47]	PHI-export	Portable Media Creator
	PHI-import	Portable Media Importer
	Study-used	Image Display, Report Reader, Print Composer
Appointment Notification [RAD-48]	None	
Instance Availability Notification [RAD-49]	None	
Store Instances [RAD-50]	Begin-storing-instances	Export Selector
	Instances-Stored	Export Manager
Store Export Selection [RAD-51]	Begin-storing-instances	Export Selector
	Instances-Stored	Export Manager
Store Additional Teaching File Information [RAD-52]	Begin-storing-instances	Export Selector
	Instances-Stored	Export Manager
Export Instances [RAD-53]	Begin-storing-instances	Export Manager – when PHI is exported
	Instances-Stored	Receiver – when PHI is exported
WADO Retrieve [RAD-55]	Instances-Stored	Imaging Document Source
	Study-used	Imaging Document Consumer

IHE Radiology Transaction	ATNA Trigger Event(s)	Actor(s) that shall be able to record audit event
Import Procedure Step In Progress [RAD-59]	None	
Import Procedure Step Completed [RAD-60]	None	
Imported Objects Stored [RAD-61]	Begin-storing-instances	Sender Importer shall audit
	Instances-Stored	Receiver (IM/IA) shall audit
Store Dose Information [RAD-62]	Begin-storing-instances	Acquisition Modality
	Instances-Stored	Image Manager/Image Archive, Dose Information Reporter, Dose Information Consumer
Submit Dose Information [RAD-63]	Begin-storing-instances	Dose Information Reporter – when PHI is exported
	Instances-Stored	Dose Registry – when PHI is exported
Query Dose Information [RAD-64]	Query Information	Image Manager/Image Archive
Retrieve Dose Information [RAD-65]	Instances-Stored	Image Manager/Image Archive
	Study-used	Dose Information Reporter, Dose Information Consumer
Rejection Note Stored [RAD-66]	Instances-deleted	Sender: Acquisition Modality, Evidence Creator, Change Requester. Note: The actor rejecting/correcting images must assume that the Image Archive may hide the images (similar to logical deletion).
	Instances-deleted	Receiver: Image Archive. Note: Although an Archive may be configured to provide rejected images, this may be changed any time by users. Thus, it is valuable to log this.
Patient Demographics Query [ITI-21]	Query Information	Patient Demographics Supplier shall audit
Provide and Register Imaging Document Set – MTOM/XOP [RAD-68]	PHI-export	Imaging Document Source
Retrieve Imaging Document Set [RAD-69]	Instances-Stored	Imaging Document Source
	Study-used	Imaging Document Consumer
Replacement Instances Stored [RAD-74]	Begin-storing-instances Instances-stored	Sender: Change Requester
	Instances-stored	Receiver: Image Manager/Archive.
Cross Gateway Retrieve Imaging Document Set [RAD-75]	Instances-Stored	Responding Imaging Gateway
	Study-used	Initiating Imaging Gateway

6 IHE Radiology Content Specifications

275 **6.1 XDR-I Imaging Document Set**

This section is currently in the [Cross-Enterprise Reliable Interchange of Images \(XDR-I\)](#) Trial Implementation Supplement.

6.2 Medical Health Documents - Imaging (deprecated)

280 This section was previously reserved for the MHD-I content specification. The MHD-I Profile is now deprecated and is replaced by Web-based Access to Imaging (WIA).

6.3 SOLE Event Definitions

This section is currently in the [Standardized Operational Log of Events \(SOLE\)](#) Trial Implementation Supplement.

6.4 Clinical Decisions Support (CDS) Information

285 This section is currently in Section 6.4.1 of the [Clinical Decision Support – Order Appropriateness Tracking \(CDS-OAT\)](#) Trial Implementation Supplement.

6.5 Imaging Analysis Result Content

This section is currently in the [AI Results \(AIR\)](#) Trial Implementation Supplement.

6.6 Report Template Structure

290 This section is currently in Section 8.1 of the [Management of Radiology Report Templates \(MRRT\)](#) Trial Implementation Supplement.

Appendices to Volume 3

300 **Appendix A – Example Analysis Result Encodings**

This appendix is currently in the [AI Results](#) (AIR) Trial Implementation Supplement.