情報共有型地域連携基盤基本部仕様

Core Specification of Infrastructure for Regional Health Information Exchange and Sharing

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本書は、情報共有型地域連携基盤基本部仕様を定める。本基本部仕様は、IHEテクニカルフレームワーク（IHE IT Infrastructure Technical Framework及びIHE Radiology Technical Framework）[1][2]が定める統合プロファイルの内、下記[3]のとおり関連する部分を抜粋してまとめたものである。IHEテクニカルフレームワークの全体像が分かるように、IntroductionやProfilesなどの記述についてはそのまま残した。

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[1] IHE IT Infrastructure Technical Framework

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[3] 本基本部仕様の該当部分

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5 Patient Identifier Cross-referencing (PIX)

The **Patient Identifier Cross-referencing Integration Profile (PIX)** is targeted at healthcare enterprises of a broad range of sizes (hospital, a clinic, a physician office, etc.). It supports the cross-referencing of patient identifiers from multiple Patient Identifier Domains via the following interactions:

- The transmission of patient identity information from an identity source to the Patient Identifier Cross-reference Manager.

- The ability to access the list(s) of cross-referenced patient identifiers either via a query/ response or via update notification.

By specifying the above transactions among specific actors, this integration profile does not define any specific enterprise policies or cross-referencing algorithms. By encapsulating these behaviors in a single actor, this integration profile provides the necessary interoperability while maintaining the flexibility to be used with any cross-referencing policy and algorithm as deemed adequate by the enterprise.

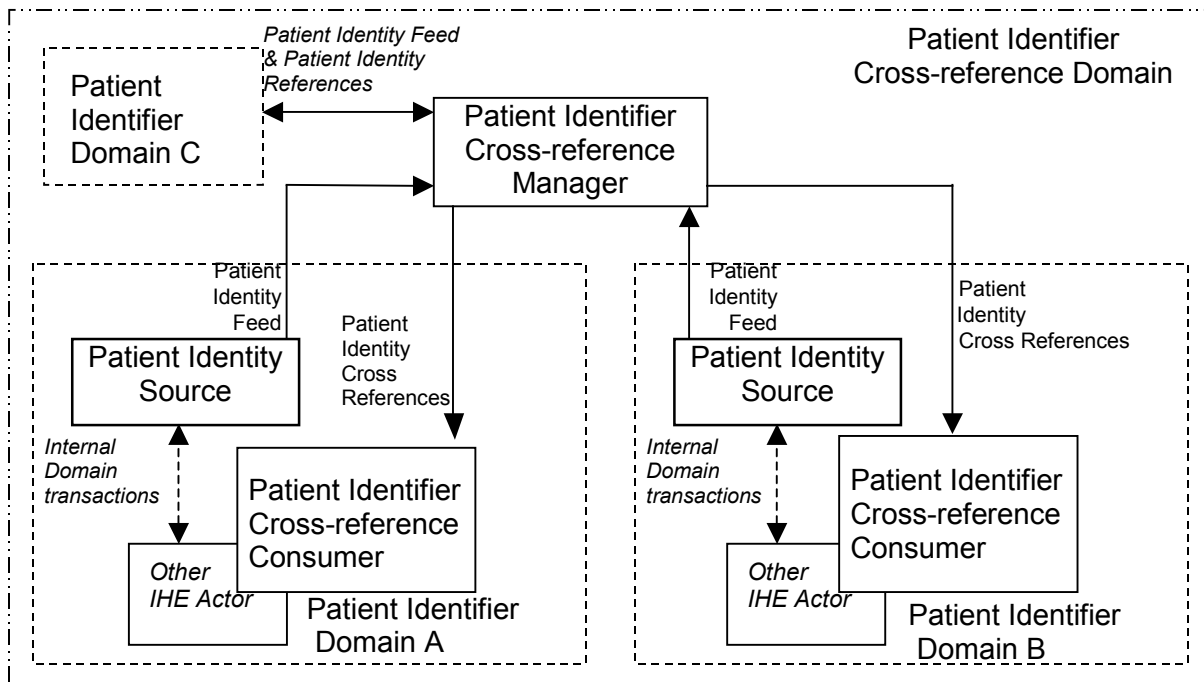The following diagram shows the intended scope of this profile (as described above).

Figure 5-1 Process Flow with Patient Identifier Cross-referencing

The diagram illustrates two types of Identifier Domains: a Patient Identifier Domain and a Patient Identifier Cross-reference Domain.

A Patient Identifier Domain is defined as a single system or a set of interconnected systems that all share a common identification scheme (an identifier and an assignment process to a patient) and

issuing authority for patient identifiers. Additionally, a Patient Identifier Domain has the following properties:

- 1175
- A set of policies that describe how identities will be defined and managed according to the specific requirements of the domain.

- An administration authority for administering identity related policies within the domain.

- A **single** system, known as a patient identity source system, that assigns a unique identifier to each instance of a patient-related object as well as maintaining a collection of identity traits.

- 1180
- Ideally, only one identifier is uniquely associated with a single patient within a given Patient Identifier Domain, though a single Patient Identity Source Actor may assign multiple identifiers to the same patient and communicate this fact to the Patient Identifier Cross-reference Manager. For a description of how the Patient Identifier Cross-reference Manager Actor responds to requests for a list of cross-referenced identifiers that include
- 1185
- these "duplicates" see ITI TF-2a: 3.9.4.2.2.6).

- An "Identifier Domain Identifier" (known as assigning authority) that is unique within a Patient Identifier Cross-reference Domain.

- Other systems in the Patient Identifier Domain rely upon the identifiers assigned by the patient identity source system of the domain to which they belong.

1190 A Patient Identifier Cross-reference Domain consists of a set of Patient Identifier Domains known and managed by a Patient Identifier Cross-reference Manager Actor. The Patient Identifier Cross-reference Manager Actor is responsible for creating, maintaining and providing lists of identifiers that are aliases of one another across different Patient Identifier Domains.

The Patient Identifier Cross-reference Domain embodies the following assumptions about
1195 agreement within the group of individual Identifier Domains:

- They have agreed to a set of policies that describe how patient identities will be cross-referenced across participating domains;

- They have agreed to a set of processes for administering these policies;

- They have agreed to an administration authority for managing these processes and
- 1200
- policies.

All these assumptions are critical to the successful implementation of this profile. This integration profile imposes minimal constraints on the participating Patient Identifier Domains and centralizes most of the operational constraints for the overall Patient Identification Cross-reference Domain in the Patient Identifier Cross-reference Manager Actor. If the individual Identifier Domains cannot
1205 agree to the items outlined above, implementation of this profile may not provide the expected results.

The Patient Identifier Cross-reference Manager Actor is not responsible for improving the quality of identification information provided to it by the Identity Source Actors. It is assumed that the Identity Source actors are responsible for providing high quality data to the Patient Identifier Cross-
1210 reference Manager. For example, the Patient Identifier Cross-reference Manager Actor is NOT responsible to provide a single reference for patient demographics. The intent is to leave the responsibility for the quality and management of its patient demographics information and the integrity of the identifiers it uses within each Patient Identity Domain (Source actors). When

receiving reports and displays from multiple PIX domains, it is inevitable that some of those reports
1215 and displays will have inconsistent names.

The Patient Identifier Cross-reference Consumer may use either a query for sets of cross-reference
patient identifiers or use both a notification about cross-reference changes and a query transaction.
In the case of using a notification, the Patient Identifier Cross-reference Consumer may also use the
PIX Query Transaction to address situations where the Patient Identifier Cross-reference Consumer
1220 may be out of synch with the Patient Identifier Cross-reference Manager. This Integration Profile
does not specify the consumer policies in using the PIX Query Transaction (ITI TF-2a: 3.9).

For a discussion of the relationship between this Integration Profile and an enterprise master patient
index (eMPI) see ITI TF-1: 5.4.

5.1 Actors/ Transactions

1225 Figure 5.1-1 shows the actors directly involved in the Patient Identifier Cross-referencing
Integration Profile and the relevant transactions between them. Other actors that may be indirectly
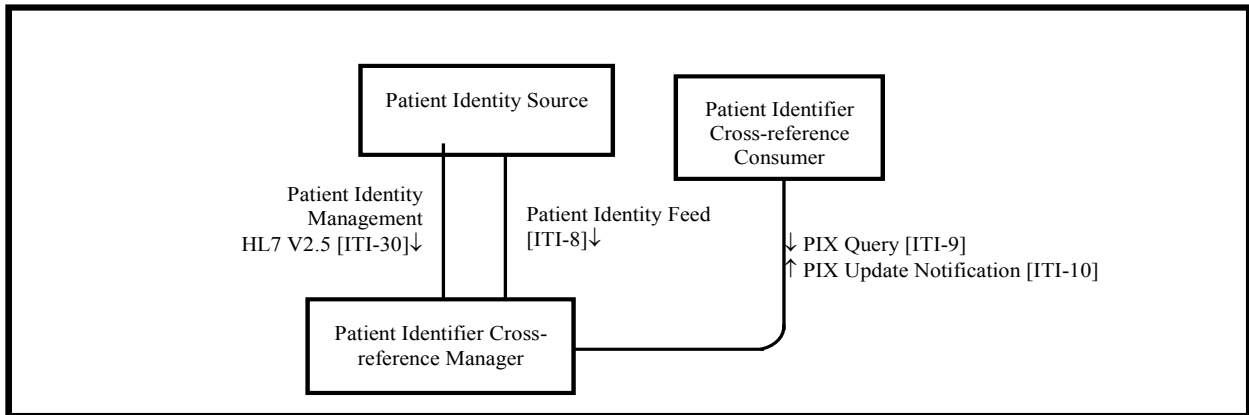involved due to their participation in other related profiles are not shown.

Figure 5.1-1 Patient Identifier Cross-referencing Actor Diagram

1230 Table 5.1-1 lists the transactions for each actor directly involved in the Patient Identifier Cross-
referencing Profile. In order to claim support of this Integration Profile, an implementation must
perform the required transactions (labeled "R"). Transactions labeled "O" are optional. A complete
list of options defined by this Integration Profile and that implementations may choose to support is
listed in the ITI TF-1: 5.2.

1235

**Table 5.1-1 Patient Identifier Cross-referencing Integration for MPI Profile - Actors and
Transactions**

Actors	Transactions	Optionality	Section
Patient Identity Source	Patient Identity Feed [ITI-8]	R	ITI TF-2a: 3.8
	Patient Identity Management [ITI-30]	O	ITI TF-2b: 3.30
Patient Identifier Cross-reference Consumer	PIX Query [ITI-9]	R	ITI TF-2a: 3.9
	PIX Update Notification [ITI-10]	O	ITI TF-2a: 3.10
Patient Identifier Cross-reference Manager	Patient Identity Feed [ITI-8]	R	ITI TF-2a: 3.8

Actors	Transactions	Optionality	Section
	Patient Identity Management [ITI-30]	O	ITI TF-2b: 3.30
	PIX Query [ITI-9]	R	ITI TF-2a: 3.9
	PIX Update Notification [ITI-10]	R	ITI TF-2a: 3.10

5.2 Patient Identifier Cross-referencing Integration Profile Options

Options that may be selected for this Integration Profile are listed in the Table 5.2-1 along with the Actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 5.2-1 Patient Identifier Cross-referencing - Actors and Options

Actor	Options	Vol & Section
Patient Identity Source	*Pediatric Demographics*	ITI TF-1: 5.2.1
Patient Identifier Cross-reference Manager	*Pediatric Demographics*	ITI TF-1: 5.2.1
Patient Identifier Cross-reference Consumer	*PIX Update Notification*	ITI TF-2a: 3.10

5.2.1 Pediatric Demographics

The experience of immunization registries and other public health population databases has shown that matching and linking patient records from different sources for the same individual person in environments with large proportions of pediatric records requires additional demographic data.

In particular, distinguishing records for children who are twins, triplets, etc. – that is, avoiding false positive matches - may be difficult because much of the demographic data for the two individuals matches. For instance, twin children may have identical last names, parents, addresses, and dates of birth; their first names may be very similar, possibly differing by only one letter. It can be very difficult for a computer or even a human being to determine in this situation whether the slight first name difference points to two distinct individuals or just a typographical error in one of the records. Additional information is extremely helpful in making this determination.

Pediatric Demographics makes use of the following six additional demographic fields to aid record matching in databases with many pediatric records.

Field	**Reason for inclusion**	**Value**
Mother's Maiden Name	Any information about the mother is helpful in making a match	Helps create true positive matches
Patient Home Telephone	A telecom helps match into the right household	Helps create true positive matches
Patient Multiple Birth Indicator	Indicates this person is a multiple - twin, triplet, etc.	Helps avoid false positive matches of multiples
Patient Birth Order	Distinguishes among those multiples.	Helps avoid false positive matches of multiples

Last Update Date/Time, Last Update Facility	These fields, although not strictly demographic, can effectively substitute when multiple birth indicator and birth order are not collected. They indirectly provide visit information. Provider visits on the same day may likely indicate two children brought to a doctor together.	Helps avoid false positive matches of multiples

Patient Identity Source actors which support the Pediatric Demographics option are required to support the Patient Identity Management [ITI-30] transaction and shall provide values, when available, for the fields identified as Pediatric Demographics fields.

1260 Patient Identifier Cross-reference Manager actors which support the Pediatric Demographics option are required to support the Patient Identity Management [ITI-30] transaction, and if values for one or more of the Pediatric Demographics fields are specified in the Patient Identity Management [ITI-30], they shall be considered as part of the matching algorithm of the PIX Manager.

Pediatric Demographics are defined as all of the following:

- Mother's Maiden Name
1265 - Patient Home Telephone
- Patient Multiple Birth Indicator
- Patient Birth Order
- Last Update Date/Time
- Last Update Facility

1270 Pediatric Demographic is particularly focused on two data issues:

- Locating a record where the data or the search criterion have differences, but both the data record and the search criterion represent the same person, and
- Avoiding improper linkage of very similar records that do not belong to the same person. This problem is most often encountered in multiple birth situations where twins may be
1275 given extremely similar names

5.3 Patient Identifier Cross-referencing Profile Process Flows

The following sections describe use cases that this profile addresses.

### 5.3.1 Use Case: Multiple Identifier Domains within a Single Facility/ Enterprise

A clinician in the Intensive Care Unit at General Hospital is reviewing a patient chart on the
1280 Intensive Care information system and wishes to review or monitor the patient's glucose level, which is included in a laboratory report stored in the hospital's main laboratory system. The Intensive Care system needs to map its own patient ID, which it generates internally, to the patient's medical record number (MRN), which is generated from the hospital's main ADT system and is used as the patient identity by the lab system. In this case the Intensive Care system is essentially in
1285 a different identifier domain than the rest of the hospital since it has its own notion of patient identity.

In this scenario, the hospital's main ADT system (acting as a Patient Identity Source) would provide a Patient Identity Feed (using the patient's MRN as the identifier) to the Patient Identifier Cross-reference Manager. Similarly, the Intensive Care system would also provide a Patient Identity Feed
1290 to the Patient Identifier Cross-reference Manager using the internally generated patient ID as the patient identifier and providing its own unique identifier domain identifier.

Once the Patient Identifier Cross-reference Manager receives the Patient Identity Feed transactions, it performs its internal logic to determine which, if any, patient identifiers can be "linked together" as being the same patient based on the corroborating information included in the Feed transactions it
1295 has received. The cross-referencing process (algorithm, human decisions, etc.) is performed within the Patient Identifier Cross-reference Manager and is outside the scope of IHE. (See ITI TF-2a: 3.9.4.2.2.6 for a more complete description of the scope of the cross-referencing logic boundary).

The Intensive Care system wants to get lab information associated with a patient that the Intensive Care system knows as patient ID = 'MC-123'. It requests the lab report from the lab system using
1300 its own patient ID (MC-123) including the domain identifier/ assigning authority. Upon receipt of the request, the lab system determines that the request is for a patient outside of its own identifier domain (ADT Domain). It requests a list of patient ID aliases corresponding to patient ID = 'MC-123' (within the "Intensive Care domain") from the Patient Identifier Cross-reference Manager. Having linked this patient with a patient known by medical record number = '007' in the 'ADT
1305 Domain', the Patient Identifier Cross-reference Manger returns this list to the lab system so that it may retrieve the lab report for the desired patient and return it to the Intensive Care system. Figure 5.3-1 illustrates this process flow.
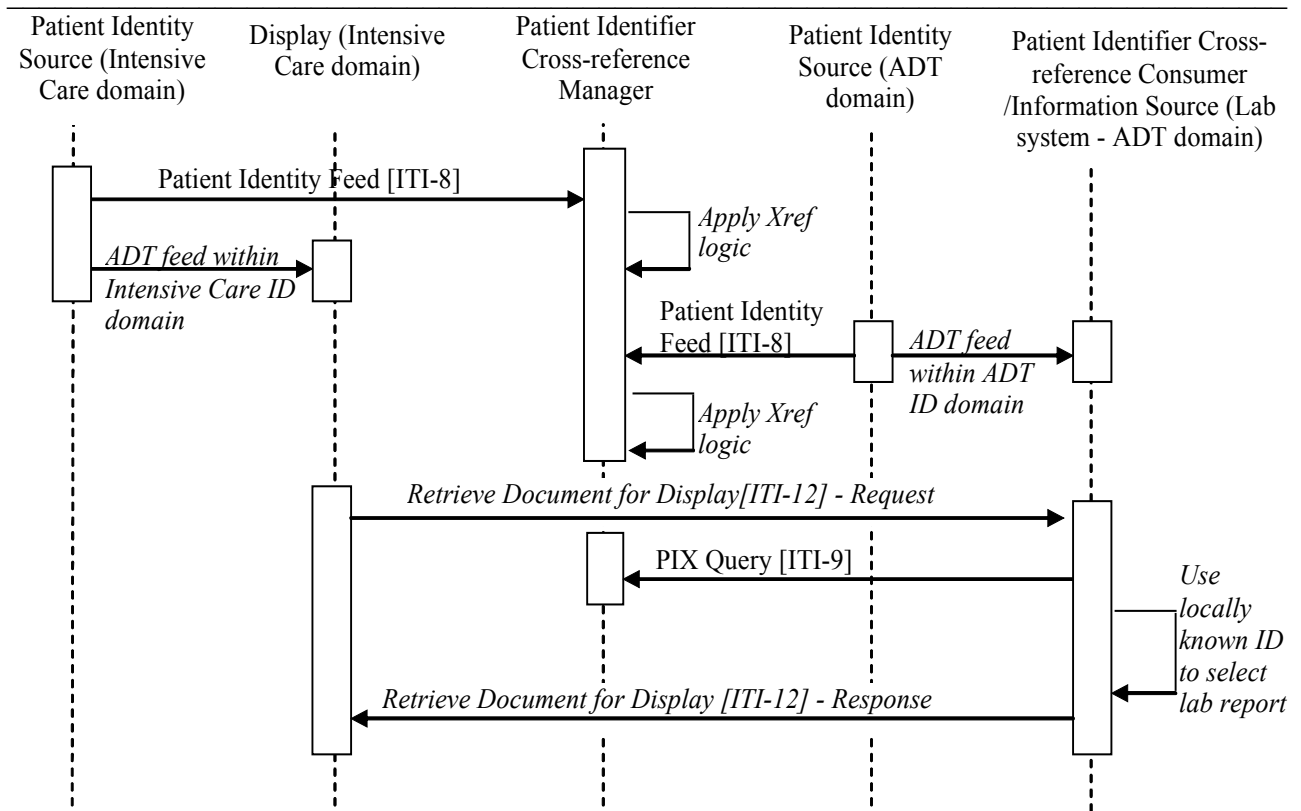
1310

Figure 5.3-1. Multiple ID Domains in a Single Facility Process Flow in PIX Profile

Note: Request and Response portions of the Retrieve Document for Display transaction are not part of this profile and included for illustration purposes only.

5.3.2 Use Case: Multiple ID Domains Across Cooperating Enterprises

1315 A healthcare enterprise is established by the consolidation of two hospitals, each having its own separate patient registration process run by different hospital information systems. When a patient is treated in one hospital, the access to its electronic records managed by the other hospital is necessary. The following use case illustrates this scenario.

Hospitals A and B have been consolidated and have a single Patient Identifier Cross-reference
1320 Manager that maintains the ID links between the two hospitals. Each hospital has a different HIS that is responsible for registering patients, but they have consolidated their cardiology information systems. The cardiology system has been configured with a Patient Identifier Cross-reference Consumer to receive patient identity notifications when cross-referencing activity occurs.

A patient is registered and then has some diagnostic stress tests done at hospital A. The cardiology
1325 information system queries the Patient Identifier Cross-reference Manager to get a list of possible ID aliases for the patient to see if any past cardiology reports may be available. No patient ID aliases are found. Sometime later the same patient goes to hospital B to have a second diagnostic stress test done. The patient is registered via the HIS in hospital B which then sends that identity information to the Patient Identifier Cross-reference Manager. The Patient Identifier Cross-
1330 reference Manager determines this is in fact the same patient as was registered previously at

hospital A. The cardiology information system was previously configured with the Patient Identifier Cross-reference Manager to receive notifications, thus a notification is sent to the cardiology system to inform it of the patient identifier aliases. This notification is done to allow systems that are aware of multiple identifier domains to maintain synchronization with patient identifier changes that occur 1335 in any of the identifier domains that they are aware of.

Figure 5.3-2 illustrates the process flow for this use case.
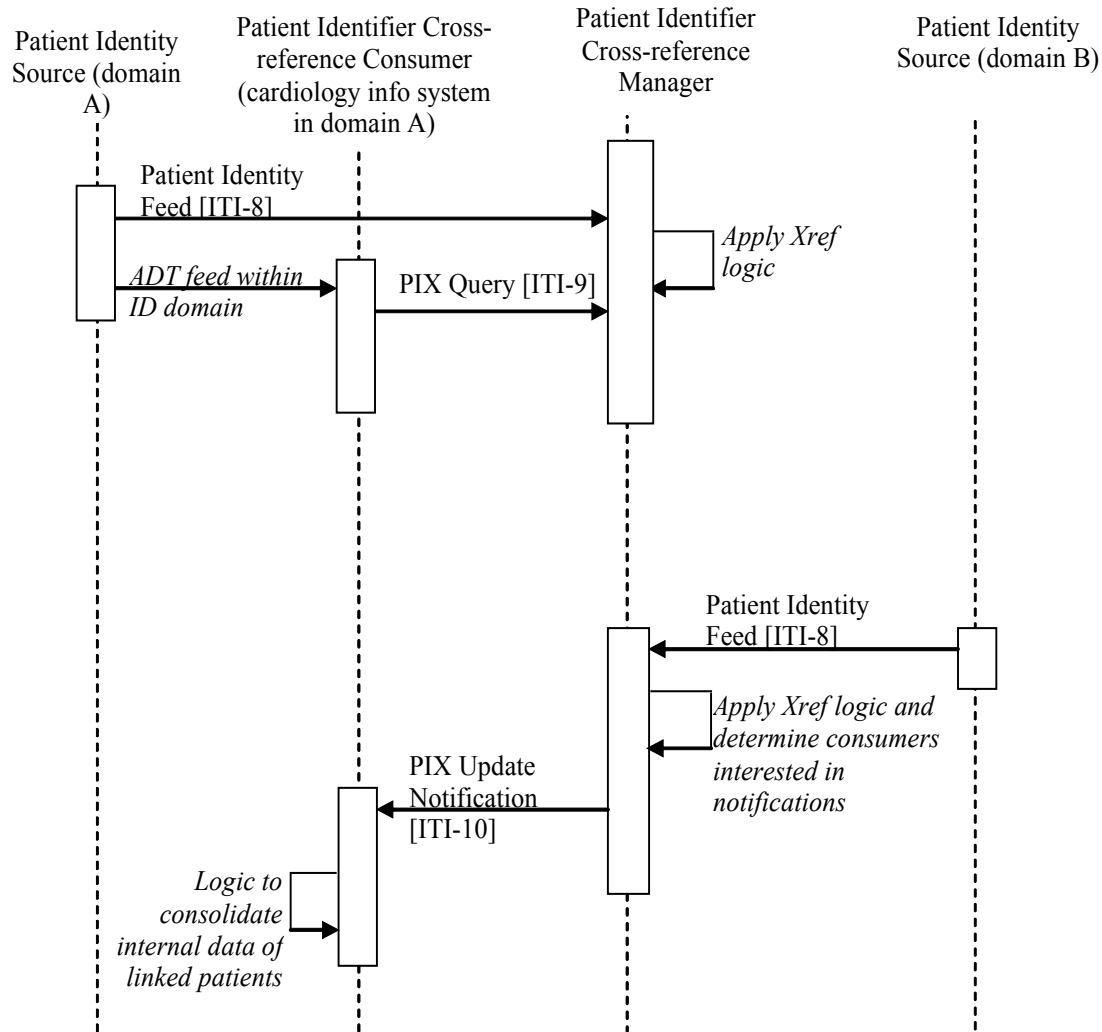
Figure 5.3-2 Multiple ID Domains Across Cooperating Enterprises Process Flow in PIX Profile

1340   Note: PIX Update Notifications are not sent for the first Patient Identity Feed for a patient, since no cross-referencing activity occurred after this first Patient Identity Feed Transaction.

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5.3.3 Pediatric Demographic Option Use Cases

The following sections describe use cases that the Pediatric Demographics option addresses.

5.3.3.1 Use Case: High Quality Demographic Feed from a Birth Registry

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A regional Immunization Information System (IIS) receives birth registry information about a pair of twins. These twins are named "Lalainne" and "Lalannie" Smith. All of the data elements in the received registration are populated, and they are all identical, except for the Given Name, the Birth Order, and the Birth Certificate #. The IIS cross-referencing system can clearly identify this very similar data as belonging to two separate individuals, because they are both flagged as having been part of a Multiple Birth, their Birth Order numbers are different, and their Birth Certificate #s are different.

1350

5.3.3.2 Use Case: Normal Demographic Feed from a Point of Care

A couple years later, the mother of these two twins, who has now divorced and remarried, takes them to Pediatric Healthcare, where they get the immunizations appropriate for 2 year olds. Pediatric Healthcare completes a registration for each of them, and submits the resulting data to the IIS. This data has their new Family Name as "Gomez," but the clerks had appropriately recorded the Birth Order of each twin. Again, the IIS was able to distinguish the two registration records as belonging to separate individuals, and it was able to match them up to their earlier records because the mother's Maiden Name was present in both the earlier records and the records submitted from Pediatric Healthcare. Pediatric Healthcare was able to download the full immunization history of each twin.

1355

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5.3.3.3 Use Case: Minimal Demographic Feed from a Health Fair

The Jackson County Health Department puts on an annual Health Fair in a shopping mall every August, partly to screen school age children for the minimum shots required for admission to the first grade. Mrs. Gomez is now working to pay for her new apartment, but her sister-in-law takes the children to the Health Fair where they are given shots based on the paper "yellow card" the sister-in-law brings with the two twins. Jackson County Health Department staff records the children's names, and the shots they were given. This information is entered into the computer back at the Clinic the next day, and submitted to the regional IIS.

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1370

At this point, even though both children's names were misspelled as "Lane" and "Lanna", the Immunization Registry was again able to recognize that the records belonged to twins rather than the same person because, although the demographic data was almost identical, the Last Update Date/Time were very close (Date was the same) and Last Update Facility indicated the same clinic. Unfortunately, they didn't write down the mother's information at the Health Fair, but recorded her sister-in-laws name and address instead, so the Immunization Registry was not able to automatically link this new information to the information it already had for "Lalainne" and "Lalannie".

1375

Other Possibilities:

A better outcome could have happened if the clinic had recorded any one of several different data elements that would have helped tie this new data to the previous data. Any one of the Mothers Maiden Name (even the Mother's First Name component), the Home Phone Number, or the unique identifier for the kids which was printed on the "yellow card" from Pediatric Healthcare would have helped.

1380

5.4 Relationship between the PIX Integration Profile and eMPI

1385   The PIX Integration Profile achieves the integration of disparate Patient Identifier Domains by using a cross-referencing approach between Patient Identifiers associated with the same patient. This section discusses how this approach is compatible with environments that wish to establish master patient identifiers (MPI), or enterprise MPI (eMPI) systems. An eMPI may be considered a particular variation in implementation of the PIX Integration Profile.

1390   The concept of an MPI is a rather broad concept, yet it is most often associated with the creation of a master patient identifier domain. Such a master domain is considered more broadly applicable or more "enterprise-level" than the other patient identifier domains it includes. Such a hierarchical inclusion of patient identification domains into a "master patient identification domain" can be considered a particular case of patient cross-reference, where the patient identifiers in the various

1395   domains are cross-referenced to the patient identifiers of the master domain. Two possible configurations are depicted by Figure 5.4-1.

Two domains included in a Master Patient Index   The same configuration represented as 3 cross-referenced domains
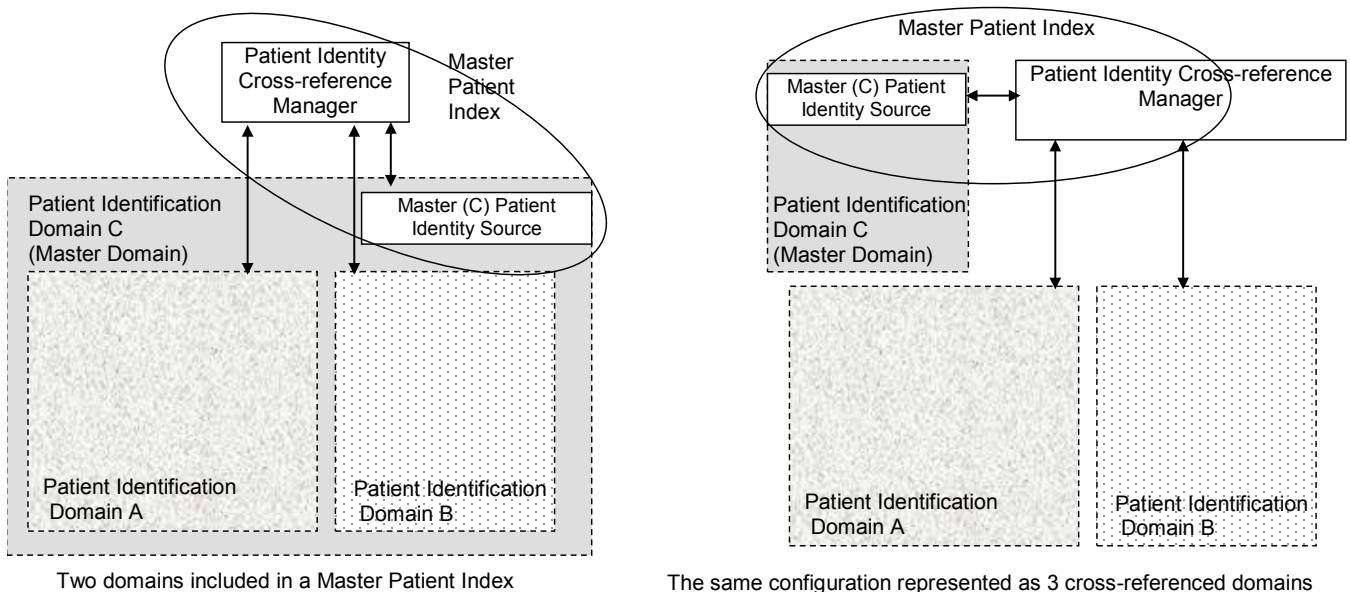
Figure 5.4-1 PIX Profile Relationship to eMPI

1400   Figure 5.4-1 above shows how the Master Patient Identifier Domain (Domain C), in a typical MPI approach, is simply another patient Identification Domain when considered in a Cross-referencing approach. The decision to place enterprise-wide systems such as Clinical Data Repositories into the so-called master domain is simply a configuration choice. In addition, such a configuration sometimes assumes that any system in Patient Domain A not only manages the patient Identifiers of

1405   Domain A but is also aware of those of Domain C. In the Patient Identifier Cross-reference Integration Profile, this is a configuration choice where certain systems have been designed and configured to operate across multiple domains. Thus the entity often called an MPI (shown by the oval) is actually the combination of a Patient Identity Source Actor (ADT) along with a Patient Identifier Cross-reference Manager.

1410   The PIX Integration Profile can coexist with environments that have chosen to deploy a distinct
        MPI, and provides a more scalable approach. Many other configurations can also be deployed, in
        particular those where the creation of a master domain "including" the other domains is not
        necessary (i.e., a simple federation of domains where none is actually the master).
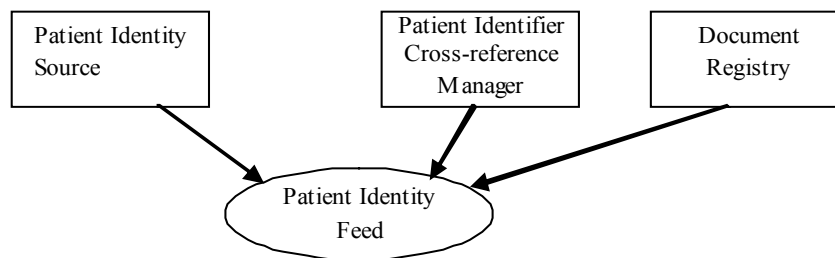
3.8 Patient Identity Feed

This section corresponds to Transaction ITI-8 of the IHE IT Infrastructure Technical Framework. Transaction ITI-8 is used by the Patient Identity Source, Patient Identifier Cross-reference Manager and Document Registry actors.

990

3.8.1 Scope

This transaction communicates patient information, including corroborating demographic data, after a patient's identity is established, modified or merged or after the key corroborating demographic data has been modified.

995 ### 3.8.2 Use Case Roles

Actor: Patient Identity Source

Role: Provides notification to the Patient Identifier Cross-reference Manager and Document Registry for any patient identification related events including: creation, updates, merges, etc.

1000 **Actor:** Patient Identifier Cross-reference Manager

Role: Serves a well-defined set of Patient Identification Domains. Based on information provided in each Patient Identification Domain by a Patient Identification Source Actor, it manages the cross-referencing of patient identifiers across Patient Identification Domains.

Actor: Document Registry

1005 **Role:** Uses patient identifiers provided by Patient Identity Source to ensure that XDS Documents metadata registered is associated with a known patient and updates patient identity in document metadata by tracking identity change operations (e.g., merge).

3.8.3 Referenced Standards

HL7 Version 2.3.1 Chapter 2 – Control, Chapter 3 – Patient Administration

1010 HL7 Version 2.3.1 was selected for this transaction for the following reasons:

- It provides a broader potential base of Patient Identity Source Actors capable of participating in the profiles associated with this transaction.

- It allows existing ADT Actors from within IHE Radiology to participate as Patient Identity Source Actors.

1015 ## 3.8.4 Interaction Diagram
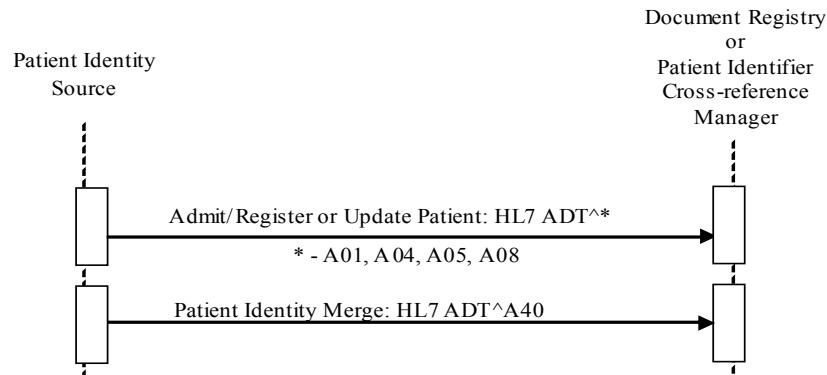
Figure 3.8-1 Patient Identity Sequence

3.8.4.1 Patient Identity Management – Admit/Register or Update Patient

3.8.4.1.1 Trigger Events

1020 The following events from a Patient Identity Source Actor will trigger one of the Admit/Register or Update messages:

- A01 – Admission of an in-patient into a facility

- A04 – Registration of an outpatient for a visit of the facility

- A05 – Pre-admission of an in-patient (i.e., registration of patient information ahead of actual
1025 admission).

Changes to patient demographics (e.g., change in patient name, patient address, etc.) shall trigger the following Admit/Register or Update message:

- A08 – Update Patient Information

The Patient Identifier Cross-reference Manager shall only perform cross-referencing logic on
1030 messages received from Patient Identity Source Actors. For a given Patient Identifier Domain there shall be one and only one Patient Identity Source Actor, but a given Patient Identity Source Actor may serve more than one Patient Identifier Domain.

3.8.4.1.2 Message Semantics

The Patient Identity Feed transaction is conducted by the HL7 ADT message, as defined in the
1035 subsequent sections. The Patient Identity Source Actor shall generate the message whenever a patient is admitted, pre-admitted, or registered, or when some piece of patient demographic data

changes. Pre-admission of inpatients shall use the A05 trigger event. The segments of the message listed below are required, and their detailed descriptions are provided in the following subsections.

1040

> Note: Conventions used in this section as well as additional qualifications to the level of specification and HL7 profiling are stated in ITI TF-2x: Appendix C and C.1.

Required segments are defined below. Other segments are optional

1045
Table 3.8-1 ADT Patient Administration Messages

ADT	Patient Administration Message	Chapter in HL7 2.3.1
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
PV1	Patient Visit	3

Each message shall be acknowledged by the HL7 ACK message sent by the receiver of ADT message to its sender. See ITI TF-2x: C.2.3, "Acknowledgement Modes", for definition and discussion of the ACK message.

1050 This transaction does not require Patient Identity Source Actors to include any attributes not already required by the corresponding HL7 message (as is described in the following sections). This minimal set of requirements enables inclusion of the largest range of Patient Identity Source Actor systems.

This transaction **does** place additional requirements on the Patient Identifier Cross-reference Manager and Document Registry Actors, requiring them to accept a set of HL7 attributes beyond
1055 what is required by HL7. (See ITI TF-2a: 3.8.4.1.3 for a description of these additional requirements).

3.8.4.1.2.1 MSH Segment

The MSH segment shall be constructed as defined in ITI TF-2x: C.2.2 "Message Control".

Field *MSH-9 Message Type* shall have at least two components. The first component shall have a
1060 value of **ADT**; the second component shall have one of the values of **A01**, **A04**, **A05** or **A08** as appropriate. The third component is optional; however, if present, it shall have the following value for each corresponding message type:

- ADT_A01 for A01 message type
- ADT_A01 for A04 message type
1065 - ADT_A01 for A05 message type
- ADT_A01 for A08 message type

3.8.4.1.2.2 EVN Segment

The Patient Identity Source Actor is not required to send any attributes within the EVN segment beyond what is specified in the HL7 standard. See Table C.1-4 in ITI TF-2x: C.2.4 "Common Segment Definitions" for the specification of this segment.

1070

3.8.4.1.2.3 PID Segment

The Patient Identity Source Actor is not required to send any attributes within the PID segment beyond what is specified in the HL7 standard.

When sending ADT messages A01, A04, and A05, the Patient Identity Source actor shall populate appropriate values in the fields as listed in Table 3.8-2:

1075

Table 3.8-2 IHE Profile - PID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	4	SI	O		00104	Set ID - Patient ID
2	20	CX	O		00105	Patient ID
3	250	CX	R		00106	Patient Identifier List
4	20	CX	O		00107	Alternate Patient ID
5	250	XPN	R		00108	Patient Name
6	250	XPN	R+		00109	Mother's Maiden Name
7	26	TS	R+		00110	Date/Time of Birth
8	1	IS	R+	0001	00111	Administrative Sex
9	250	XPN	O		00112	Patient Alias
10	250	CE	O	0005	00113	Race
11	250	XAD	R2		00114	Patient Address
12	4	IS	O	0289	00115	County Code
13	250	XTN	R2		00116	Phone Number - Home
14	250	XTN	R2		00117	Phone Number - Business
15	250	CE	O	0296	00118	Primary Language
16	250	CE	O	0002	00119	Marital Status
17	250	CE	O	0006	00120	Religion
18	250	CX	O		00121	Patient Account Number
19	16	ST	R2		00122	SSN Number – Patient
20	25	DLN	R2		00123	Driver's License Number - Patient
21	250	CX	O		00124	Mother's Identifier
22	250	CE	O	0189	00125	Ethnic Group
23	250	ST	O		00126	Birth Place
24	1	ID	O	0136	00127	Multiple Birth Indicator
25	2	NM	O		00128	Birth Order
26	250	CE	O	0171	00129	Citizenship
27	250	CE	O	0172	00130	Veterans Military Status

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
28	250	CE	O	0212	00739	Nationality
29	26	TS	O		00740	Patient Death Date and Time
30	1	ID	O	0136	00741	Patient Death Indicator

Adapted from the HL7 standard, Version 2.3.1

1080

Note1: This table reflects attributes required to be handled by the Patient Identifier Cross-reference Manager (receiver). It is likely that not all attributes marked as R2 or R+ above will be sent in some environments.

Note2: The field length of many attributes in this table exceeds the requirements stated in HL7 2.3.1. The Patient Identifier Cross-reference Manager (receiver) is required to support these extended lengths to cope with the information it needs to complete identifier cross-referencing logic. The Patient Identity Source may or may not send values of the full length listed in this table.

1085 This message shall use the field PID-3 Patient Identifier List to convey the Patient ID uniquely identifying the patient within a given Patient Identification Domain.

The Patient Identity Source Actor shall provide the patient identifier in the ID component (first component) of the PID-3 field (PID-3.1). The Patient Identity Source Actor shall use component PID-3.4 to convey the assigning authority (Patient Identification Domain) of the patient

1090 identifier. Either the first subcomponent (namespace ID) or the second and third subcomponents (universal ID and universal ID type) shall be populated. If all three subcomponents are populated, the first subcomponent shall reference the same entity as is referenced by the second and third components.

3.8.4.1.2.4 PV1 Segment

1095 The Admit/ Register or Update Patient message is not required to include any attributes within the PV1 segment beyond what is specified in the HL7 standard.

3.8.4.1.3 Expected Actions – Patient Identifier Cross-reference Manager

The Patient Identifier Cross-reference Manager shall be capable of accepting attributes in the PID segment as specified in HL7 standard as well as their extended field length as defined in

1100 Table 3.8-2. This is to ensure that the Patient Identifier Cross-reference Manager can handle a sufficient set of corroborating information in order to perform its cross-referencing function.

If the PID-3.4 (assigning authority) component is not included in the message (as described in ITI TF-2a: 3.8.4.1.2.3) the Patient Identifier Cross-reference Manager shall fill PID-3.4 prior to storing the ID information and performing its cross-referencing activities. The information filled

1105 by the Patient Identifier Cross-reference Manager is based on the configuration associating each of the Patient Identity Source actors with the subcomponents of the correct assigning authority (namespace ID, UID and UID type). (See 3.8.4.1.3.1 below for a list of required Patient Identifier Cross-reference Manager configuration parameters).

A single Patient Identity Source Actor can serve multiple Patient Identification domains. The

1110 Patient Identifier Cross-reference Manager Actor shall only recognize (by configuration) a single Patient Identity Source Actor per domain. (See ITI TF-2a: 3.8.4.1.3.1 below for a list of required Patient Identifier Cross-reference Manager configuration parameters).

The cross-referencing process (algorithm, human decisions, etc.) is performed within the Patient Identifier Cross-reference Manager Actor, but its specification is beyond the scope of IHE.

1115 Once the Patient Identifier Cross-reference Manager has completed its cross-referencing function, it shall make the newly cross-referenced identifiers available to PIX queries and send out notification to any Patient Identifier Cross-reference Consumers that have been configured (as being interested in receiving such notifications) using the PIX Update Notification transaction (see ITI TF-2a: 3.10 for the details of that transaction).

1120 **3.8.4.1.3.1 Required Patient Identifier Cross-reference Manager Configuration**

The following items are expected to be parameters that are configurable on the Patient Identifier Cross-reference Manager Actor. For each Patient Identification Domain included in the Identification Cross-reference Domain managed by a Patient Identifier Cross-reference Manager Actor, the following configuration information is needed:

1125 • Identifier of the Domain. This identifier shall specify all 3 components of the HL7 assigning authority (including the namespace ID and/or both the universal ID and universal ID type subcomponents) of the PID-3 field for the identification of the domain.

• Patient Identity Source Actor for the domain. This is expected to be the MSH-3 Sending Application and the corresponding MSH-4 Sending Facility fields in the HL7 ADT message.
1130 (Alternative identification schemes might include IP address of the Patient Identity Source Actor or Node Authentication if the Audit Trail and Node Authentication Integration Profile is used.)

3.8.4.1.4 Expected Actions – Document Registry

The Document Registry shall be capable of accepting attributes in the PID segment as specified
1135 in Table 3.8-2. The Patient Identity Feed transaction contains more triggers and data than what the XDS Document Registry needs for its operation. In particular, A08 – Update Patient Information, if received shall be ignored.

Table 3.8-2 IHE Profile - PID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R		00106	Patient Identifier List

Adapted from the HL7 standard, Version 2.3.1

1140 Note: This table reflects only the attributes required to be handled by the Document Registry (receiver). Other attributes of the PID Segment may be ignored.

If subcomponents 2 and 3 (the universal ID and the universal ID Type of Assigning Authority) of the Patient Identification Domain of the XDS Affinity Domain in PID-3.4 are not filled in the message (as described in ITI TF-2a: 3.8.4.1.2.3) the Document Registry shall fill subcomponents
1145 2 and 3 of the Patient Identification Domain of the XDS Affinity Domain prior to storing the patient identity in the registry. The assigning authority information filled by the Document Registry is based on its configuration of the Patient Identification Domain of the XDS Affinity Domain (See ITI TF-2a: 3.8.4.1.4.1 below for a list of required Document Registry configuration parameters).

1150 The Document Registry shall store only the patient identifiers of the patient identification domain designated by the XDS Affinity Domain for document sharing in the registry. Patient identifiers of other patient identification domains (assigning authorities), if present in a received message, shall be ignored.

3.8.4.1.4.1 Required Document Registry Configuration

1155 The following items are expected to be parameters that are configurable on the Document Registry Actor:

- Identifier of the Patient Identification Domain of the XDS Affinity Domain. This identifier shall be specified with 3 components of the HL7 assigning authority (data type HD): namespaceID, universal ID and universal ID type. The universal ID shall be an ISO OID
1160 (Object Identifier), and therefore the universal ID Type must be "ISO".

3.8.4.2 Patient Identity Management –Patient Identity Merge (Merge Patient ID)

3.8.4.2.1 Trigger Events

When two patients' records are found to identify the same patient by a Patient Identity Source Actor in a Patient Identifier Domain and are merged, the Patient Identity Source shall trigger the
1165 following message:

- A40 – Merge Patient – Internal ID

An A40 message indicates that the Patient Identity Source Actor has done a merge within a specific Patient Identification Domain. That is, MRG-1 (patient ID) has been merged into PID-3 (Patient ID).

1170 ### 3.8.4.2.2 Message Semantics

The Patient Identity Feed transaction is an HL7 ADT message. The message shall be generated by the system (Patient Identity Source Actor) that performs the update whenever two patient records are found to reference the same person.

> **Note:** Conventions used in this section as well as additional qualifications to the level of specification and HL7 profiling
1175 are stated in ITI TF-2x: Appendix C and C.1.

The segments of the HL7 Merge Patient message listed below are required, and the detailed description of the message is provided in ITI TF-2a: 3.8.4.2.2.1–3.8.4.2.2.6. The PV1 segment is optional.

Table 3.8-3 ADT A40 Patient Administration Message

ADT A40	Patient Administration Message	Chapter in HL7 v2.3.1
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
MRG	Merge Information	3
[PV1]	Patient Visit	3

1180   Each message shall be acknowledged by the HL7 ACK message sent by the receiver of ADT message to its sender. See ITI TF-2x: C.2.3 "Acknowledgement Modes" for definition and discussion of the ACK message.

A separate merge message shall be sent for each pair of patient records to be merged. For example, if Patients A, B, and C are all to be merged into Patient B, two ADT^A40 messages would be sent. In the first ADT^A40 message, patient B would be identified in the PID segment

1185   and Patient A would be identified in the MRG segment. In the second ADT^A40 message, patient B would be identified in the PID segment, and Patient C would be identified in the MRG segment.

Modification of any patient demographic information shall be done by sending a separate Update Patient Information (A08) message for the current Patient ID. An A40 message is the only

1190   method that may be used to update a Patient ID.

3.8.4.2.2.1 MSH Segment

MSH segment shall be constructed as defined in ITI TF-2x: C.2.2 "Message Control".

Field *MSH-9 Message Type* shall have at least two components. The first component shall have a

1195   value of **ADT**; the second component shall have value of **A40**. The third component is optional; however, if present, it shall have a value of **ADT_A39**.

3.8.4.2.2.2 EVN Segment

See ITI TF-2x: C.2.4 for the list of all required and optional fields within the EVN segment.

3.8.4.2.2.3 PID Segment

1200   The PID segment shall be constructed as defined in ITI TF-2a: 3.8.4.1.2.3.

3.8.4.2.2.4 MRG Segment

The PID and PV1 segments contain the dominant patient information, including patient identifier and the issuing assigning authority. 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

1205   that the "old" identifier shall not be referenced in future transactions following the merge.

The Patient Identity Source Actor shall send the "old" patient identifier (to be merged) in MRG-1, with the identifier value in the component MRG-1.1 and the assigning authority in the component MRG-1.4. The Patient Identity Source Actor shall populate the same value of the assigning authority in PID-3.4, in the component MRG-1.4.

1210   IHE does not require that the Patient Identity Source Actor send any attributes within the MRG segment beyond what is specified in the HL7 standard.

3.8.4.2.2.5 PV1 Segment

PV1 segment shall be constructed as defined in ITI TF-2a: 3.8.4.1.2.4.

3.8.4.2.3 Expected Actions

1215 The Patient Identifier Cross-reference Manager shall be capable of accepting attributes in the MRG segment as specified in Table 3.8-4.

Table 3.8-4 IHE Profile - MRG segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	250	CX	R		00211	Prior Patient Identifier List
2	250	CX	O		00212	Prior Alternate Patient ID
3	250	CX	O		00213	Prior Patient Account Number
4	250	CX	O		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		01281	Prior Patient Name

Adapted from the HL7 Standard, Version 2.3.1

In addition, the Patient Identifier Cross-reference Manager shall perform the Expected Actions as
1220 specified in ITI TF-2a: 3.8.4.1.3.

When the Patient Identifier Cross-reference Manager receives the ADT^A40 message type of the Patient Identity Feed transaction, it shall cross-reference the patient identifiers provided in the PID-3 and MRG-1 fields of the message by replacing any references it is maintaining internally to the patient ID provided in the MRG-1 field by the patient ID included in the PID-3 field. After
1225 the identifier references are replaced, the Patient Identifier Cross-reference Manager shall reapply its internal cross-referencing logic/ policies before providing the updated information via either the PIX Query or PIX Notification Transactions.

3.8.4.2.4 Expected Actions – Document Registry

The Document Registry shall be capable of accepting attributes in the MRG segment as specified
1230 in Table 3.8-4. Other attributes may exist, but the Document Registry shall ignore them.

Table 3.8-4 IHE Profile - MRG segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	250	CX	R		00211	Prior Patient Identifier List
2	250	CX	O		00212	Prior Alternate Patient ID
3	250	CX	O		00213	Prior Patient Account Number
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		01281	Prior Patient Name

Adapted from the HL7 Standard, Version 2.3.1

In addition, the Document Registry shall perform the Expected Actions as specified in ITI TF-2a: 3.8.4.1.4.

1235   When the Document Registry receives the ADT^A40 message type of the Patient Identity Feed
        transaction, it shall merge the patient identity specified in MRG-1 (secondary patient identity)
        into the patient identity specified in PID-3 (primary patient identity) in its registry. After the
        merge, all Document Submission Sets (including all Documents beneath them) under the
        secondary patient identity before the merge shall point to the primary patient identity. The
1240   secondary patient identity shall no longer be referenced in the future services provided by the
        Document Registry.

3.8.5 Security Considerations

3.8.5.1 Audit Record Considerations – Admit/Register or Update Patient

        The Patient Admit/Register transactions (A01, A04, A05) and Update Patient Information (A08)
1245   transaction are to be audited as "Patient Record" events, as defined in table 3.20.6-1. The actors
        involved in the transaction shall create audit data in conformance with DICOM (Supp 95)
        "Patient Record". The following tables show items that are required to be part of the audit record
        for these specific PIX transactions.

3.8.5.1.1 Patient Identity Source Actor audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/ EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"C" (create) for A01, A04, A05 "U" (update) for A08
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-8", "IHE Transactions", "Patient Identity Feed")
Source (Patient Identity Source Actor) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Manager or Document Registry) (1)			
Audit Source (Patient Identity Source Actor) (1)			
Patient (1)			

1250   Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identity Source Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) AuditMessage/ ActiveParticipant	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identifier Cross-reference Manager or Document Registry facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*M*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

| Patient (AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*M*	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

1255 3.8.5.1.2 Patient Identifier Cross-reference Manager or Document Registry Actor audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"C" (create) for A01, A04, A05 "U" (update) for A08
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-8", "IHE Transactions", "Patient Identity Feed")

Source (Patient Identity Source Actor) (1)
Destination (Patient Identifier Cross-reference Manager or Document Registry) (1)
Audit Source (Patient Identifier Cross-reference Manager or Document Registry) (1)
Patient(1)
Where:

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Identity Source Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

	Field Name	Opt	Value Constraints
Destination **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Identifier Cross-reference Manager or Document Registry facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

	Field Name	Opt	Value Constraints
Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

1260

	Field Name	Opt	Value Constraints
Patient	ParticipantObjectTypeCode	M	"1" (person)

ParticipantObjectTypeCodeRole	M	"1" (patient)	
ParticipantObjectDataLifeCycle	U	*not specialized*	
ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")	
ParticipantObjectSensitivity	U	*not specialized*	
ParticipantObjectID	M	the patient ID in HL7 CX format.	
ParticipantObjectName	U	*not specialized*	
ParticipantObjectQuery	U	*not specialized*	
ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)	

3.8.5.2 Audit Record Considerations – Patient Identity Merge (Merge Patient ID)

The Patient Identity Merge transaction (A40) is to be audited as a "Patient Record" event, as defined in Table 3.20.6-1. The source of the transaction shall create audit data in conformance with DICOM (Supp 95) "Patient Record". The following tables show items that are required to be part of the audit record for the Patient Identity Merge transaction. Logically, a merge operation consists of a delete on one patient record, and an update of another patient record. Separate audit records shall be written for the delete operation and the update operation.

1270 **3.8.5.2.1 Patient Identity Source Actor audit message:**

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"D" (delete) for the Delete operation "U" (update) for the Update operation
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-8", "IHE Transactions", "Patient Identity Feed")
Source (Patient Identity Source Actor) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Manager or Document Registry) (1)			
Audit Source (Patient Identity Source Actor) (1)			
Patient(1)			

Where:

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Identity Source Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) **AuditMessage/** **ActiveParticipant**	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

	Field Name	Opt	Value Constraints
Destination **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Identifier Cross-reference Manager or Document Registry facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source	AuditSourceID	U	*Not specialized.*
AuditMessage/ AuditSourceIdentification	AuditEnterpriseSiteID	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

Patient	ParticipantObjectTypeCode	M	"1" (person)
(AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

1275 ### 3.8.5.2.2 Patient Identifier Cross-reference Manager or Document Registry Actor audit message:

	Field Name	**Opt**	**Value Constraints**
Event	EventID	M	EV(110110, DCM, "Patient Record")
AuditMessage/ EventIdentification	EventActionCode	M	"D" (delete) for the Delete audit record "U" (update) for the Update audit record
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-8", "IHE Transactions", "Patient Identity Feed")
Source (Patient Identity Source Actor) (1)			
Destination (Patient Identifier Cross-reference Manager or Document Registry) (1)			
Audit Source (Patient Identifier Cross-reference Manager or Document Registry) (1)			
Patient(1)			

Where:

Source	UserID	M	The identity of the Patient Identity Source Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
AuditMessage/ ActiveParticipant	*AlternativeUserID*	*M*	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Destination	UserID	M	The identity of the Patient Identifier Cross-reference Manager or Document Registry facility and receiving application from the HL7 message; concatenated together, separated by the | character.
AuditMessage/ ActiveParticipant			

	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source	*AuditSourceID*	*U*	*Not specialized.*
AuditMessage/ AuditSourceIdentification	*AuditEnterpriseSiteID*	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

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Patient	ParticipantObjectTypeCode	M	"1" (person)
(AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*M*	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

3.9 PIX Query

This section corresponds to Transaction ITI-9 of the IHE IT Infrastructure Technical Framework.
Transaction ITI-9 is used by the Patient Identifier Cross-reference Consumer and Patient
Identifier Cross-reference Manager actors.

3.9.1 Scope

This transaction involves a request by the Patient Identifier Cross-reference Consumer Actor for
a list of patient identifiers that correspond to a patient identifier known by the consumer. The
request is received by the Patient Identifier Cross-reference Manager. The Patient Identifier
Cross-reference Manager immediately processes the request and returns a response in the form
of a list of corresponding patient identifiers, if any.

3.9.2 Use Case Roles
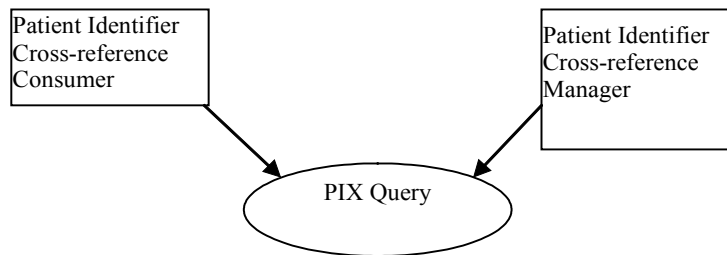
Actor: Patient Identifier Cross-reference Consumer

Role: Queries the Patient Identifier Cross-reference Manager for a list of corresponding patient
identifiers, if any

Actor: Patient Identifier Cross-reference Manager

Role: Manages the cross-referencing of patient identifiers across Patient Identification Domains.
Upon request it returns a list of corresponding patient identifiers, if any.

3.9.3 Referenced Standard

HL7 2.5, Chapter 2 – Control, Chapter 3 – Patient Administration, Chapter 5 – Query

HL7 version 2.5 was selected for this transaction for the following reasons:

It was considered the most stable version that contained the functionality required by
transactions ITI-9 and ITI-10.

3.9.4 Interaction Diagram
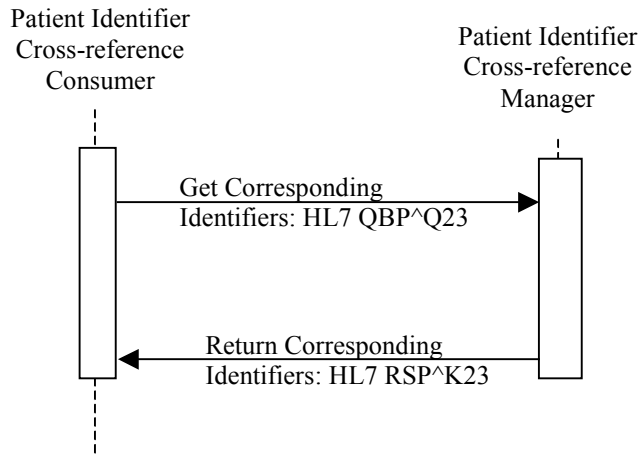
Figure 3.9-1 Get Corresponding Identifiers Sequence

3.9.4.1 Get Corresponding Identifiers

3.9.4.1.1 Trigger Events

A Patient Identifier Cross-reference Consumer's need to get the patient identifier associated with a domain for which it needs patient related information will trigger the request for corresponding patient identifiers message based on the following HL7 trigger event:

- Q23 – Get Corresponding Identifiers

3.9.4.1.2 Message Semantics

The Request for Corresponding Patient Identifiers transaction is conducted by the HL7 QBP^Q23 message. The Patient Identifier Cross-reference Consumer Actor shall generate the query message whenever it needs to obtain a corresponding patient identifier(s) from other Patient Identification Domain(s). The segments of the message listed below are required, and their detailed descriptions are provided in the following subsections.

> Note: Conventions used in this section as well as additional qualifications to the level of specification and HL7 profiling are stated in ITI TF-2x: Appendix C and C.1.

Table 3.9-1 QBP Query By Parameter

QBP	Query By Parameter	Chapter in HL7 2.5
MSH	Message Header	2
QPD	Query Parameter Definition	5
RCP	Response Control Parameter	5

1325   The receiver shall respond to the query by sending the RSP^K23 response message. This satisfies the requirements of original mode acknowledgment; no intermediate ACK message is to be sent.

3.9.4.1.2.1 MSH Segment

The MSH segment shall be constructed as defined in ITI TF-2x: C.2.2 "Message Control".

1330   Field *MSH-9 Message Type* shall have all three components populated with a value. The first component shall have a value of QBP; the second component shall have the value of Q23. The third component shall have a value of QBP_Q21.

3.9.4.1.2.2 QPD Segment

The Patient Identifier Cross-reference Consumer Actor is required to send attributes within the
1335   QPD segment as described in Table 3.9-2.

Table 3.9-2 IHE Profile - QPD segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	250	CE	R	0471	01375	Message Query Name
2	32	ST	R+		00696	Query Tag
3	250**	CX	R			Person Identifier
4	250	CX	O			What Domains Returned

Adapted from the HL7 Standard, version 2.5

     ** Note: This value assumes completion of an HL7 erratum to correct an error identified in the standard.

This message shall use the field QPD-3 *Person Identifier* to convey a single Patient ID uniquely
1340   identifying the patient within a given Patient Identification Domain.

The Patient Identifier Cross-reference Consumer Actor shall provide the patient identifier in the ID component (first component) of the QPD-3 field (QPD-3.1).

The Patient Identifier Cross-reference Consumer Actor shall provide component QPD-3.4, Assigning Authority, by including either the first subcomponent (namespace ID) or the second
1345   and third subcomponents (universal ID and universal ID type) If all three subcomponents are populated, the first subcomponent shall reference the same entity as is referenced by the second and third components.

If the requesting system wishes to select the domains from which they wish to receive Patient IDs, it does so by populating *QPD-4-What Domains Returned* with as many repetitions as
1350   domains for which it wants to receive Patient IDs. Each repetition of QPD-4 shall contain an instance of data type CX in which only the fourth component (Assigning Authority) is populated; the remaining components shall be empty. The responding system shall return the Patient ID value for each requested domain if a value is known.

If QPD-4 is empty, the Patient Identifier Cross-reference Manager Actor shall return Patient IDs
1355   for all domains for which it possesses a corresponding Patient ID (subject to local publication restrictions).

The Consumer shall specify "IHE PIX Query" for QPD-1 Message Query Name.

3.9.4.1.2.3 RCP Segment

1360 Although HL7 requires that the RCP Segment be sent in all QBP messages, IHE does not require that the Patient Identifier Cross-reference Consumer Actor send any attributes within the RCP segment, as is specified in the HL7 standard.

3.9.4.1.2.3.1 Populating RCP-1-Query Priority

Field *RCP-1-Query Priority* shall always contain **I**, signifying that the response to the query is to be returned in Immediate mode.

1365 3.9.4.1.3 Expected Actions

The Patient Identifier Cross-reference Manager shall be capable of accepting attributes in the QPD segment as specified in Table 3.9-2.

The Patient Identifier Cross-reference Manager Actor must be capable of receiving all valid combinations of subcomponents that make up the Assigning Authority component (i.e., all valid 1370 combinations of QPD-3.4).

The Patient Identifier Cross-reference Manager Actor shall be capable of accepting multiple concurrent PIX Query requests (Get Corresponding Identifiers messages) and responding correctly using the Return Corresponding Identifiers message.

3.9.4.2 Return Corresponding Identifiers

1375 3.9.4.2.1 Trigger Events

The Patient Identifier Cross-reference Manager's response to the Get Patient Identifiers message will trigger the following message:

- K23 – Corresponding patient identifiers

3.9.4.2.2 Message Semantics

1380 The Return Corresponding Identifiers transaction is conducted by the HL7 RSP^K23 message. The Patient Identifier Cross-reference Manager Actor shall generate this message in direct response to the QBP^Q23 query message previously received. This message satisfies the Application Level, Original Mode Acknowledgement for the HL7 QBP^Q23 message. The segments of the message listed without enclosing square brackets in the Table below are 1385 required. Detailed descriptions of all segments listed in the table below are provided in the following subsections. Other segments of the message are optional.

Note: Conventions used in this section as well as additional qualifications to the level of specification and HL7 profiling are stated in ITI TF-2x: Appendix C and C.1.

Table 3.9-3 RSP Segment Pattern Response

RSP	Segment Pattern Response	Chapter in HL7 2.5

RSP	Segment Pattern Response	Chapter in HL7 2.5
MSH	Message Header	2
MSA	Message Acknowledgement	2
[ERR]	Error segment	2
QAK	Query Acknowledgement	5
QPD	Query Parameter Definition	5
[PID]	Patient Identification	3

3.9.4.2.2.1 MSH Segment

The MSH segment shall be constructed as defined in ITI TF-2x: C.2.2, "Message Control".

Field *MSH-9-Message Type* shall have all three components populated with a value. The first component shall have a value of RSP; the second component shall have the value of K23. The third component shall have a value of RSP_K23.

3.9.4.2.2.2 MSA Segment

The Patient Identifier Cross-reference Manager Actor is not required to send any attributes within the MSA segment beyond what is specified in the HL7 standard. See ITI TF-2x: C.2.3 for the list of all required and optional fields within the MSA segment.

3.9.4.2.2.3 QAK Segment

The Patient Identifier Cross-reference Manager Actor shall send attributes within the QAK segment as defined in Table 3.9-4. For the details on filling in QAK-2 (Query Response Status) refer to ITI TF-2a: 3.9.4.2.2.6.

Table 3.9-4 IHE Profile - QAK segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	32	ST	R		00696	Query Tag
2	2	ID	R+	0208	00708	Query Response Status

Adapted from the HL7 standard, version 2.5

3.9.4.2.2.4 QPD Segment

The Patient Identifier Cross-reference Manager Actor shall echo the QPD Segment value that was sent in the QBP^Q23 message.

3.9.4.2.2.5 PID Segment

The Patient Identifier Cross-reference Manager Actor shall return only those attributes within the PID segment that are required by the HL7 standard: *PID-3-Patient IdentifierList* and *PID-5-Patient Name*.

The PID segment is returned only when the Patient Identifier Cross-reference Manager Actor recognizes the specified Patient Identification Domain and Patient ID and an identifier exists for

the specified patient in at least one other domain. See ITI TF-2a: 3.9.4.2.2.6, "Patient Identifier
Cross-reference Manager Actor Query Response Behavior," for a detailed description of how the
Patient Identifier Cross-reference Manager Actor responds to the query request under various
circumstances.

The Patient Identifier Cross-reference Manager Actor shall use the field PID-3 Patient Identifier
List to convey the Patient ID uniquely identifying the patient within each Patient Identification
Domain for which a Patient ID exists for the specified patient. Each resulting ID returned in PID-
3 shall include a fully qualified Assigning Authority component. In other words, the Assigning
Authority component returned shall include ALL subcomponents (namespace ID, Universal ID,
and Universal ID type).

To eliminate the issue of conflicting name values between Patient Identifier Domains, the Patient
Identifier Cross-reference Manager Actor shall return in an empty (not present) value in the first
repetition of field PID-5-Patient Name, and shall return a second repetition of field *PID-5-
Patient Name* in which the only populated component is Component 7 (Name Type Code).
Component 7 of repetition 2 shall contain a value of S (Coded Pseudo-name to assure
anonymity). All other components of repetition 2 shall be empty (not present).

3.9.4.2.2.6 Patient Identifier Cross-reference Manager Actor Query Response Behavior

It is wholly the responsibility of the Patient Identifier Cross-reference Manager Actor to perform
the matching of patient identifiers based on the patient traits it receives. The information
provided by the Patient Identifier Cross-reference Manager Actor to Patient Identifier Cross-
reference Consumer Actors is a list of cross-referenced identifiers in two or more of the domains
managed by the cross-referencing Actor. The list of cross-references is not made available until
the set of policies and processes for managing the cross-reference function have been completed.
The policies of administering identities adopted by the cooperating domains are completely
internal to the Patient Identifier Cross-reference Manager Actor and are outside of the scope of
this framework. Possible matches should not be communicated until the healthcare institution
policies and processes embodied in the Patient Identifier Cross-reference Manager Actor reach a
positive matching decision.

The Patient Identifier Cross-reference Manager Actor shall respond to the query request as
described by the following 6 cases:

Case 1: The Patient Identifier Cross-reference Manager Actor recognizes the specified Patient
Identification Domain and Patient ID sent by the Patient Identifier Cross-reference Consumer in
QPD-3, and corresponding identifiers exist for the specified patient in at least one of the domains
requested in QPD-4 (one identifier per domain). (See Case 6 below for the required behavior if
there are multiple identifiers recognized within a given Identifier Domain by the Patient
Identifier Cross-reference Manager Actor.)

AA (application accept) is returned in MSA-1.

OK (data found, no errors) is returned in QAK-2.

A single PID segment is returned in which one repetition of *PID-3 Patient Identifier List* is
populated for each of the domains, if any, that the Patient Identifier Cross-reference Manager

1455   Actor did recognize in which a single identifier exists for the requested patient, not including the queried-for patient identifier that is returned in QPD-3.

Case 2: The Patient Identifier Cross-reference Manager Actor recognizes the Patient Identification Domain and Patient ID sent in QPD-3, but no identifier exists for that patient in any of the domains sent in QPD-4.

1460   **AA** (application accept) is returned in MSA-1.

NF (no data found, no errors) is returned in QAK-2.

No PID segment is returned.

Case 3: The Patient Identifier Cross-reference Manager Actor recognizes the specified Patient Identification Domain sent in the fourth component of QPD-3, but does not recognize the Patient

1465   ID sent in the first component of QPD-3.

AE (application error) is returned in MSA-1 and in QAK-2.

An ERR segment is returned in which the components of *ERR-2-Error Location* are valued as follows.

COMP #	COMPONENT NAME	VALUE
1	Segment ID	QPD
2	Sequence	1
3	Field Position	3
4	Field Repetition	1
5	Component Number	1
6	Sub-Component Number	*(empty)*

1470   As specified by HL7, *ERR-2.6-Sub-Component Number* is not valued because we are referring to the entire fourth component of field QPD-3.

ERR-3-HL7 Error Code is populated with the error condition code **204** (unknown key identifier). Together with the values in ERR-2, this signifies that the Patient Identifier Cross-reference Manager Actor did not recognize the value in the first component of QPD-3.

1475   **Case 4**: The Patient Identifier Cross-reference Manager Actor does not recognize the Patient Identification Domain of the identifier sent in QPD-3.

AE (application error) is returned in MSA-1 and in QAK-2.

An ERR segment is returned in which the components of *ERR-2-Error Location* are valued as follows.

1480

COMP #	COMPONENT NAME	VALUE
1	Segment ID	QPD
2	Sequence	1

COMP #	COMPONENT NAME	VALUE
3	Field Position	3
4	Field Repetition	1
5	Component Number	4
6	Sub-Component Number	*(empty)*

As specified by HL7, *ERR-2.6-Sub-Component Number* is not valued because we are referring to the entire fourth component of field QPD-3.

ERR-3-HL7 Error Code is populated with the error condition code **204** (unknown key identifier). Together with the values in ERR-2, this signifies that the Patient Identifier Cross-reference Manager Actor did not recognize the value in the fourth component of QPD-3.

Case 5: The Patient Identifier Cross-reference Manager Actor does not recognize one or more of the Patient Identification Domains for which an identifier has been requested.

AE (application error) is returned in MSA-1 and in QAK-2.

For each domain that was not recognized, an ERR segment is returned in which the components of *ERR-2-Error Location* are valued as follows.

COMP #	COMPONENT NAME	VALUE
1	Segment ID	QPD
2	Sequence	1
3	Field Position	4
4	Field Repetition	*(see below)*
5	Component Number	*(empty)*
6	Sub-Component Number	*(empty)*

As specified by HL7, *ERR-2.5-Component Number* and *ERR-2.6-Sub-Component Number* are not valued because we are referring to the entire field QPD-4.

ERR-3-HL7 Error Code is populated with the error condition code **204** (unknown key identifier). Together with the values in ERR-2, this signifies that the Patient Identifier Cross-reference Manager Actor did not recognize the domain for the occurrence of *QPD-4-What Domains Returned* whose ordinal number is returned as an integer in ERR-2.4.

Case 6: The Patient Identifier Cross-reference Manager Actor recognizes the specified Patient Identification Domain and Patient ID sent by the Patient Identifier Cross-reference Consumer in QPD-3, and corresponding identifiers exist for the specified patient in at least one of the domains requested in QPD-4, and there are multiple identifiers within at least one of the requested domains.

AA (application accept) is returned in MSA-1.

OK (data found, no errors) is returned in QAK-2.

A single PID segment is returned in which one repetition of *PID-3-Patient Identifier List* is populated for each of the identifiers, not including the queried-for patient identifier that is returned in QPD-3. If the Patient Identifier Cross-reference Manager Actor chooses to return

multiple identifiers associated with the same domain, it shall return these identifiers grouped in
1510   successive repetitions within the *PID-3-Patient Identifier List*.

3.9.4.2.3 Expected Actions

The Patient Identifier Cross-reference Consumer will use the list of patient identifier aliases
provided by the Patient Identifier Cross-reference Manger to perform the functions for which it
requested the list.

1515   In the case where the returned list of identifiers contains multiple identifiers for a single domain,
the Patient Identifier Cross-reference Consumer shall either use ALL of the multiple identifiers
from the given domain or it shall ignore ALL of the multiple identifiers from the given domain.

This allows Patient Identifier Cross-reference Consumer Actors capable of handling multiple
identities for a single patient within a single domain (i.e., those that can correctly aggregate the
1520   information associated with the different identifiers) to do so. For those Patient Identifier Cross-
reference Consumer Actors not capable of handling this situation, ignoring the entire list of
different identifiers prevents the consumer from presenting incomplete data.

3.9.5 Security Considerations

3.9.5.1 Audit Record Considerations

1525   The PIX Query Transaction is a Query Information event as defined in Table 3.20.6-1. The
Actors involved in the transaction shall create audit data in conformance with DICOM (Supp 95)
"Query", with the following exceptions:

3.9.5.1.1 Patient Identifier Cross-reference Consumer audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-9", "IHE Transactions", "PIX Query")
Source (Patient Identifier Cross-reference Consumer) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Manager) (1)			
Audit Source (Patient Identity Cross-reference Consumer) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identifier Cross-reference Consumer Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) AuditMessage/ ActiveParticipant	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

1530

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identifier Cross-reference Manager facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient (AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Query	ParticipantObjectTypeCode	M	"2" (system object)

	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-9", "IHE Transactions", "PIX Query")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	U	*not specialized*
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	M	The complete query message (including MSH and QPD segments), base64 encoded.
	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

3.9.5.1.2 Patient Identifier Cross-reference Manager audit message:

	Field Name	**Opt**	**Value Constraints**
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-9", "IHE Transactions", "PIX Query")
Source (Patient Identifier Cross-reference Manager) (1)			
Destination (Patient Identifier Cross-reference Consumer) (1)			
Audit Source (Patient Identifier Cross-reference Manager) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

Source **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Identifier Cross-reference Consumer Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

1535

Destination **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Identifier Cross-reference Manager facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	U	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source	*AuditSourceID*	*U*	*Not specialized.*
AuditMessage/ AuditSourceIdentification	*AuditEnterpriseSiteID*	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient	ParticipantObjectTypeCode	M	"1" (Person)
(AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Query Parameters	ParticipantObjectTypeCode	M	"2" (system object)
(AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	*U*	*Not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-9", "IHE Transactions", "PIX Query")
	ParticipantObjectSensitivity	*U*	*Not specialized*
	ParticipantObjectID	*U*	*not specialized*
	ParticipantObjectName	*U*	*Not specialized*
	ParticipantObjectQuery	M	The complete query message (including MSH and QPD segments), base64 encoded.
	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

1540   **3.10 PIX Update Notification**

This section corresponds to Transaction ITI-10 of the IHE IT Infrastructure Technical Framework. Transaction ITI-10 is used by the Patient Identifier Cross-reference Consumer and Patient Identifier Cross-reference Manager actors.

3.10.1 Scope

1545   This transaction involves the Patient Identifier Cross-reference Manager Actor providing notification of updates to patient identifier cross-reference associations to Patient Identifier Cross-reference Consumers that have registered (by configuration on the Cross-reference Manager) their interest in receiving such notifications. This transaction uses HL7's generic 'Update Person Information' message to communicate this patient-centric information.

1550   3.10.2 Use Case Roles
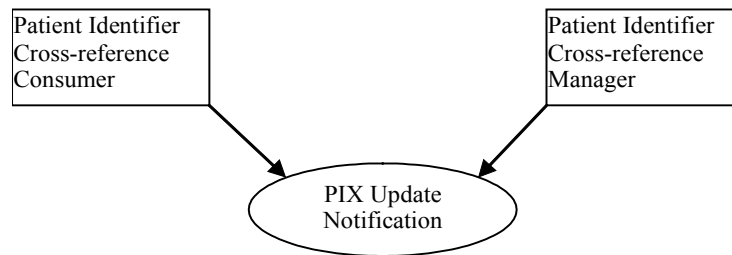
Actor: Patient Identifier Cross-reference Manager

Role: It serves a well-defined set of Patient Identification Domains. The Patient Identifier Cross-reference Manager manages the cross-referencing of patient identifiers across Patient
1555   Identification Domains by providing a list of patient ID "aliases" via notification to a configured list of interested Patient Identifier Cross-reference Consumers.

Actor: Patient Identifier Cross-reference Consumer

Role: Receives notifications from the Patient Identifier Cross-reference Manager of changes to patient ID aliases. Typically the Patient Identifier Cross-reference Consumer Actor uses this
1560   information to maintain information links about patients in a different patient ID domain.

3.10.3 Referenced Standard

HL7 Version 2.5, Chapter 2 – Control, Chapter 3 – Patient Administration

HL7 version 2.5 was selected for this transaction for the following reason:

It was considered the most stable version that contained the functionality required by Transaction
1565   ITI-9 and ITI-10.

3.10.4 Interaction Diagram
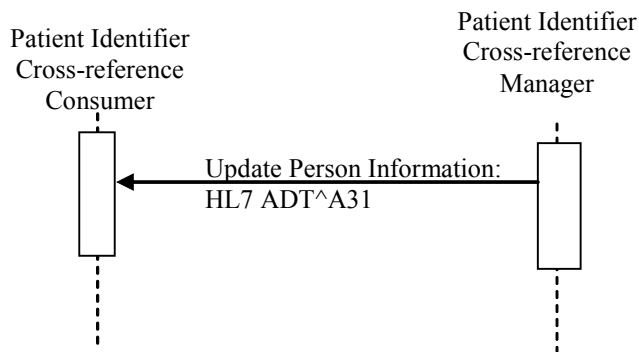
Figure 3.10-1 Update Person Information Sequence

3.10.4.1 Update Person Information

3.10.4.1.1   Trigger Events

1570

The Patient Identifier Cross-reference Manager shall notify a Patient Identifier Cross-reference Consumer when there is a change in a set of cross-referenced patient identifiers for any of the patient identifiers belonging to Patient Identifier Domains of interest to the consumer. The configuration of the domains of interest to a Patient Cross-reference Consumer is maintained by the Patient Cross-reference Manager Actor.

1575

Several notifications may have to be issued to communicate a single update to a set of cross-reference patient identifiers as required to reflect all the changes on the resulting sets of cross-reference patient Identifiers belonging to Patient Identifier Domains of interest to the Patient Identifier Cross-referencing Consumer.

1580

The following HL7 trigger event will be used to update to the list of patient identifiers:

- A31 – Update Person Information

3.10.4.1.2   Message Semantics

The PIX Update Notification transaction is conducted by the ADT^A31 message. The Patient Identifier Cross-reference Manager Actor initiates this transaction whenever identifier list information is updated for a patient.

1585

It is wholly the responsibility of the Patient Identifier Cross-reference Manager Actor to perform the matching of patient identifiers based on the patient traits it receives. The information provided by the Patient Identifier Cross-reference Manager Actor to Patient Identifier Cross-reference Consumer Actors shall only contain a list of cross-referenced identifiers for the domains of interest as configured with the Patient Identifier Cross-reference Manager actor in

1590

two or more of the domains managed by the cross-referencing Actor. Multiple notifications may need to be sent. For example:

Consumer CON_A is configured to receive update notifications for domains DOM_A and DOM_AD. Notifications are sent as follows:

1595
- A PIX A01 feed is sent for a patient for DOM_A. The update notification shall contain the patient identifier and assigning authority for DOM_A.

- A PIX A01 feed is processed for DOM_AD. The Patient Identifier Cross-reference Manager cross references this patient with DOM_A. The update notification shall contain the patient identifier and assigning authority for DOM_A and DOM_AD.

1600
- A PIX A08 feed is processed for DOM_AD changing the patient address. The Patient Identifier Cross-reference Manager cross references determines this patient is no longer the same patient as DOM_A. Two update notifications shall be sent. One containing the patient identifier and assigning authority for DOM_A. The other one containing the patient identifier and assigning authority for DOM_AD.

1605 The list of cross-references is not made available until the set of policies and processes for managing the cross-reference function have been completed. The policies of administering identities adopted by the cooperating domains are completely internal to the Patient Identifier Cross-reference Manager Actor and are outside of the scope of this standard. Possible matches should not be communicated until the healthcare institution policies and processes embodied in
1610 the Patient Identifier Cross-reference Manager Actor reach a positive matching decision.

The Patient Identifier Cross-reference Manager Actor Configuration is expected to have configuration indicating which Identity Consumers are interested in receiving the PIX Update Notification Transactions. This configuration information shall include identification of the identity consumer systems interested in receiving notifications and, for each of those systems, a
1615 list of the patient identifier domains of interest. The Patient Identifier Cross-reference Manager Actor should account for consumers interested in all domains.

The segments of the message listed in the Table below are required. Other segments are optional.

Table 3.10-1 ADT Patient Administration Message

ADT	Patient Administration Message	Chapter in HL7 2.5
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
PV1	Patient Visit	3

Each message shall be acknowledged by the HL7 ACK message sent by the receiver of ADT
1620 message to its sender. See ITI TF-2x: C.2.3, "Acknowledgement Modes" for the definition and discussion of the ACK message.

3.10.4.1.2.1 MSH Segment

The MSH segment shall be constructed as defined in ITI TF-2x: C.2.2, "Message Control".

Field *MSH-9 Message Type* shall have all three components populated with a value. The first
1625   component shall have a value of ADT; the second component shall have the value of A31. The
third component shall have a value of ADT_A05.

3.10.4.1.2.2 EVN Segment

See ITI TF-2x: C.2.4 for the list of all required and optional fields within the EVN segment.

3.10.4.1.2.3 PID Segment

1630   The Patient Identifier Cross-reference Manager Actor shall provide only those attributes within
the PID segment that are required by the HL7 standard: *PID-3-Patient Identifier List* and *PID-5-
Patient Name*.

The Patient Identifier Cross-reference Manager Actor shall use the field *PID-3 Patient Identifier
List* to convey the Patient IDs uniquely identifying the patient within each Patient Identification
1635   Domain for which a Patient ID exists for the specified patient. Each resulting ID returned in PID-
3 shall include a fully qualified Assigning Authority component. In other words, the Assigning
Authority component returned shall include ALL subcomponents (namespace ID, Universal ID,
and Universal ID type).

To eliminate the issue of multiple name values between Patient Identifier Domains, the Patient
1640   Identifier Cross-reference Manager Actor shall return a single space character in field *PID-5-
Patient Name*.

A single PID segment is sent in which one repetition of *PID-3-Patient Identifier List* is populated
for each of the identifiers in the notification. If the Patient Identifier Cross-reference Manager
Actor chooses to send multiple identifiers associated with the same domain, it shall return these
1645   identifiers grouped in successive repetitions within the *PID-3-Patient Identifier List*.

3.10.4.1.2.4 PV1 Segment

As is specified by the HL7 Standard, Version 2.5, the PV1 Segment is required. The required
field *PV1-2-patient class* shall contain **N** (not applicable) to indicate the transmission of patient
information outside the context of a visit or encounter. Other fields shall be left blank.

1650

Table 3.10-2 IHE Profile – PV1 segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
2	1	IS	R	0004	00132	Patient Class

Adapted from the HL7 Standard, version 2.5

3.10.4.1.3   Expected Actions

The Patient Identifier Cross-reference Consumer, when it receives the ADT^A31 message, shall
1655   update its internal identifier information for the affected patient(s) in all domains in which it is
interested whenever it receives updated identifier information that results in a change to the
cross-referencing of a patient.

In the case where the returned list of identifiers contains multiple identifiers for a single domain, the Patient Identifier Cross-reference Consumer shall either use ALL of the multiple identifiers
1660 from the given domain or it shall ignore ALL of the multiple identifiers from the given domain.

This allows Patient Identifier Cross-reference Consumer Actors capable of handling multiple identities for a single patient within a single domain (i.e., those that can correctly aggregate the information associated with the different identifiers) to do so. For those Patient Identifier Cross-reference Consumer Actors not capable of handling this situation, ignoring the entire list of
1665 different identifiers prevents the consumer from presenting incomplete data.

3.10.5 Security Considerations

3.10.5.1 Audit Record Considerations

The PIX Update Notification Transaction is "Patient Record" event, as defined in Table 3.20.6-1. The Actors involved in the transaction shall create audit data in conformance with DICOM
1670 (Supp 95) "Patient Record", with the following exceptions:

3.10.5.1.1 Patient Identifier Cross-reference Manager audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"R" (Read)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-10", "IHE Transactions", "PIX Update Notification")
Source (Patient Identifier Cross-reference Manager) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Consumer) (1)			
Audit Source (Patient Identifier Cross-reference Manager) (1)			
Patient IDs(1..n) (represents the components of PID-3)			

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identifier Cross-reference Manager Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*Not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) AuditMessage/ ActiveParticipant	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*Not specialized*
	UserName	*U*	*Not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identifier Cross-reference Consumer facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*Not specialized*
	UserName	*U*	*Not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*Not specialized*
	AuditSourceTypeCode	*U*	*Not specialized*

1675

Patient IDs (AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*Not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*

_____

	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

3.10.5.1.2 Patient Identifier Cross-reference Consumer audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/ EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"U" (update)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-10", "IHE Transactions", "PIX Update Notification")

Source (Patient Identifier Cross-reference Manager) (1)
Destination (Patient Identifier Cross-reference Consumer) (1)
Audit Source (Patient Identifier Cross-reference Consumer) (1)
Patient IDs(1..n) (represents the components of PID-3)

Where:

	Field Name		
Source **AuditMessage/ ActiveParticipant**	UserID	M	The identity of the Patient Identifier Cross-reference Manager Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

	Field Name		
Destination **AuditMessage/ ActiveParticipant**	UserID	M	The identity of the Patient Identifier Cross-reference Consumer facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

	Field Name		
Audit Source **AuditMessage/ AuditSourceIdentification**	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

1680

	Field Name		
Patient IDs **(AudittMessage/ ParticipantObjectIdentifi cation)**	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.

_____

	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

23 Patient Identifier Cross-referencing HL7 V3 (PIXV3)

4375   The *Patient Identifier Cross-referencing HL7 V3 Integration Profile (PIXV3)* is targeted at cross-enterprise Patient Identifier Cross-reference Domains (as defined in ITI TF-1: 5) as well as healthcare enterprises with developed IT infrastructure. The discussion in ITI TF-1: 5 fully applies here, with the obvious adjustments to the referenced transactions.
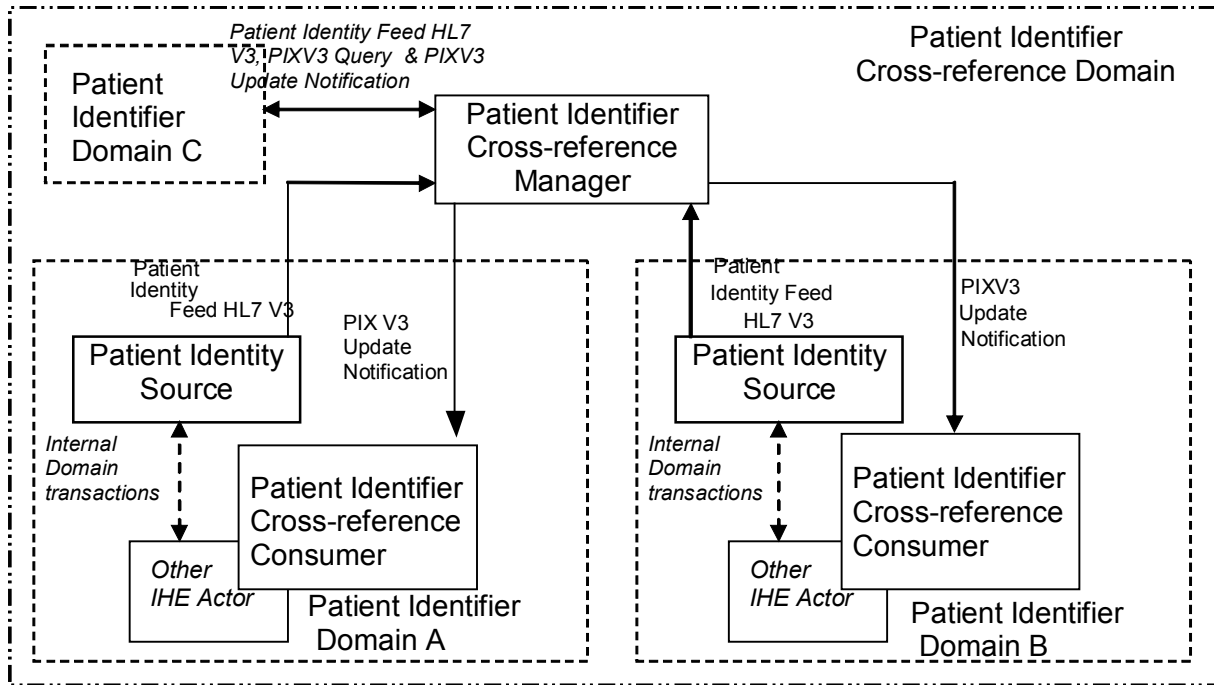
4380   **Figure 23-1 Process Flow with Patient Identifier Cross-referencing HL7 V3**

23.1 Actors/Transactions

The actors in this profile are the same as the actors defined in the PIX profile (ITI TF-1: 5.1). Figure 23.1-1 shows the actors directly involved in the Patient Identifier Cross-referencing HL7 V3 Integration Profile and the relevant transactions between them. Other actors that may be indirectly
4385   involved due to their participation in other related profiles are not shown.
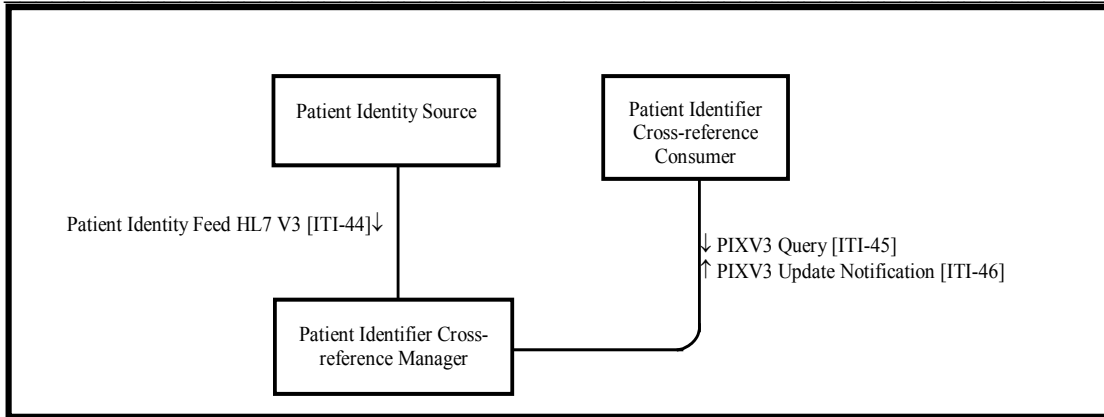
Figure 23.1-1 Patient Identifier Cross-referencing HL7 V3 Actor Diagram

Table 23.1-1 lists the transactions for each actor directly involved in the Patient Identifier Cross-referencing Profile. In order to claim support of this Integration Profile, an implementation must

4390 perform the required transactions (labeled "R"). Transactions labeled "O" are optional. A complete list of options defined by this Integration Profile and that implementations may choose to support is listed in the ITI TF-1: 23.2.

Table 23.1-1 Patient Identifier Cross-referencing HL7 V3 Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section
Patient Identity Source	Patient Identity Feed HL7 V3[ITI-44]	R	ITI TF-2b: 3.44
Patient Identifier Cross-reference Consumer	PIXV3 Query[ITI-45]	R	ITI TF-2b: 3.45
	PIXV3 Update Notification [ITI-46]	O	ITI TF-2b: 3.46
Patient Identifier Cross-reference Manager	Patient Identity Feed HL7 V3[ITI-44]	R	ITI TF-2b: 3.44
	PIXV3 Query[ITI-45]	R	ITI TF-2b: 3.45
	PIXV3 Update Notification[ITI-46]	R	ITI TF-2b: 3.46

4395 The transactions in this profile directly correspond to the transactions used in the PIX profile (ITI TF-1: 5) and provide the identical functionality. Table 23.1-2 describes this correspondence.

Table 23.1-2 Transactions Correspondence between the PIX and PIXV3 profiles

Transactions in PIX	Section in Volume	Transactions in PIXV3	Section
Patient Identity Feed [ITI-8]	ITI TF-2a: 3.8	Patient Identity Feed HL7 V3[ITI-44]	ITI TF-2b: 3.44
PIX Query[ITI-9]	ITI TF-2a: 3.9	PIXV3 Query[ITI-45]	ITI TF-2b: 3.45
PIX Update Notification [ITI-10]	ITI TF-2a: 3.10	PIXV3 Update Notification [ITI-46]	ITI TF-2b: 3.46

4400 ## 23.2 Patient Identifier Cross-referencing HL7 V3 Integration Profile Options

Options that may be selected for this Integration Profile are listed in the Table 23.2-1 along with the Actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 23.2-1 Patient Identifier Cross-referencing HL7 V3 - Actors and Options

Actor	Options	Vol & Section
Patient Identity Source	Pediatric Demographics	
Patient Identifier Cross-reference Manager	Pediatric Demographics	
Patient Identifier Cross-reference Consumer	PIXV3 Update Notification Transaction	ITI TF-2b: 3.46

4405

23.2.1 Pediatric Demographics

The experience of immunization registries and other public health population databases has shown that matching and linking patient records from different sources for the same individual person in environments with large proportions of pediatric records requires additional demographic data.

4410 In particular, distinguishing records for children who are twins, triplets, etc. – that is, avoiding false positive matches - may be difficult because much of the demographic data for the two individuals matches. For instance, twin children may have identical last names, parents, addresses, and dates of birth; their first names may be very similar, possibly differing by only one letter. It can be very difficult for a computer or even a human being to determine in this situation whether the slight first
4415 name difference points to two distinct individuals or just a typographical error in one of the records. Additional information is extremely helpful in making this determination.

Pediatric Demographics makes use of the following six additional demographic fields to aid record matching in databases with many pediatric records.

Field	Reason for inclusion	Value
Mother's Maiden Name	Any information about the mother is helpful in making a match	Helps create true positive matches
Patient Home Telephone	A telecom helps match into the right household	Helps create true positive matches
Patient Multiple Birth Indicator	Indicates this person is a multiple – twin, triplet, etc.	Helps avoid false positive matches of multiples
Patient Birth Order	Distinguishes among those multiples.	Helps avoid false positive matches of multiples
Last Update Date/Time, Last Update Facility	These fields, although not strictly demographic, can effectively substitute when multiple birth indicator and birth order are not collected. They indirectly provide visit information. Provider visits on the same day may likely indicate two children brought to a doctor together.	Helps avoid false positive matches of multiples

4420

Patient Identity Source actors which support the Pediatric Demographics option are required to support the Patient Identity Management [ITI-30] transaction and shall provide values, when available, for the fields identified as Pediatric Demographics fields.

4425   Patient Identifier Cross-reference Manager actors which support the Pediatric Demographics option are required to support the Patient Identity Management [ITI-30] transaction, and if values for one or more of the Pediatric Demographics fields are specified in the Patient Identity Management [ITI-30], they shall be considered as part of the matching algorithm of the PIX Manager.

Pediatric Demographics are defined as all of the following:

- Mother's Maiden Name
4430   - Patient Home Telephone
- Patient Multiple Birth Indicator
- Patient Birth Order
- Last Update Date/Time
- Last Update Facility

4435

23.3 Patient Identifier Cross-referencing HL7 V3 Integration Profile Process Flows

Sections ITI TF-1: 5.3.1 and ITI TF-1: 5.3.2 describe use cases that this profile addresses. Figures 5.3-1 and 5.3-2 also apply with the changes to the corresponding PIXV3 transactions as specified in
4440   table 23.1-2.

23.4 Relationship between the PIXV3 Integration Profile and eMPI

The discussion in ITI TF-1: 5.4 fully applies to this profile.

23.5 Patient Identifier Communication Requirement

The patient identifier in HL7 V3 messages is represented by the II data type. This data type has two
4445   components: a root, and an extension. For compatibility with the use of patient identifiers in profiles using HL7 V2 messages, and with the specification of the patient identifier in the XDS profile, the patient identifier SHALL be represented as a root and an extension, where the root is an appropriately assigned OID. The direct correspondence between the II data type and the HL7 Version 2.5 CX data type (used in field PID-3) is shown in ITI TF-2x: Appendix R.

4450   ## 23.6 Security Considerations

The implementer of this profile is advised that many risks cannot be mitigated by the IHE profile and instead the responsibility for mitigation is transferred to the vendor, and occasionally to the operational environment.

In order to address identified security risks:

4455

- All actors in PIXV3 should be grouped with a Consistent Time (CT) Profile - Time Client actor. This grouping will assure that all systems have a consistent time clock to assure a consistent timestamp for audit logging.

- All actors in PIXV3 should be grouped with an Audit Trail and Node Authentication (ATNA) profile - Secure Node actor or ATNA Secure Application actor. This grouping will

4460   assure that only highly trusted systems can communicate and that all changes are recorded in the audit log.

- All actors in PIXV3 should be grouped with an XUA X-Service User or X-Service Provider actor as appropriate. This grouping will enable service side access control and more detailed audit logging.

4465

- All actors in PIXV3 should be grouped with the appropriate actor from the Enterprise User Authentication (EUA) profile to enable single sign-on inside an enterprise by facilitating one name per user for participating devices and software.

3.44 Patient Identity Feed HL7 V3

This section corresponds to Transaction ITI-44 of the IHE IT Infrastructure Technical Framework. Transaction ITI-44 is used by the Patient Identity Source, Patient Identifier Cross-reference Manager and Document Registry Actors.

3.44.1 Scope

The scope is identical to ITI TF-2a: 3.8.1.

3.44.2 Use Case Roles
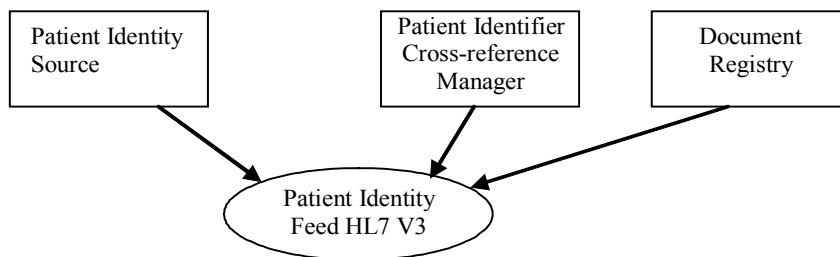
Actor: Patient Identity Source

Role: Provides notification to the Patient Identifier Cross-reference Manager and Document Registry for any patient identification related events including: creation, updates, merges, etc.

Corresponding HL7 v3 Application Roles:

Patient Registry Informer (PRPA_AR201301UV02)

Actor: Patient Identifier Cross-reference Manager

Role: Serves a well-defined set of Patient Identification Domains. Based on information provided in each Patient Identification Domain by a Patient Identification Source Actor, it manages the cross-referencing of patient identifiers across Patient Identification Domains.

Corresponding HL7 v3 Application Roles:

Patient Registry Tracker (PRPA_AR201302UV02)

Actor: Document Registry

3915 **Role:** Uses patient identifiers provided by Patient Identity Source to ensure that XDS Documents metadata registered is associated with a known patient and updates patient identity in document metadata by tracking identity change operations (e.g., merge).

Corresponding HL7 v3 Application Roles:

Patient Registry Tracker (PRPA_AR201302UV02)

3920 ### 3.44.3 Referenced Standards

HL7 Version 3 Edition 2008 Patient Administration DSTU, Patient Topic (found at http://www.hl7.org/memonly/downloads/v3edition.cfm#V32008).

3.44.4 Interaction Diagrams
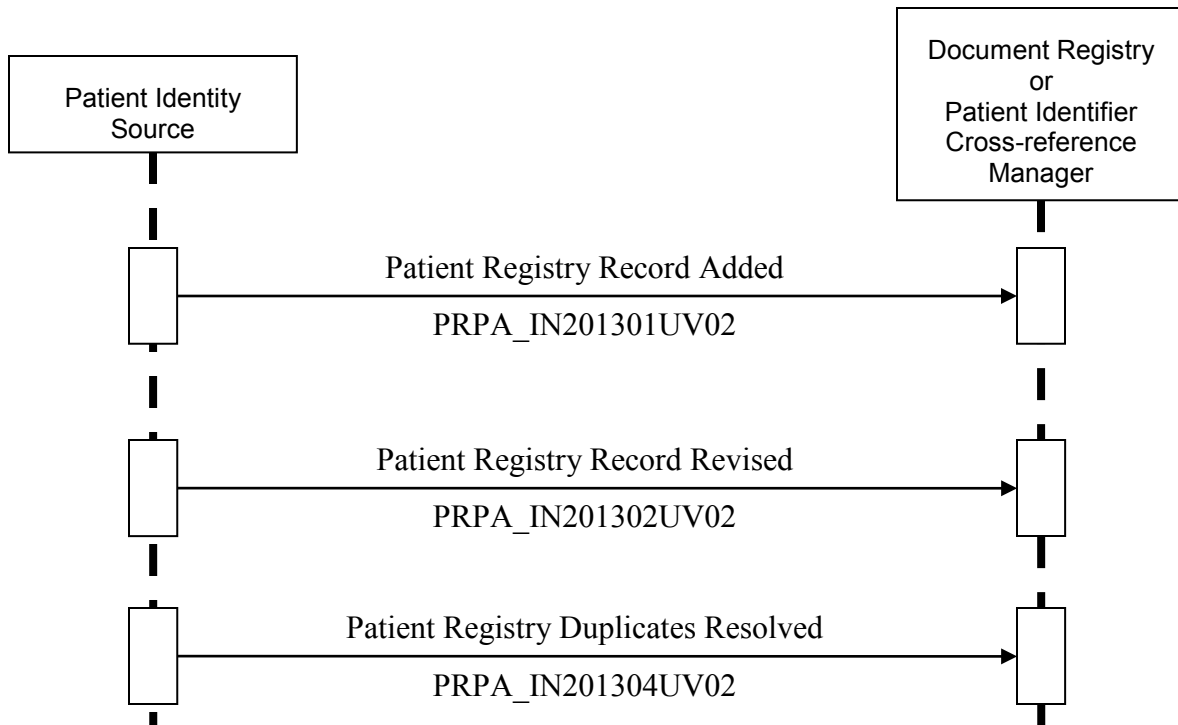
3925 **Figure 3.44-1 Patient Identity Sequence**

3.44.4.1 Patient Identity Management – Add or Revise Patient Record

3.44.4.1.1 Trigger Events

The following events from a Patient Identity Source will trigger one of the Add or Revise Patient Record messages:

Patient Registry Record Added (PRPA_TE201301UV02)

This trigger event signals that a new patient was added to a Patient Identity Source.

Changes to patient demographics (e.g., change in patient name, patient address, etc.) shall trigger the following Patient Registry Record Revised message:

Patient Registry Record Revised (PRPA_TE201302UV02)

This trigger event signals that patient information was revised in a Patient Identity Source.

The Patient Identifier Cross-reference Manager shall only perform cross-referencing logic on messages received from Patient Identity Source Actors. For a given Patient Identifier Domain there shall be one and only one Patient Identity Source Actor, but a given Patient Identity Source Actor may serve more than one Patient Identifier Domain.

3.44.4.1.2 Message Semantics

The Patient Identity Feed transaction is carried out by the HL7 v3 Patient Activate (PRPA_MT201301UV02) and Patient Revise (PRPA_MT201302UV02) messages, as defined in the subsequent sections. The Patient Identity Source shall generate the message whenever a patient is registered or when some piece of patient demographic data changes. The components of the message listed below are required, and their detailed descriptions are provided in the following subsections.

Each message shall be acknowledged by the HL7 v3 Accept Acknowledgement (MCCI_MT000200UV01), which is described in ITI TF-2x: Appendix O.

The message information model in ITI TF-2b: 3.44.4.1.2.2.describes the relevant data elements for this transaction. Specific requirements for the particular actors are found in ITI TF-2b: 3.44.4.1.3 Expected Actions.

3.44.4.1.2.1 Major Components of the Patient Registry Record Added/Revised Messages

Patient

The *Patient* class is the entry point to the R-MIMs for the *Patient Activate (PRPA_RM201301UV02)* and *Patient Revise (PRPA_RM201302UV02)* models. The patient identifiers are captured using an Instance Identifier (II) data type. Please see ITI TF-2x: Appendix E for a detailed description about the use of the HL7 V3 II data type for patient identifiers.

Provider Organization

The Patient class is scoped by the provider organization where this person is a patient. The HL7 definition of the CMET requires that the provider organization needs to be identified by an id attribute, and at least one of address, telecommunications address, or contact person to be present. The id attribute SHALL have only a root, expressed as an ISO OID.

Person

The *Person* class contains identifying and demographic data elements for the focal person similar to those in the HL7 v2.x PID segment such as name, gender, date of birth, marital status and deceased indicator and time.

Language Communication

Information about what language(s) should be used to communicate with the focal person can be sent in the *LanguageCommunication* class.

PersonalRelationship

This is used for sending information pertaining to the mother's maiden name.

Citizen

Citizenship information for a person, including citizen identifier and effective time can be sent in the *Citizen* class. The nation that scopes the *Citizen* role, as identified by *Nation.code*, is mandatory.

Other Identifiers

The *OtherIDs* class is used to capture other identifiers associated with the person such as a driver's license number or social security number. In this transaction the IDs assigned by the scoping provider organization are represented in the id attribute of the Patient class. All other IDs are represented in the OtherIDs class. For the purposes of interoperability where both HL7 V3 and HL7 v2.x based transactions are used, the following requirement is imposed on the OtherIDs.id attribute and on the scopingOrganization.id attribute:

OtherIDs.id.root SHALL be identical to scopingOrganization.id.root

scopingOrganization.id.extension SHALL NOT have any value

Please see ITI TF-2x: E.2 for details on the use of the II data type for patient identifiers.

3.44.4.1.2.2 Message Information Model of the Patient Registry Record Added/Revised Messages

Below is the Message Information Model for both the Patient Activate and Patient Revise messages, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict common subset of the *Patient Activate (PRPA_RM201301UV02)* and *Patient Revise (PRPA_RM201302UV02)* RMIMs. While HL7 defines two models for the two messages, a single common subset is sufficient for the purposes of this IHE transaction.

The base RMIMs can be found on the HL7 V3 2008 Edition CD at Edition2008/domains/uvpa/editable/PRPA_RM201301UV.htm and

Edition2008/domains/uvpa/editable/PRPA_RM201302UV.htm. The following restrictions are made on the original RMIMs to arrive at the restricted model:

4000   The focal entity choice is restricted to be only a person

The relationship holder of the personal relationship is restricted to be a person (using CMET COCT_MT030207UV)

The provider organization which is scoping the patient role is required in both the Add and Revise messages (it is optional in the original Revise message definition).

4005   The following roles are omitted:

asPatientOfOtherProvider

guarantor

guardian

contactParty

4010   asMember

careGiver

asStudent

The following participations are omitted:

subjectOf (administrativeObservation)

4015   coveredPartyOf (coverage)
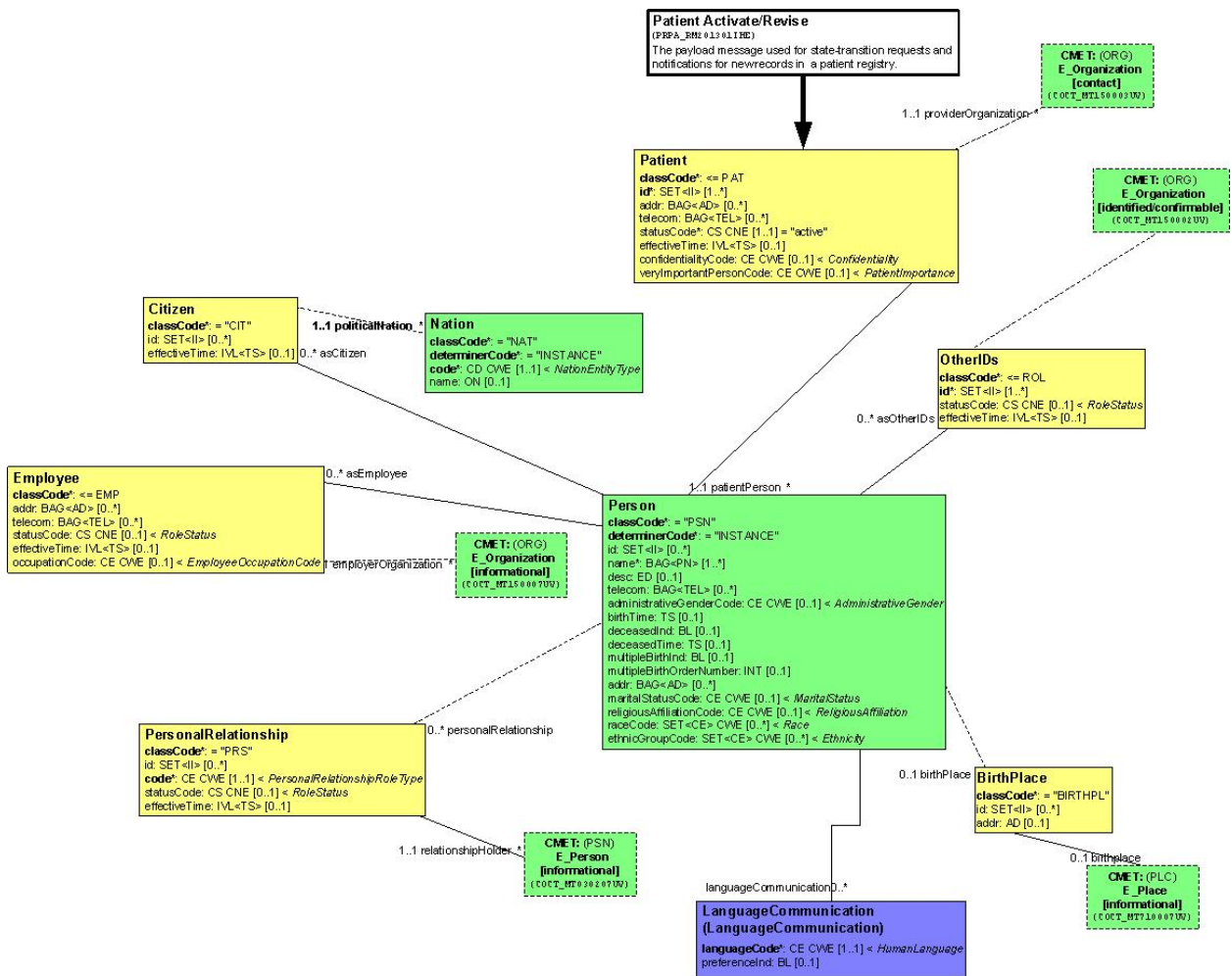
Figure 3.44.4.1.2-1

The attributes of this model are described in the following table. Note that CMETs are not
4020   discussed, as the HL7 definitions for them are being used.

Table 3.44.4.1.2-1

PRPA_HD201301IHE Patient Activate/Revise	This HMD extract defines the message used to report that a new patient record was added, or a patient record was updated. Derived from Figure 3.44.4.1.2-1 (PRPA_RM201301IHE)
Patient	The primary record for the focal person in a Patient Identity Source
classCode [1..1] (M) Patient (CS) {CNE:PAT}	Structural attribute; this is a "patient" role
id [1..*] (M) Patient (SET<II>)	Identifiers designated by this patient identity source for the focal person
statusCode [1..1] Patient (CS) {CNE:active, fixed value= "active"}	A value specifying the state of this record in a patient registry (based on the RIM role class state-machine). This record is active.
confidentialityCode [0..*]	Value(s) that control the disclosure of information about this living

PRPA_HD201301IHE Patient Activate/Revise	This HMD extract defines the message used to report that a new patient record was added, or a patient record was updated. Derived from Figure 3.44.4.1.2-1 (PRPA_RM201301IHE)
Patient (SET<CE>) {CWE:Confidentiality}	subject as a patient
veryImportantPersonCode [0..1] Patient (CE) {CWE:PatientImportance}	A code specifying the patient's special status granted by the scoper organization, often resulting in preferred treatment and special considerations. Examples include board member, diplomat.
Person	A subtype of LivingSubject representing a human being Either Person.name or Patient.id must be non-null
classCode [1..1] (M) Person (CS) {CNE:PSN, fixed value= "PSN"}	Structural attribute; this is a "person" entity
determinerCode [1..1] (M) Person (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	Structural attribute; this is a specific person
name [1..*] Person (BAG<PN>)	Name(s) for this person
telecom [0..*] Person (BAG<TEL>)	Telecommunication address(es) for communicating with this person
administrativeGenderCode [0..1] Person (CE) {CWE:AdministrativeGender}	A value representing the gender (sex) of this person. Note: this attribute does not include terms related to clinical gender which is a complex physiological, genetic and sociological concept that requires multiple observations in order to be comprehensively described.
birthTime [0..1] Person (TS)	The date and time this person was born
deceasedInd [0..1] Person (BL)	An indication that this person is dead
deceasedTime [0..1] Person (TS)	The date and time this person died
multipleBirthInd [0..1] Person (BL)	An indication that this person was part of a multiple birth
multipleBirthOrderNumber [0..1] Person (INT)	The order in which this person was born if part of a multiple birth
addr [0..*] Person (BAG<AD>)	Address(es) for corresponding with this person
maritalStatusCode [0..1] Person (CE) {CWE:MaritalStatus}	A value representing the domestic partnership status of this person
religiousAffiliationCode [0..1] Person (CE) {CWE:ReligiousAffiliation}	A value representing the primary religious preference of this person
raceCode [0..*] Person (SET<CE>) {CWE:Race}	A set of values representing the races of this person
ethnicGroupCode [0..*] Person (SET<CE>) {CWE:Ethnicity}	A set of values representing the ethnic groups of this person

PRPA_HD201301IHE Patient Activate/Revise	This HMD extract defines the message used to report that a new patient record was added, or a patient record was updated. Derived from Figure 3.44.4.1.2-1 (PRPA_RM201301IHE)
OtherIDs	Used to capture additional identifiers for the person such as a Drivers' license or Social Security Number. Please see notes above in the Major Components section on the use of OtherIDs.
classCode [1..1] (M) Role (CS) {CNE:ROL}	Structural attribute. This can be any specialization of "role" except for Citizen, or Employee.
id [1..*] (M) Role (SET<II>)	One or more identifiers issued to the focal person by the associated scopingOrganization (e.g., a Driver's License number issued by a DMV)
PersonalRelationship	A personal relationship between the focal living subject and another living subject
classCode [1..1] (M) Role (CS) {CNE:PRS, fixed value= "PRS"}	Structural attribute; this is a "personal relationship" role
id [0..*] Role (SET<II>)	Identifier(s) for this personal relationship
code [1..1] (M) Role (CE) {CWE:PersonalRelationshipRoleType}	A required value specifying the type of personal relationship between the relationshipHolder and the scoping living subject drawn from the PersonalRelationshipRoleType domain, for example, spouse, parent, unrelated friend
statusCode [0..1] Role (CE) {CWE:RoleStatus}	A value specifying the state of this personal relationship (based on the RIM Role class state-machine), for example, following divorce a spouse relationship would be "terminated".
effectiveTime [0..1] Role (IVL<TS>)	An interval of time specifying the period during which this personal relationship is in effect, if such time is applicable and known.
Citizen	Used to capture person information relating to citizenship.
classCode [1..1] (M) Role (CS) {CNE:CIT, fixed value= "CIT"}	Structural attribute; this is a "citizen" role
id [0..*] Role (SET<II>)	Identifier(s) for the focal person as a citizen of a nation
effectiveTime [0..1] Employee (IVL<TS>)	An interval of time specifying the period during which this employment relationship is in effect, if such time limit is applicable and known.
Nation	A politically organized body of people bonded by territory and known as a nation.
classCode [1..1] (M) Organization (CS) {CNE:NAT, fixed value= "NAT"}	Structural attribute; this is a 'nation' type of entity
determinerCode [1..1] (M) Organization (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	Structural attribute; this is a specific entity
code [1..1] (M) Organization (CD) {CWE:NationEntityType}	A value that identifies a nation state
name [0..1]	A non-unique textual identifier or moniker for this nation

PRPA_HD201301IHE Patient Activate/Revise	This HMD extract defines the message used to report that a new patient record was added, or a patient record was updated. Derived from Figure 3.44.4.1.2-1 (PRPA_RM201301IHE)
Organization (ON)	
Employee	A relationship of the focal person with an organization to receive wages or salary. The purpose of this class is to identify the type of relationship the employee has to the employer rather than the nature of the work actually performed. For example, it can be used to capture whether the person is a Military Veteran or not..
classCode [1..1] (M) Employee (CS) {CNE:EMP}	Structural attribute; this is an "employee" role
statusCode [0..1] Employee (CS) {CNE:RoleStatus}	A value specifying the state of this employment relationship (based on the RIM Role class state-machine), for example, active, suspended, terminated.
statusCode [0..1] Employee (CS) {CNE:RoleStatus}	A value specifying the state of this employment relationship (based on the RIM Role class state-machine), for example, active, suspended, terminated.
effectiveTime [0..1] Employee (IVL<TS>)	An interval of time specifying the period during which this employment relationship is in effect, if such time limit is applicable and known.
occupationCode [0..1] Employee (CE) {CWE:EmployeeOccupationCode}	A code qualifying the classification of kind-of-work based upon a recognized industry or jurisdictional standard. OccupationCode is used to convey the person's occupation as opposed to jobClassCode (not used in this transaction) which characterizes this particular job. For example, it can be used to capture whether the person is a Military Veteran or not.
BirthPlace	The birthplace of the focal living subject.
classCode [1..1] (M) Birthplace (CS) {CNE:BIRTHPL}	Structural attribute; this is a "birthplace" role.
id [0..*] place (SET<II>)	A living subject's birth place represented by a unique identifier.
addr [0..*] Patient (BAG<AD>)	A living subject's birth place represented as an address. Note: Either BirthPlace.addr or an associated Place.name must be valued.
classCode [1..1] (M) Birthplace (CS) {CNE:BIRTHPL}	Structural attribute; this is a "birthplace" role.
LanguageCommunication	A language communication capability of the focal person
languageCode [1..1] (M) LanguageCommunication (CE) {CWE:HumanLanguage}	A value representing a language for which the focal person has some level of proficiency for written or spoken communication. Examples: Spanish, Italian, German, English, American Sign
preferenceInd [0..1] LanguageCommunication (BL)	An indicator specifying whether or not this language is preferred by the focal person for the associated mode

3.44.4.1.2.3 Control Act and Transmission Wrappers

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.44.4.1.2-2 contains the Transmission and Control Act wrappers used for the two interactions, and the associated constraints.

Table 3.44.4.1.2-2 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000100UV01 – Send Message Payload	MFMI_MT700701UV01 – Master File / Registry Notification Control Act, Role Subject
The value of interactionId SHALL be set to PRPA_IN201301UV02 or PRPA_IN201302UV02 The value of processingModeCode SHALL be set to T The acceptAckCode SHALL be set to AL There SHALL be only one receiver Device	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201301UV02 or PRPA_TE201302UV02 respectively RegistrationEvent.statusCode SHALL be set to "active" There SHALL be no InReplacementOf act relationship for these interactions.

The composite message schemas which describe the full payload of these interactions, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the HL7 V3 2008 Normative Edition schemas are at Edition2008/processable/multicacheschemas/PRPA_IN201301UV02.xsd and Edition2008/processable/multicacheschemas/PRPA_IN201302UV02.xsd).

3.44.4.1.2.4 Web Services Types and Messages

The Patient Registry Record Added/Revised messages will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL naming conventions SHALL apply:

```
"add" message    -> "PRPA_IN201301UV02_Message"
"revise" message -> "PRPA_IN201302UV02_Message"
acknowledgement  -> "MCCI_IN000002UV01_Message"
```

The following WSDL snippet describes the types for these messages:

```
    …
 <types>
     <xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-
org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201301UV02.xs
d"/>
<xsd:element name="PRPA_IN201301UV02"/>
</xsd:schema>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201302UV02.xs
d"/>
```

```
<xsd:element name="PRPA_IN201302UV02"/>
</xsd:schema>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
```
4060
```
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/MCCI_IN000002UV01.xs
d"/>
```
4065
```
<xsd:element name="MCCI_IN000002UV01"/>
</xsd:schema>
  </types>
…
```

The messages are described by the following snippet:

4070
```
        …
<message name="PRPA_IN201301UV02_Message">
<part element="hl7:PRPA_IN201301UV02" name="Body"/>
  </message>
  <message name="PRPA_IN201302UV02_Message">
```
4075
```
<part element="hl7:PRPA_IN201302UV02" name="Body"/>
  </message>
  <message name="MCCI_IN000002UV01_Message">
<part element="hl7:MCCI_IN000002UV01" name="Body"/>
  </message>
```
4080
```
        …
```

The port types for the WSDL describing the Patient Identity Feed Service are described together with the expected actions of the actors which receive these messages in sections ITI TF-2b: 3.44.4.1.3 and TF-2b: 3.44.4.1.4.

3.44.4.1.3 Expected Actions – PIX Manager

4085 The Patient Identifier Cross-reference Manager shall be capable of accepting attributes specified in Table 3.44.4.1.2-1 above. This is to ensure that the Patient Identifier Cross-reference Manager can handle a sufficient set of corroborating information in order to perform its cross-referencing function.

The Patient Identifier Cross-reference Manager shall only recognize a single Patient Identity
4090 Source per domain.

The cross-referencing process (algorithm, human decisions, etc.) is performed within the Patient Identifier Cross-reference Manager, but its specification is beyond the scope of IHE.

Once the Patient Identifier Cross-reference Manager has completed its cross-referencing function, it shall make the newly cross-referenced identifiers available to PIX queries and send
4095 out notification to any Patient Identifier Cross-reference Consumers that have been configured as being interested in receiving such notifications using the PIX Update Notification HL7 V3 transaction (see ITI TF-2b: 3.46 for the details of that transaction).

3.44.4.1.3.1 Web Services Port Type and Binding Definitions

IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "PIXManager".

4100   The following WSDL naming conventions SHALL apply:

```
wsdl:definitions/@name="PIXManager":
"add" message     -> "PRPA_IN201301UV02_Message"
"revise" message -> "PRPA_IN201302UV02_Message"
acknowledgement  -> "MCCI_IN000002UV01_Message"
portType          -> "PIXManager_PortType"
add operation     -> "PIXManager_PRPA_IN201301UV02"
revise operation -> "PIXManager_PRPA_IN201302UV02"
SOAP 1.2 binding -> "PIXManager_Binding_Soap12"
SOAP 1.2 port    -> "PIXManager_Port_Soap12"
```

The following WSDL snippets specify the Patient Identity Feed Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

3.44.4.1.3.1.1 Port Type

```
<portType name="PIXManager_PortType">
    <operation name="PIXManager_PRPA_IN201301UV02">
<input message="tns:PRPA_IN201301UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201301UV02"/>
<output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
org:v3:MCCI_IN000002UV01"/>
</operation>
<operation name="PIXManager_PRPA_IN201302UV02">
<input message="tns:PRPA_IN201302UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201302UV02"/>
<output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
org:v3:MCCI_IN000002UV01"/>
</operation>
  </portType>
```

3.44.4.1.3.1.2 Bindings

4130   SOAP 1.2 binding:

```
…
  <binding name="PIXManager_Binding_Soap12" type="PIXManager_PortType">
    <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="PIXManager_PRPA_IN201301UV02">
      <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201301UV02"/>
      <input>
        <wsoap12:body use="literal"/>
      </input>
      <output>
        <wsoap12:body use="literal"/>
      </output>
    </operation>
    <operation name="PIXManager_PRPA_IN201302UV02">
      <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201302UV02"/>
      <input>
        <wsoap12:body use="literal"/>
      </input>
      <output>
```

```
4150        <wsoap12:body use="literal"/>
          </output>
        </operation>
      </binding>
      …
```

4155 An informative WSDL for the PIX Manager implementing the PIXV3 profile is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.4.1.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.4.1.4 Expected Actions – Document Registry

4160 The Document Registry shall be capable of accepting attributes in the Patient Registry Record Added or Patient Registry Record Revised messages as specified in Table 3.44.4.1.2-1. The Patient Identity Feed transaction contains more than what the XDS Document Registry needs for its operation.

The Document Registry shall store only the patient identifiers of the patient identification
4165 domain designated by the Affinity Domain for document sharing in the registry. Patient identifiers of other patient identification domains, if present in a received message, shall be ignored.

3.44.4.1.4.1 Web Services Port Type and Binding Definitions

IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "DocumentRegistry".

4170 The following WSDL naming conventions SHALL apply:
```
        wsdl:definitions/@name="DocumentRegistry":
        "add" message     -> "PRPA_IN201301UV02_Message"
        "revise" message -> "PRPA_IN201302UV02_Message"
        acknowledgement  -> "MCCI_IN000002UV01_Message"
4175    portType         -> "DocumentRegistry_PortType"
        add operation    -> "DocumentRegistry_PRPA_IN201301UV02"
        revise operation -> "DocumentRegistry_PRPA_IN201302UV02"
        SOAP 1.2 binding -> "DocumentRegistry_Binding_Soap12"
        SOAP 1.2 port    -> "DocumentRegistry_Port_Soap12"
4180
```

The following WSDL snippets specify the Patient Identity Feed Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

3.44.4.1.3.1.1 Port Type

```
4185  <portType name="DocumentRegistry_PortType">
        <operation name="DocumentRegistry_PRPA_IN201301UV02">
    <input message="tns:PRPA_IN201301UV02_Message" wsaw:Action="urn:hl7-
    org:v3:PRPA_IN201301UV02"/>
    <output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
4190 org:v3:MCCI_IN000002UV01"/>
    </operation>
```

```
         <operation name="DocumentRegistry_PRPA_IN201302UV02">
         <input message="tns:PRPA_IN201302UV02_Message" wsaw:Action="urn:hl7-
         org:v3:PRPA_IN201302UV02"/>
4195     <output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
         org:v3:MCCI_IN000002UV01"/>
         </operation>
           </portType>
```

3.44.4.1.3.1.2 Bindings

4200   SOAP 1.2 binding:

```
…
   <binding name="DocumentRegistry_Binding_Soap12"
type="DocumentRegistry_PortType">
     <wsoap12:binding style="document"
4205 transport="http://schemas.xmlsoap.org/soap/http"/>
     <operation name="DocumentRegistry_PRPA_IN201301UV02">
<wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201301UV02"/>
        <input>
          <wsoap12:body use="literal"/>
4210    </input>
        <output>
          <wsoap12:body use="literal"/>
        </output>
     </operation>
4215    <operation name="DocumentRegistry_PRPA_IN201302UV02">
        <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201302UV02"/>
        <input>
          <wsoap12:body use="literal"/>
        </input>
4220    <output>
          <wsoap12:body use="literal"/>
        </output>
     </operation>
   </binding>
4225 …
```

An informative WSDL for the Document Registry implementing the XDS.b profile is available
online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.4.1.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

4230   **3.44.4.2 Patient Identity Management – Patient Identity Merge**

3.44.4.2.1 Trigger Events

When two patients' records are found to identify the same patient by a Patient Identity Source in
a Patient Identifier Domain, the Patient Identity Source shall indicate this information using the
following trigger:

4235   **Patient Registry Duplicates Resolved (PRPA_TE201304UV02)**

This trigger event signals that duplicate records were resolved in a patient registry.

A Patient Registry Duplicates Resolved message indicates that the Patient Identity Source has done a merge within a specific Patient Identification Domain. That is, the surviving identifier (patient ID) has subsumed a duplicate patient identifier.

4240 3.44.4.2.2 Message Semantics

The Patient Registry Duplicates Resolved interaction is carried out by the HL7 v3 Patient Demographics message (PRPA_MT201303UV02). The message shall be generated by the system (Patient Identity Source) that performs the update whenever two patient records are found to reference the same person.

4245 The components of the HL7 Merge Patient message listed below are required, and the detailed description of the message is provided in Sections ITI TF-2b: 3.44.4.2.2.1 to 3.44.4.2.2.4.

Each message shall be acknowledged by the HL7 v3 Accept Acknowledgement (MCCI_MT000200UV01), which is described in ITI TF-2x: Appendix O.

When two Patient identifiers are to be merged, the subsumed identifier is referenced in the
4250 Registry Trigger Event Control Act Wrapper and the payload is sent for the surviving identifier. For example, if Patients A, B, and C are all to be merged into Patient B, then two messages are sent. In the first message Patient A's identifier is referenced in the Registry Trigger Event Control Act Wrapper via the *replacementOf* act relationship and Patients B's identifier is referenced in the *Patient* class of the payload. In the second message Patient C's identifier is
4255 referenced in the wrapper, and Patient B's identifier is, again, in the payload.

The message information model in ITI TF-2b: 3.44.4.2.2.2 describes the relevant data elements for this transaction. Specific requirements for the particular actors are found in ITI TF-2b: 3.44.4.2.3 Expected Actions.

3.44.4.2.2.1 Major Components of the Patient Registry Duplicates Resolved

4260 **Patient**

The *Patient* class is the entry point to the R-MIM for the *Patient Demographics (PRPA_RM201303UV02)* in the Patient Identity Source. The patient identifier is represented using an Instance Identifier (II) data type. Please see ITI TF-2x: Appendix E for a detailed description about the use of the HL7 V3 II data type for patient identifiers.

4265 **Provider Organization**

The Patient class is scoped by the provider organization which is the assigning authority for the patient's identifier. For this message the provider organization class is optional. The HL7 definition of the CMET requires that the provider organization needs to be identified by an id attribute, and at least one of address, telecommunications address, or contact person to be
4270 present. The id attribute SHALL have only a root expressed as an ISO OID, and it shall match the root of the Patient.id attribute

Person

The *Person* class contains the name for the focal person (similarly to the requirement for the HL7 v2.x PID segment).

4275 3.44.4.2.2.2 Message Information Model of the Patient Registry Duplicates Resolved Message

Below is the Message Information Model for the Duplicates Resolved message, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict subset of the *Patient Demographics (PRPA_RM201303UV02)* RMIM.

4280 The base RMIM can be found on the HL7 V3 2008 Edition CD at Edition2008/domains/uvpa/editable/PRPA_RM201303UV.htm. The following restrictions were made on the original RMIMs to arrive at the restricted model:

> The focal entity choice is restricted to be only a person
>
> All optional classes are removed

4285 > All optional attributes in the Patient and Person class are removed

This restricted model makes clear the purpose of this message – it is to inform about the merge of identities in the Patient Identity Source. If there are any updates to the demographics of the patient in question, this information shall be relayed via a Patient Registry Record Revised message. This follows the semantics of the Patient Identity Feed transaction as defined in ITI TF-
4290 2a: 3.8, and is a restriction on the semantics of this message as defined by HL7 (where any demographics information can be updated with the Duplicates Resolved message).

The provider organization is also optionally available.
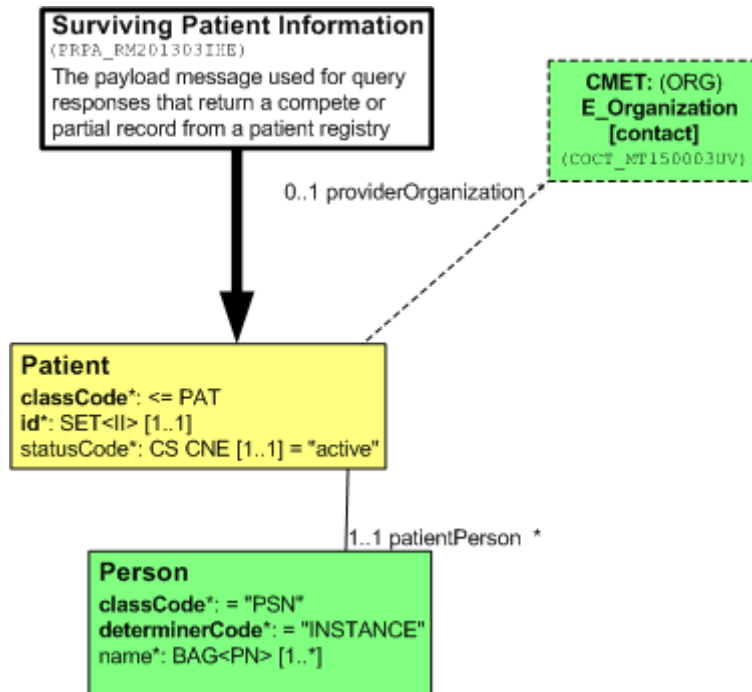
Figure 3.44.4.2.2-1

4295   The attributes of this model are described in the following table.

Table 3.44.4.2.2-1

PRPA_HD201303IHE Duplicates Resolved	This HMD extract defines the message used to report that two patient identifiers were merged (i.e., a duplicate was resolved). Derived from Figure 3.44.4.2.2-1 (PRPA_RM201303IHE)
Patient	The primary record for the focal person in a Patient Identity Source
classCode [1..1] (M) Patient (CS) {CNE:PAT}	Structural attribute; this is a "patient" role
id [1..*] (M) Patient (SET<II>)	Identifiers designated by various patient identity sources for the focal person
statusCode [1..1] Patient (CS) {CNE:active, fixed value= "active"}	A value specifying the state of this record in a patient registry (based on the RIM role class state-machine). This record is active.
Person	A subtype of LivingSubject representing a human being Both Person.name and Patient.id must be non-null
classCode [1..1] (M) Person (CS) {CNE:PSN, fixed value= "PSN"}	Structural attribute; this is a "person" entity
determinerCode [1..1] (M) Person (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	Structural attribute; this is a specific person
name [1..*] Person (BAG<PN>)	Name(s) for this person

3.44.4.2.2.3 Control Act and Transmission Wrappers

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.44.4.1.2-2 contains the Transmission and Control Act wrappers used for this
4300   interaction, and the associated constraints.

Table 3.44.4.2.2-3 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000100UV01 – Send Message Payload	MFMI_MT700701UV01 – Master File / Registry Notification Control Act, Role Subject
The value of interactionId SHALL be set to PRPA_IN201304UV02 The value of processingModeCode SHALL be set to T The acceptAckCode SHALL be set to AL There SHALL be only one receiver Device	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201304UV02 RegistrationEvent.statusCode SHALL be set to "active" There SHALL be an InReplacementOf act relationship The value of PriorRegistration.statusCode SHALL be "obsolete" There SHALL be a PriorRegisteredRole role There SHALL be a single PriorRegisteredRole.id attribute, representing the subsumed patient identifier.

The composite message schemas which describe the full payload of this interaction, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schemas from the HL7 V3 2008 Normative Edition can be found at

4305   Edition2008/processable/multicacheschemas/PRPA_IN201304UV02.xsd).

3.44.4.2.2.4 Web Services Types and Messages

The Patient Registry Resolve Duplicates message will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL naming conventions SHALL apply:

4310
```
"resolve duplicates" message -> "PRPA_IN201304UV02_Message"

Acknowledgement              -> "MCCI_IN000002UV01_Message"
```

The following WSDL snippet describes the types for these messages:

4315
```
 …
 <types>
    <xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-
org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
4320 schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201304UV02.xs
d"/>
<xsd:element name="PRPA_IN201304UV02"/>
</xsd:schema>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
4325 xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/MCCI_IN000002UV01.xs
d"/>
4330 <xsd:element name="MCCI_IN000002UV01"/>
</xsd:schema>
  </types>
…
```

The messages are described by the following snippet:

4335
```
      …
  <message name="PRPA_IN201304UV02_Message">
<part element="hl7:PRPA_IN201304UV02" name="Body"/>
  </message>
  <message name="MCCI_IN000002UV01_Message">
4340 <part element="hl7:MCCI_IN000002UV01" name="Body"/>
  </message>
      …
```

The port types for the WSDL describing the Resolved Duplicates Service are described together with the expected actions of the actors which receive these messages in ITI TF-2b: 3.44.4.2.3

4345   and 3.44.4.2.4.

3.44.4.2.3 Expected Actions – PIX Manager

The Patient Identifier Cross-reference Manager shall be capable of accepting attributes in the Resolve Duplicates message as specified in Table 3.44.4.2.2-1.

The Patient Identifier Cross-reference Manager shall perform the Expected Actions similar to the ones specified in ITI TF-2a: 3.8.4.2.3. The particular behavior is described below.

When the Patient Identifier Cross-reference Manager receives the Resolve Duplicates message type of the Patient Identity Feed transaction, it shall cross-reference the patient identifiers provided in the wrapper and the payload of the message by replacing any references it is maintaining internally to the patient ID provided in the wrapper by the patient ID included in the payload. After the identifier references are replaced, the Patient Identifier Cross-reference Manager shall reapply its internal cross-referencing logic/ policies before providing the updated information via either the PIX Query or PIX Notification Transactions.

3.44.4.2.3.1 Web Services Port Type and Binding Definitions

IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "PIXManager".

The following WSDL naming conventions SHALL apply:
```
wsdl:definitions/@name="PIXManager":
"merge" message  -> "PRPA_IN201304UV02_Message"
acknowledgement  -> "MCCI_IN000002UV01_Message"
portType         -> "PIXManager_PortType"
merge operation  -> "PIXManager_PRPA_IN201304UV02"
SOAP 1.2 binding -> "PIXManager_Binding_Soap12"
SOAP 1.2 port    -> "PIXManager_Port_Soap12"
```

The following WSDL snippets specify the Patient Identity Feed Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

3.44.4.2.3.1.1 Port Type

```
  <portType name="PIXManager_PortType">
    <operation name="PIXManager_PRPA_IN201304UV02">
<input message="tns:PRPA_IN201304UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201304UV02"/>
<output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
org:v3:MCCI_IN000002UV01"/>
</operation>
  </portType>
```

3.44.4.2.3.1.2 Bindings

SOAP 1.2 binding:
```
…
  <binding name="PIXManager_Binding_Soap12" type="PIXManager_PortType">
    <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="PIXManager_PRPA_IN201304UV02">
      <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201304UV02"/>
```

The line numbers 4350, 4355, 4360, 4365, 4370, 4375, 4380, 4385 appear in the left margin.

```
         <input>
4390       <wsoap12:body use="literal"/>
         </input>
         <output>
           <wsoap12:body use="literal"/>
         </output>
4395     </operation>
      </binding>
      …
```

An informative WSDL for the PIX Manager implementing the PIXV3 profile is available online
4400 on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.4.2.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.4.2.4 Expected Actions – Document Registry

The Document Registry shall be capable of accepting attributes in the Resolve Duplicates
4405 message as specified in Table 3.44.4.2.2.2-1. Other attributes may exist, but the Document
Registry shall ignore them.

The Document Registry shall perform the Expected Actions similar to the ones specified in ITI
TF-2a: 3.8.4.2.4. The particular behavior is described below.

When the Document Registry receives the Resolve Duplicates message of the Patient Identity
4410 Feed transaction, it shall merge the patient identity specified in the PriorRegistrationRole.id
attribute of the Control-Act wrapper (subsumed patient identifier) into the patient identity
specified in Patient.id attribute of the message payload (surviving patient identifier) in its
registry. After the merge, all Document Submission Sets (including all Documents and Folders
beneath them) under the secondary patient identity before the merge shall point to the primary
4415 patient identity. The secondary patient identity shall no longer be referenced in the future
services provided by the Document Registry.

Changes resulting from a Resolve Duplicates message are not reversible. No un-resolve message
is supported by this transaction.

See ITI TF-2a: 3.18.4.1.2.3.8.1 of the Technical Framework for details of how this message type
4420 affects results of a Stored Query transaction and the end of ITI TF-2a: 3.14.4.1.2.12 to see how it
affects the Register transaction.

A Resolve Duplicates message contains two attributes of interest:

- PriorRegistrationRole.id – subsumed patient identifier: the patient identifier which is to
  become obsolete
4425 - Patient.id – surviving patient identifier: the patient identifier which is to remain active.

After a duplicate resolution, the Patient.id attribute represents all records formerly represented by
either the Patient.id attribute or the PriorRegistrationRole.id attribute. All other attributes may be
ignored.

4430 The following conditions shall be detected by the Document Registry. Messages containing these conditions shall not update the state of the Document Registry.

- The subsumed patient identifier is not issued by the correct Assigning Authority according to the Affinity Domain configuration.

- The surviving patient identifier is not issued by the correct Assigning Authority according to the Affinity Domain configuration.

4435 - The subsumed and surviving patient identifiers are the same.

- The subsumed patient identifier has already been subsumed by an earlier message.

- The surviving patient identifier has already been subsumed by and earlier message.

- The subsumed patient identifier does not convey a currently active patient identifier known to the Document Registry.

4440 If none of the above conditions occur then the Document Registry shall perform the following duties:

1. Records the merge. Only the subsumed and surviving patient identifiers need be remembered. A patient identifier merge affects the processing of future Register Document Set [ITI-14] transactions. See ITI TF-2a: 3.14.4.1.2.12 XDS Registry Adaptor for details.

2. Multiple merge transactions can form a recorded merge chain, where the Subsumed identifier of the current merge is the Surviving identifier of a previous merge.

3. Register Document Set transactions referencing a subsumed identifier are rejected with an XDSUnknownPatientId error.

4450 4. Stored Query transactions referencing a subsumed identifier return no content.

5. Stored Query transactions referencing a surviving identifier successfully match the entire recorded merge chain and return appropriate metadata.

6. No change in the Registry Query transaction.

4455 Note: This transaction does not specify how the merge is to be implemented. It may or may not change the stored form of the metadata. It only specifies the observable results from the perspective of the Registry Stored Query transaction [ITI-18] and the Register Document Set transaction [ITI-14].

3.44.4.2.4.1 Web Services Port Type and Binding Definitions

IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "DocumentRegistry".

The following WSDL naming conventions SHALL apply:

4460
```
wsdl:definitions/@name="DocumentRegistry":
"resolve duplicates" message  -> "PRPA_IN201304UV02_Message"
acknowledgement               -> "MCCI_IN000002UV01_Message"
portType                      -> "DocumentRegistry_PortType"
resolve duplicates operation  -> "DocumentRegistry_PRPA_IN201304UV02"
4465
SOAP 1.2 binding              -> "DocumentRegistry_Binding_Soap12"
SOAP 1.2 port                 -> "DocumentRegistry_Port_Soap12"
```

The following WSDL snippets specify the Patient Identity Feed Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

3.44.4.2.4.1.1 Port Type

```
<portType name="DocumentRegistry_PortType">
    <operation name="DocumentRegistry_PRPA_IN201304UV02">
<input message="tns:PRPA_IN201304UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201304UV02"/>
<output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
org:v3:MCCI_IN000002UV01"/>
</operation>
    </portType>
```

3.44.4.2.4.1.2 Bindings

SOAP 1.2 binding:

```
…
    <binding name="DocumentRegistry_Binding_Soap12"
type="DocumentRegistry_PortType">
    <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="DocumentRegistry_PRPA_IN201304UV02">
<wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201304UV02"/>
      <input>
        <wsoap12:body use="literal"/>
      </input>
      <output>
        <wsoap12:body use="literal"/>
      </output>
    </operation>
    </binding>
…
```

An informative WSDL for the Document Registry implementing the XDS.b profile is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.4.2.4.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.44.5 Security Requirements

This transaction is generally used in profiles that require actors to be grouped with a Secure Node as defined in the IHE Audit Trail and Node Authentication Integration profile. This use of the ATNA profile in an XDS Affinity Domain does not require a centralized XDS Affinity Domain Audit Record Repository.

The use of ATNA along with XDS does require that each member of the XDS Affinity Domain have audit and security mechanisms in place. See ITI TF-1: Appendix G and ITI-TF-2x: Appendix K.

The individual actors involved are often members of different secure domains. The data transfers between different secure domains need different protection than transfers within a secure domain and shall be encrypted with TLS authentication of both hosts.

4515   Transfers within a single secure domain may choose to omit encryption if it is unnecessary, so it is recommended that the online transfer security mechanisms be configurable. Certificate management and exchange is defined as part of the XDS Affinity Domain business relationships and no IHE Integration Profile is specified at this time, see ITI TF-1: Appendix L.

Each transaction will result in audit records describing the transaction. Each secure domain has its own audit server to capture the records for the actors that are within that domain. Access to
4520   audit records by other enterprises within the XDS Affinity Domain is managed and controlled by the business relationship terms of the XDS Affinity Domain. There is no automatic IHE transaction for such access.

3.44.5.1 Security Audit Record

When grouped with ATNA Secure Node or Secure Application actors, this transaction is to be
4525   audited as "Patient Record" event, as defined in table 3.20.6-1. The following tables show items that are required to be part of the audit record for this transaction.

Logically, a merge operation consists of a delete on one patient record, and an update of another patient record. Separate audit records shall be written for the delete operation and the update operation.

4530   ### 3.44.5.1.1 Patient Identity Source audit message

	Field Name	Opt	Value Constraints
Event **AuditMessage/ EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"C" (create) , "U" (update), or "D" (delete) as appropriate
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-44", "IHE Transactions", "Patient Identity Feed")
Source (Patient Identity Source Actor) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Manager or Document Registry) (1)			
Audit Source (Patient Identity Source Actor) (1)			
Patient (1)			

Where:

Source **AuditMessage/** **ActiveParticipant**	UserID	M	the content of the <wsa:ReplyTo/> element
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.
Human **Requestor (if** **known)** **AuditMessage/** **ActiveParticipant**	UserID	M	identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination **AuditMessage/** **ActiveParticipant**	UserID	M	SOAP endpoint URI.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	*U*	*not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient **(AudittMessage/** **ParticipantObjectIdentifi** **cation)**	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format (see ITI TF-2x: appendix E)
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	M	Type=II (the literal string), Value=the value of message.id

4535

3.44.5.1.2 Patient Identifier Cross-reference Manager audit message

	Field Name	**Opt**	**Value Constraints**
Event	EventID	M	EV(110110, DCM, "Patient Record")

	EventActionCode	M	"C" (create) , "U" (update), or "D" (delete) as appropriate
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-44", "IHE Transactions", "Patient Identity Feed")

Source (Patient Identity Source Actor) (1)
Destination (Patient Identifier Cross-reference Manager or Document Registry) (1)
Audit Source (Patient Identifier Cross-reference Manager or Document Registry) (1)
Patient(1)

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	the content of the <wsa:ReplyTo/> element
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Destination AuditMessage/ ActiveParticipant	UserID	M	SOAP endpoint URI
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	*U*	*not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

4540

Patient (AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format (see ITI TF-2x: appendix E).
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*M*	Type=II (the literal string), Value=the value of message.id

3.44.5.1.3 Document Registry audit message

Document Registry audit message are the same as Patient Identifier Cross-reference Manager audit message as presented in section ITI TF-2b: 3.44.5.1.2

4545

3.45 PIXV3 Query

This section corresponds to Transaction ITI-45 of the IHE IT Infrastructure Technical Framework. Transaction ITI-45 is used by the Patient Identifier Cross-reference Consumer and Patient Identifier Cross-reference Manager actors.

4550 **3.45.1 Scope**

The scope is identical to ITI TF-2a: 3.9.1, PIX Query Scope.

3.45.2 Use Case Roles
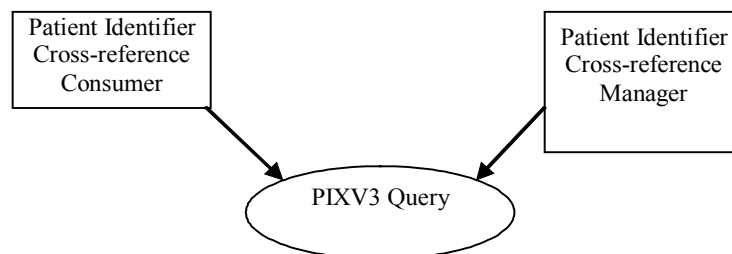
Actor: Patient Identifier Cross-reference Consumer

4555 **Role:** Queries the Patient Identifier Cross-reference Manager for a list of corresponding patient identifiers, if any

> **Corresponding HL7 v3 Application Roles**:
>
> Patient Registry Query Placer (PRPA_AR201303UV02)

Actor: Patient Identifier Cross-reference Manager

4560 **Role:** Manages the cross-referencing of patient identifiers across Patient Identification Domains. Upon request it returns a list of corresponding patient identifiers, if any.

> **Corresponding HL7 v3 Application Roles:**
>
> Patient Registry Query Fulfiller (PRPA_AR201304UV02)

3.45.3 Referenced Standards

4565 HL7 Version 3 Edition 2008 Patient Administration DSTU, Patient Topic (found at http://www.hl7.org/memonly/downloads/v3edition.cfm#V32008)

Implementers of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V Web Services for IHE Transactions.

3.45.4 Interaction Diagrams
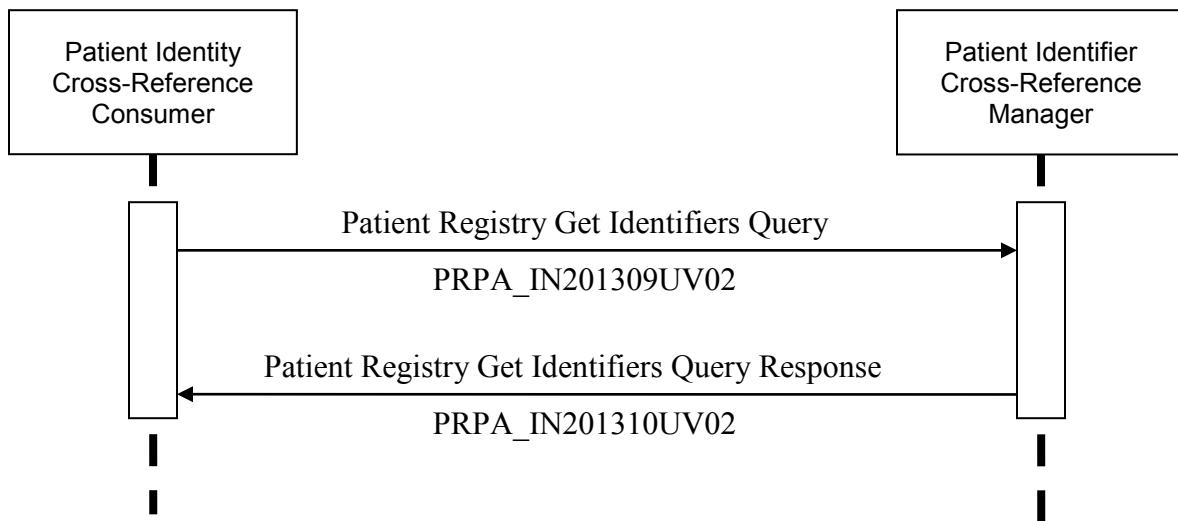
4570

3.9B-1 Get Corresponding Identifiers Sequence

3.45.4.1 Get Corresponding Identifiers

3.45.4.1.1 Trigger Events

A Patient Identifier Cross-reference Consumer's need to get the patient identifier associated with
4575   a domain for which it needs patient related information will trigger the request for
corresponding patient identifiers message based on the following HL7 trigger event:

Patient Registry Get Identifiers Query (PRPA_TE201309UV02)

This query requests all other identifiers associated with a particular person identifier.

3.45.4.1.2 Message Semantics

4580   The Get Corresponding Identifiers transaction is initiated by the HL7 Patient Registry Query by
Identifier (PRPA_MT201307UV02) message. The Patient Identifier Cross-reference Consumer
shall generate the query message whenever it needs to obtain corresponding patient identifier(s)
from other Patient Identification Domain(s). The components of the message listed below are
required, and their detailed descriptions are provided in the following subsections.

4585   The receiver shall respond to the query by sending the Patient Identifiers message
(PRPA_MT201304UV02), which uses the Application Level Acknowledgement transmission
wrapper. This satisfies the requirements of original mode acknowledgment; no intermediate
Accept Acknowledgement message is to be sent. All appropriate identifiers shall be returned in a
single response; therefore no continuation queries are allowed in this transaction.

4590

3.45.4.1.2.1 Major Components of the Patient Registry Query by Identifier

PatientIdentifier Parameter

This required parameter specifies the identifier associated with the person whose information is being queried. For this parameter item, a single patient identifier is specified in the PatientIdentifier.value attribute. Please see Appendix E for the use of the II data type for patient identifiers.

DataSource Parameter

This optional parameter specifies the assigning authority/authorities of the Patient Identity Domain(s) whose identifiers need to be returned. If no such parameter is supplied, the PIX Manager is required to return the identifiers from all known Patient Identity Domains.

3.45.4.1.2.2 Message Information Model of the Patient Registry Query by Identifier Message

Below is the Message Information Model for the Query by Identifier message, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict subset of the *Patient Registry Query by Identifier (PRPA_RM201307UV02) RMIM.*

The base RMIM can be found on the HL7 V3 2008 Edition CD at Edition2008/domains/uvpa/editable/PRPA_RM201307UV.htm. The following restrictions were made on the original RMIMs to arrive at the restricted model:

Exactly one PatientIdentifier parameter SHALL be present

Exactly one PatientIdentifier.value attribute SHALL be present

If one or more DataSource parameters are present, each SHALL contain exactly one DataSource.value parameter

The optional attributes ParameterList.id, QueryByParameter responseElementGroupId, QueryByParameter.modifyCode, and QueryByParameter.executionAndDeliveryTime were removed from the model

QueryByParameter.responsePriorityCode is required and is fixed to I (Immediate)

QueryByParameter.statusCode is defaulted to "new".

4620
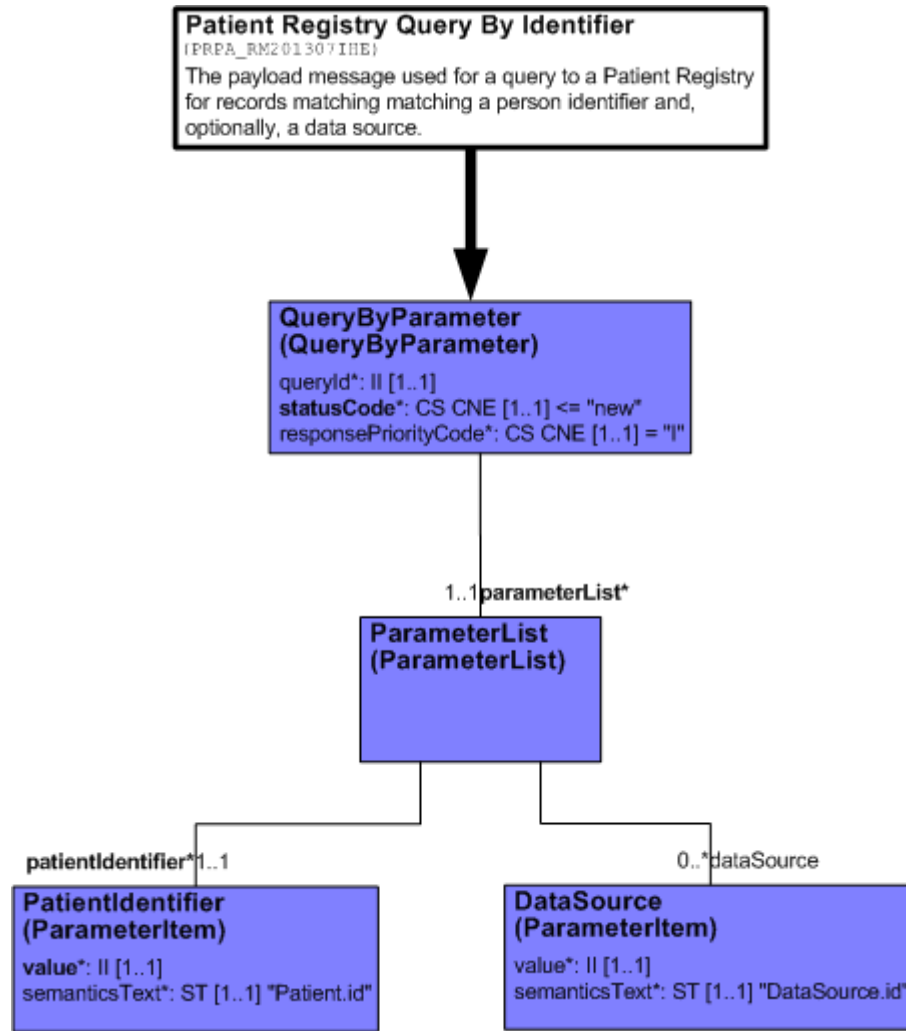
Figure 3.45.4.1.2-1

The attributes of this model are described in the following table.

Table 3.45.4.1.2-2

PRPA_HD201307IHE Patient Registry Query by Identifier	This HMD extract defines the message used to query a patient registry for a list of identifiers. Derived from Figure 3.45.4.1.2-1 (PRPA_RM201307IHE)
QueryByParameter	The entry point for the domain content in this query
queryId [1..1] QueryByParameter (II)	Unique identifier for the query
statusCode [1..1] (M) QueryByParameter (CS) {CNE:QueryStatusCode, fixed value="new"}	There are no continuations necessary for this type of query, so the status is always "new"
responsePriorityCode [1..1] QueryByParameter (CS) {CNE:QueryPriority, fixed value="I"}	The PIX manager is required to send an immediate response.
DataSource	Optional parameter specifying the assigning authority of a Patient

PRPA_HD201307IHE Patient Registry Query by Identifier	This HMD extract defines the message used to query a patient registry for a list of identifiers. Derived from Figure 3.45.4.1.2-1 (PRPA_RM201307IHE)
	Identity Domain
value [1..1] ParameterItem (II)	The identifier for the Patient Identity Domain's assigning authority. IHE restriction: The value.root attribute SHALL be a valid ISO OID The value.extension attribute SHALL NOT be present
semanticsText [1..1] ParameterItem (ST){default= "DataSource.id"}	
PatientIdentifier	
value [1..1] (M) ParameterItem (II)	The patient identifier known to the PIX Consumer
semanticsText [1..1] ParameterItem (ST){default= "Patient.id"}	

4625 The Patient Identifier Cross-reference Consumer shall provide the patient identifier in the PatientIdentifier.value attribute according to the rules specified in ITI TF-2x: Appendix E.

If the requesting system wishes to select the Patient Identity Domains from which patient identifiers are returned, it does so by sending as many DataSource parameters as domains for which it wants to receive patient identifiers. Each instance of the DataSource parameter shall
4630 provide the Assigning Authority identifier for a specific domain using the DataSource.value attribute. Note that the DataSource.value.extension attribute shall not be provided, and the DataSource.value.root attribute shall contain a valid ISO OID. The responding system shall return the Patient.id value for each requested domain, if a value is known. Note that the value of Patient.id.root attribute shall match the DataSource.value.root attribute representing the
4635 corresponding Assigning Authority.

If no DataSource parameter is specified the Patient Identifier Cross-reference Manager shall return patient identifiers for all domains for which it possesses a corresponding identifier (subject to local publication restrictions).

3.45.4.1.2.3 Control Act and Transmission Wrappers

4640 Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.44.4.1.2-2 contains the Transmission and Control Act wrappers used for this interaction, and the associated constraints.

Table 3.45.4.1.2-4 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000100UV01 – Send Message Payload	QUQI_MT021001UV01 – Query Control Act Request: Query By Parameter
The value of interactionId SHALL be set to PRPA_IN201309UV02	The value of ControlActProcess.moodCode SHALL be set to EVN

Transmission Wrapper	Trigger Event Control Act Wrapper
The value of processingModeCode SHALL be set to T	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201309UV02
The acceptAckCode SHALL be set to AL	The value of authroOrPerformer.typeCode SHALL be set to AUT
There SHALL be only one receiver Device	

4645 The composite message schemas which describe the full payload of this interaction, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schemas from the HL7 V3 2008 Normative Edition are at Edition2008/processable/multicacheschemas/PRPA_IN201309UV02.xsd).

3.45.4.1.2.4 Web Services Types and Messages

4650 The Patient Registry Query by Identifier message and response will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL naming conventions SHALL apply:
```
Query by Identifier -> "PRPA_IN201309UV02_Message"
Query Response      -> "PRPA_IN201310UV02_Message"
```

4655 The following WSDL snippet describes the types for these messages:
```
    …
 <types>
     <xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-
org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201309UV02.xs
d"/>
<xsd:element name="PRPA_IN201309UV02"/>
</xsd:schema>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201310UV02.xs
d"/>
<xsd:element name="PRPA_IN201310UV02"/>
</xsd:schema>
   </types>
…
```

The messages are described by the following snippet:
```
    …
  <message name="PRPA_IN201309UV02_Message">
<part element="hl7:PRPA_IN201309UV02" name="Body"/>
  </message>
  <message name="PRPA_IN201310UV02_Message">
<part element="hl7:PRPA_IN201310UV02" name="Body"/>
  </message>
```

4685   The port types for the WSDL describing the Resolved Duplicates Service are described together
with the expected actions of the actors which receive these messages in sections ITI TF-2b:
3.45.4.1.3.

3.45.4.1.3 Expected Actions

The Patient Identifier Cross-reference Manager shall be capable of accepting attributes as
4690   specified in Table 3.45.4.1.2-1 above.

The Patient Identifier Cross-reference Manager shall be capable of accepting multiple concurrent
PIX Query requests (Get Corresponding Identifiers messages) and responding correctly using the
Return Corresponding Identifiers message.

3.45.4.1.3.1 Web Services Port Type and Binding Definitions

4695   **IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "PIXManager".**

The following WSDL naming conventions SHALL apply:

```
wsdl:definitions/@name="PIXManager":
"get identifiers" query    -> "PRPA_IN201309UV02_Message"
"get identifiers" response -> "PRPA_IN201310UV02_Message"
portType                   -> "PIXManager_PortType"
get identifiers operation  -> "PIXManager_PRPA_IN201309UV02"
SOAP 1.2 binding           -> "PIXManager_Binding_Soap12"
SOAP 1.2 port              -> "PIXManager_Port_Soap12"
```

4700

4705   The following WSDL snippets specify the PIXV3 Query Port Type and Binding definitions,
according to the requirements specified in ITI TF-2x: Appendix V.

3.45.4.1.3.1.1 Port Type

4710
```
<portType name="PIXManager_PortType">
    <operation name="PIXManager_PRPA_IN201309UV02">
<input message="tns:PRPA_IN201309UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201309UV02"/>
<output message="tns:PRPA_IN201310UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201310UV02"/>
</operation>
    </portType>
```
4715

3.45.4.1.3.1.2 Bindings

SOAP 1.2 binding:

4720
```
…
  <binding name="PIXManager_Binding_Soap12" type="PIXManager_PortType">
    <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="PIXManager_PRPA_IN201309UV02">
      <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201309UV02"/>
      <input>
        <wsoap12:body use="literal"/>
      </input>
```
4725

```
        <output>
          <wsoap12:body use="literal"/>
4730    </output>
      </operation>
    </binding>
…
```

4735   An informative WSDL for the PIX Manager implementing the PIXV3 profile is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.45.4.1.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.45.4.2 Return Corresponding Identifiers

4740   ### 3.45.4.2.1 Trigger Events

The Patient Identifier Cross-reference Manager's response to the Get Corresponding Identifiers message will trigger the following message:

Patient Registry Get Identifiers Query Response (PRPA_TE201310UV02)

This query response returns all other identifiers associated with a particular person identifier.

4745   ### 3.45.4.2.2 Message Semantics

The Return Corresponding Identifiers message is conducted by the HL7 Patient Identifiers message. The Patient Identifier Cross-reference Manager shall generate this message in direct response to the Patient Registry Query by Identifier message previously received. This message satisfies the Application Level, Original Mode Acknowledgement for the query message.

4750   ### 3.45.4.2.2.1 Major Components of the Get Corresponding Identifiers Query Response

Patient

The *Patient* class is the entry point to the R-MIM for the *Patient Identifiers (PRPA_RM201304UV02)*. This is where at least one of the requested patient IDs will be listed.

4755   **Person**

The *Person* class contains the name of the patient for additional verification purposes.

Provider Organization

The Patient class is optionally scoped by the provider organization where this person is a patient. The HL7 definition of the CMET requires that the provider organization needs to be identified
4760   by an id attribute, and at least one of address, telecommunications address, or contact person to be present. The id attribute SHALL have only a root, expressed as an ISO OID, and at least one

of the id attributes of the Patient class SHALL have a matching root component. (see ITI TF-2x: Appendix E on the use of the II data type for patient identifiers).

Other Identifiers

4765   The *OtherIDs* class can optionally be used to capture other identifiers associated with the person such as a driver's license number or social security number. It is important to recognize that the HL7 RIM distinguishes between person-level IDs and patient-level IDs. In this transaction, however, the Patient Identity Cross-Reference Manager has the option to send all identifiers in the id attributes of the Patient class. If that is the case, the OtherIDs class shall not be used. For

4770   the purposes of interoperability where both HL7 V3 and HL7 v2.x based transactions are used, and the OtherIDs class is present, the following requirement is imposed on the OtherIDs.id attribute and on the scopingOrganization.id attribute:

> OtherIDs.id.root SHALL be identical to scopingOrganization.id.root

> scopingOrganization.id.extension SHALL NOT have any value

4775   **3.45.4.2.2.2 Message Information Model of the Patient Identifiers Message**

Below is the Message Information Model for the Patient Identifiers message, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict subset of the *Patient Identifiers (PRPA_RM201304UV02)* RMIM.

The base RMIM can be found on the HL7 V3 2008 Edition CD at

4780   Edition2008/domains/uvpa/editable/PRPA_RM201304UV.htm. The following restrictions were made on the original RMIMs to arrive at the restricted model:

- The focal entity choice is restricted to be only a person
- All optional classes are removed, except for the provider organization, and other identifiers
- All optional attributes in the Patient and Person class are removed

4785
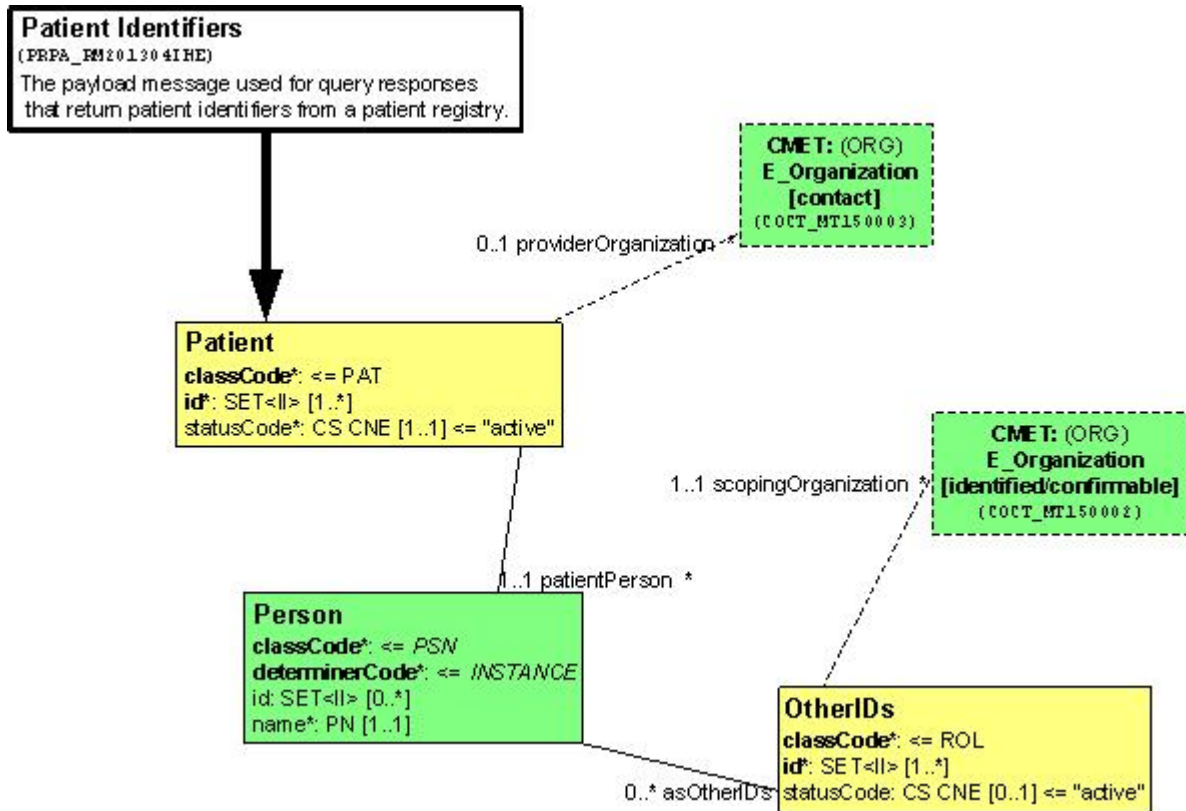
Figure 3.45.4.2.2-1

The attributes of this model are described in the following table.

4790

Table 3.45.4.2.2-3

PRPA_HD201304IHE PatientIdentifiers	This HMD extract defines the message used to respond to the Patient Registry Query By Identifier Derived from Figure 3.45.4.2.2-1 (PRPA_RM201304IHE)
Patient	The primary record for the focal person in a Patient Identity Cross-Reference Manager
classCode [1..1] (M) Patient (CS) {CNE:PAT}	Structural attribute; this is a "patient" role
id [1..*] (M) Patient (SET<II>)	Linked patient identifiers from one or more Patient Identity Domains
statusCode [1..1] Patient (CS) {CNE:active, fixed value= "active"}	A value specifying the state of this record in a patient registry (based on the RIM role class state-machine). This record is active.
Person	A subtype of LivingSubject representing a human being Both Person.name and Patient.id must be non-null
classCode [1..1] (M) Person (CS) {CNE:PSN, fixed value= "PSN"}	Structural attribute; this is a "person" entity
determinerCode [1..1] (M)	Structural attribute; this is a specific person

PRPA_HD201304IHE PatientIdentifiers	This HMD extract defines the message used to respond to the Patient Registry Query By Identifier Derived from Figure 3.45.4.2.2-1 (PRPA_RM201304IHE)
Person (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	
name [1..*] Person (BAG<PN>)	Name(s) for this person
OtherIDs	Used to capture additional identifiers for the person such as a Drivers' license or Social Security Number.
classCode [1..1] (M) Role (CS) {CNE:ROL}	Structural attribute. This can be any specialization of "role"
id [1..*] (M) Role (SET<II>)	One or more identifiers issued to the focal person by the associated scopingOrganization (e.g., a Driver's License number issued by a DMV)

3.45.4.2.2.3 Control Act and Transmission Wrappers

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.44.4.1.2-2 contains the Transmission and Control Act wrappers used for this interaction, and the associated constraints.

4795

Table 3.45.4.4.2-5 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000300UV01 – Send Application Acknowledgement	MFMI_MT700711UV01 – Master File/Registry Query Response Control Act (Role Subject)
The value of interactionId SHALL be set to PRPA_IN201310UV02 The value of processingModeCode SHALL be set to T The acceptAckCode SHALL be set to NE There SHALL be only one receiver Device	The value of ControlActProcess.moodCode SHALL be set to EVN
	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201310UV02
	There SHALL be zero or one RegistrationEvents present in this message.
	If a RegistrationEvent is part of the message, there SHALL be exactly one Patient role present in the payload.
	There SHALL be no replacementOf act-relationship present in this message
	There SHALL be a QueryByParameter copy of the original query.

The composite message schemas which describe the full payload of this interaction, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schema from the HL7 V3 2008 Normative Edition are at

4800   Edition2008/processable/multicacheschemas/PRPA_IN201310UV02.xsd).

3.45.4.2.2.4 Web Services Types and Messages

Since this is a response to a query, please see ITI TF-2b: 3.45.4.1.2.4 for the web services components of this message.

3.45.4.2.3 Expected Actions - Patient Identifier Cross-reference Manager

4805 The Patient Identifier Cross-reference Manager shall return the attributes within the message that are required by the HL7 standard, as shown in Figure 3.45.4.2.2-1.

A RegistrationEvent, and the associated Patient class are returned only when the Patient Identifier Cross-reference Manager recognizes the specified Patient ID in the query parameter, and an identifier exists for the specified patient in at least one other domain. The Patient
4810 Identifier Cross-reference Manager shall use at one or more Patient.id attributes (and, optionally, zero or more OtherIDs.id attributes) to convey the patient IDs which uniquely identify the patient within each Patient Identification Domain. The identifiers are captured using an Instance Identifier (II) data type. See Appendix E for a detailed description of the use of the II data type for patient identifiers.

4815 It is wholly the responsibility of the Patient Identifier Cross-reference Manager to perform the matching of patient identifiers based on the patient identifier it receives. The information provided by the Patient Identifier Cross-reference Manager to the Patient Identifier Cross-reference Consumer is a list of cross-referenced identifiers in one or more of the domains managed by the Patient Identifier Cross-reference Manager, in addition to the original identifier
4820 used in the query. The identifier used in the query is returned only in the copy of the QueryByParameter parameter list. The list of cross-references is not made available until the set of policies and processes for managing the cross-reference function have been completed. The policies of administering identities adopted by the cooperating domains are completely internal to the Patient Identifier Cross-reference Manager and are outside of the scope of this framework.
4825 Possible matches should not be communicated until the healthcare institution policies and processes embodied in the Patient Identifier Cross-reference Manager reach a positive matching decision.

The Patient Identifier Cross-reference Manager shall respond to the query request as described by the following 6 cases:

4830 **Case 1**: The Patient Identifier Cross-reference Manager recognizes the specified Patient ID sent by the Patient Identifier Cross-reference Consumer in PatientIdentifier.value, and corresponding identifiers exist for the specified patient in at least one of the domains requested in DataSource.value (one identifier per domain). (See Case 6 below for the required behavior if there are multiple identifiers recognized within a given Identifier Domain by the Patient
4835 Identifier Cross-reference Manager.)

AA (application accept) is returned in Acknowledgement.typeCode (transmission wrapper).

OK (data found, no errors) is returned in QueryAck.queryResponseCode (control act wrapper).

A single RegistrationEvent class is returned, where at least one of the identifiers, which the Patient Identifier Cross-reference Manager did recognize as belonging to a requested domain, is
4840 returned in Patient.id. Subsequent such identifiers, if any, are returned in either Patient.id or OtherIDs.id, not including the queried-for patient identifier that is returned in the QueryByParameter parameter list (control act wrapper).

Case 2: The Patient Identifier Cross-reference Manager recognizes the specified Patient ID sent by the Patient Identifier Cross-reference Consumer in PatientIdentifier.value, there are no

4845 specific domains requested in the query (no DataSource parameters are present), and corresponding identifiers exist for the specified patient in at least one other domain known to the Patient Identifier Cross-reference Manager (one identifier per domain).

AA (application accept) is returned in Acknowledgement.typeCode (transmission wrapper).

OK (data found, no errors) is returned in QueryAck.queryResponseCode (control act wrapper).

4850 A single RegistrationEvent class is returned, where at least one of the identifiers, which the Patient Identifier Cross-reference Manager did recognize as belonging to a domain different from the domain of the queried-for patient identifier, is returned in Patient.id. Subsequent such identifiers, if any, are returned in either Patient.id or OtherIDs.id, not including the queried-for patient identifier, which is returned in the QueryByParameter parameter list (control act
4855 wrapper).

Case 3: The Patient Identifier Cross-reference Manager recognizes the specified Patient ID sent in PatientIdentifier.value, but no identifier exists for that patient in any of the domains sent in DataSource.value.

AA (application accept) is returned in Acknowledgement.typeCode (transmission wrapper).

4860 **NF** (no data found, no errors) is returned in QueryAck.queryResponseCode (control act wrapper).

No RegistrationEvent is returned.

The queried-for patient identifier is returned in the QueryByParameter parameter list (control act wrapper).

4865 **Case 4**: The Patient Identifier Cross-reference Manager does not recognize the Patient ID sent in the PatientIdentifier.value.

AE (application error) is returned in Acknowledgement.typeCode (transmission wrapper) and in QueryAck.queryResponseCode (control act wrapper).

No RegistrationEvent is returned.

4870 The queried-for patient identifier is returned in the QueryByParameter parameter list (control act wrapper).

An AcknowledgmentDetail class is returned in which the attributes typeCode, code, and location are valued as follows.

Attribute	VALUE
typeCode	E
code	204 (Unknown Key Identifier)
location	XPath expression for the value element of the PatientIdentifier parameter

4875 **Case 5**: The Patient Identifier Cross-reference Manager does not recognize one or more of the Patient Identification Domains for which an identifier has been requested.

AE (application error) is returned in Acknowledgement.typeCode (transmission wrapper) and in QueryAck.queryResponseCode (control act wrapper).

No RegistrationEvent is returned.

4880   The queried-for patient identification domains are returned in the QueryByParameter parameter list (control act wrapper).

For each domain that was not recognized, an AcknowledgmentDetail class is returned in which the attributes typeCode, code, and location are valued as follows:

Attribute	VALUE
typeCode	E
Code	204 (Unknown Key Identifier)
Location	XPath expression for the value element of the DataSource parameter (which includes the repetition number of the parameter)

4885   **Case 6**: The Patient Identifier Cross-reference Manager recognizes the specified Patient ID sent by the Patient Identifier Cross-reference Consumer in PatientIdentifier.value, and corresponding identifiers exist for the specified patient in at least one of the domains requested in DataSource.value, and there are multiple identifiers within at least one of the requested domains.

AA (application accept) is returned in Acknowledgement.typeCode (transmission wrapper).

4890   **OK** (data found, no errors) is returned in QueryAck.queryResponseCode (control act wrapper)

A single RegistrationEvent class is returned, where at least one of the identifiers, which the Patient Identifier Cross-reference Manager did recognize as belonging to a requested domain, is returned in Patient.id. Subsequent such identifiers, if any, are returned in either Patient.id or OtherIDs.id, not including the queried-for patient identifier that is returned in the

4895   QueryByParameter parameter list (control act wrapper).

If the Patient Identifier Cross-reference Manager chooses to return multiple identifiers associated with the same domain, it shall return these identifiers either grouped in a single instance of the OtherIDs class, or all represented via repetitions of the Patient.id attribute.

3.45.4.2.3.1 Web Services Port Type and Binding Definitions

4900   The WSDL snippets for this message are shown in ITI TF-2b: 3.45.4.1.3.1

3.45.4.2.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.45.4.2.4 Expected Actions - Patient Identifier Cross-reference Consumer

The Patient Identifier Cross-reference Consumer will use the list of patient identifier aliases

4905   provided by the Patient Identifier Cross-reference Manger to perform the functions, for which it requested the list. The identifiers found in both Patient.id and OtherIDs.id attributes shall be considered together to form a complete list of patient identifiers from the different Patient Identity domains (either requested or available).

In the case where the returned list of identifiers contains multiple identifiers for a single domain, the Patient Identifier Cross-reference Consumer shall either use ALL of the multiple identifiers from the given domain or it shall ignore ALL of the multiple identifiers from the given domain.

This allows Patient Identifier Cross-reference Consumers capable of handling multiple identities for a single patient within a single domain (i.e., those that can correctly aggregate the information associated with the different identifiers) to do so. For those Patient Identifier Cross-reference Consumers not capable of handling this situation, ignoring the entire list of different identifiers prevents the consumer from presenting incomplete data.

3.45.5 Security Requirements

No transaction specific security considerations.

3.45.5.1 Audit Record Considerations

When grouped with ATNA Secure Node or Secure Application actors, this transaction is to be audited as "Query Information" event, as defined in table 3.20.6-1. The following tables show items that are required to be part of the audit record for this transaction.

3.45.5.1.1 Patient Identifier Cross-reference Consumer audit message:

	Field Name	Opt	Value Constraints
Event AuditMessage/ EventIdentification	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-45", "IHE Transactions", "PIX Query")
Source (Patient Identifier Cross-reference Consumer) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Manager) (1)			
Audit Source (Patient Identity Cross-reference Consumer) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

Source **AuditMessage/** **ActiveParticipant**	UserID	M	the content of the <wsa:ReplyTo/> element
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) **AuditMessage/** **ActiveParticipant**	UserID	M	identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination **AuditMessage/** **ActiveParticipant**	UserID	M	SOAP endpoint URI
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	*U*	*not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient **(AudittMessage/** **ParticipantObjectIdentifi** **cation)**	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format (see ITI TF-2x: appendix E).
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Query Parameters **(AudittMessage/** **ParticipantObjectIdentifi** **cation)**	ParticipantObjectTypeCode	M	"2" (system object)
	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-45", "IHE Transactions", "PIX Query")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	*U*	*not specialized*

	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	M	the QueryByParameter segment of the query, base64 encoded
	ParticipantObjectDetail	U	not specialized

4930 ### 3.45.5.1.2 Patient Identifier Cross-reference Manager audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-45", "IHE Transactions", "PIX Query")

Source (Patient Identifier Cross-reference Manager) (1)
Destination (Patient Identifier Cross-reference Consumer) (1)
Audit Source (Patient Identifier Cross-reference Manager) (1)
Patient (0..n)
Query Parameters(1)

Where:

	UserID	M	the content of the <wsa:ReplyTo/> element
Source **AuditMessage/** **ActiveParticipant**	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

	UserID	M	SOAP endpoint URI
Destination **AuditMessage/** **ActiveParticipant**	*AlternativeUserID*	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

	AuditSourceID	*U*	*not specialized.*
Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditEnterpriseSiteID*	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

	ParticipantObjectTypeCode	M	"1" (Person)
Patient **(AudittMessage/** **ParticipantObjectIdentifi** **cation)**	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format (see ITI TF-2x: appendix E).

_____

	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Query Parameters *(AudittMessage/ ParticipantObjectIdentifi cation)*	ParticipantObjectTypeCode	M	"2" (system object)
	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-45", "IHE Transactions", "PIX Query")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	*U*	*not specialized*
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	M	the QueryByParameter segment of the query, base64 encoded
	ParticipantObjectDetail	U	not specialized

4935

3.46 PIXV3 Update Notification

This section corresponds to Transaction ITI-46 of the IHE IT Infrastructure Technical Framework. Transaction ITI-46 is used by the Patient Identifier Cross-reference Consumer and Patient Identifier Cross-reference Manager actors.

4940 **3.46.1 Scope**

The scope is identical to the scope of transaction ITI-10, described in section ITI TF-2a: 3.10.1.

3.46.2 Use Case Roles
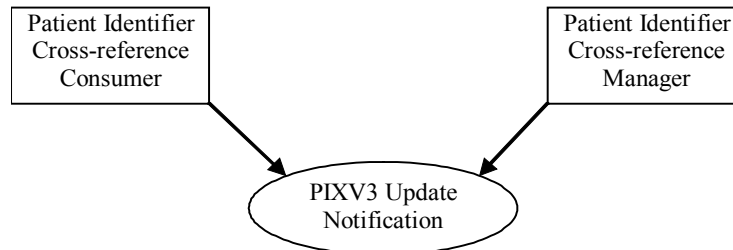
Actor: Patient Identifier Cross-reference Manager

4945 **Role:** It serves a well-defined set of Patient Identification Domains. The Patient Identifier Cross-reference Manager manages the cross-referencing of patient identifiers across Patient Identification Domains by providing a list of patient ID "aliases" via notification to a configured list of interested Patient Identifier Cross-reference Consumers.

Corresponding HL7 v3 Application Roles:

4950 Patient Registry Informer (PRPA_AR201301UV02)

Actor: Patient Identifier Cross-reference Consumer

Role: Receives notifications from the Patient Identifier Cross-reference Manager of changes to patient ID aliases. Typically the Patient Identifier Cross-reference Consumer uses this information to maintain information links about patients in a different patient ID domain.

4955 **Corresponding HL7 v3 Application Roles:**

Patient Registry Tracker (PRPA_AR201302UV02)

3.46.3 Referenced Standards

HL7 Version 3 Edition 2008 Patient Administration DSTU, Patient Topic (found at http://www.hl7.org/memonly/downloads/v3edition.cfm#V32008)

4960 Implementers of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V Web Services for IHE Transactions.

3.46.4 Interaction Diagrams
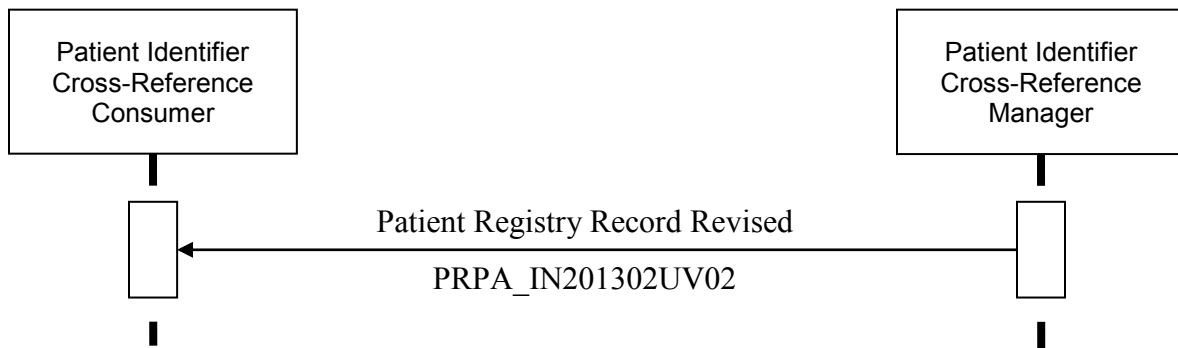
3.46-1 Update Patient Information Sequence

4965 ### 3.46.4.1 Update Patient Information

3.46.4.1.1 Trigger Events

The Patient Identifier Cross-reference Manager shall notify a Patient Identifier Cross-reference Consumer when there is a change in a set of cross-referenced patient identifiers for any of the patient identifiers belonging to Patient Identifier Domains of interest to the consumer. The
4970 configuration of the domains of interest to a Patient Cross-reference Consumer is maintained by the Patient Cross-reference Manager.

Several notifications may have to be issued to communicate a single update to a set of cross-reference patient identifiers as required to reflect all the changes on the resulting sets of cross-reference patient Identifiers belonging to Patient Identifier Domains of interest to the Patient
4975 Identifier Cross-referencing Consumer.

The following HL7 trigger event will be used to update to the list of patient identifiers:

Patient Registry Record Revised (PRPA_TE201302UV02)

This trigger event signals that patient information was revised in a patient registry.

3.46.4.1.2 Message Semantics

4980 The PIX Update Notification transaction is conducted by the Patient Revise (PRPA_MT201302UV02) message. The Patient Identifier Cross-reference Manager initiates this transaction whenever identifier list information is updated for a patient.

Each message shall be acknowledged by the HL7 V3 Accept Acknowledgement (MCCI_MT000200UV01), which is described in ITI TF-2x: Appendix O.

4985 It is wholly the responsibility of the Patient Identifier Cross-reference Manager to perform the matching of patient identifiers based on the patient traits it receives. The information provided by the Patient Identifier Cross-reference Manager to Patient Identifier Cross-reference Consumer Actors shall only contain a list of cross-referenced identifiers for the domains of interest as configured with the Patient Identifier Cross-reference Manager in two or more of the domains

4990 managed by the Patient Identifier Cross-reference Manager. Multiple notifications may need to be sent. For example:

Consumer CON_A is configured to receive update notifications for domains DOM_A and DOM_AD.   Notifications are sent as follows:

> A PIXV3 Patient Registry Record Add message is sent for a patient for DOM_A. The
4995 update notification shall contain the patient identifier for DOM_A.

> A PIXV3 Patient Registry Record Add message is processed for DOM_AD. The Patient Identifier Cross-reference Manager cross references this patient with DOM_A. The update notification shall contain the patient identifiers for both DOM_A and DOM_AD.

5000 > A PIXV3 Patient Registry Record Revise message is processed for DOM_AD changing the patient address. The Patient Identifier Cross-reference Manager cross references determines this patient is no longer the same patient as DOM_A. Two update notifications shall be sent. One containing the patient identifier for DOM_A. The other one containing the patient identifier for DOM_AD.

5005 The list of cross-references is not made available until the set of policies and processes for managing the cross-reference function have been completed. The policies of administering identities adopted by the cooperating domains are completely internal to the Patient Identifier Cross-reference Manager and are outside of the scope of this profile. Possible matches should not be communicated until the healthcare institution policies and processes embodied in the
5010 Patient Identifier Cross-reference Manager reach a positive matching decision.

The Patient Identifier Cross-reference Manager shall have configuration indicating which Identity Consumers are interested in receiving the PIXV3 Update Notification Transactions. This configuration information shall include identification of the identity consumer systems interested in receiving notifications and, for each of those systems, a list of the patient identifier domains of
5015 interest. The Patient Identifier Cross-reference Manager should account for consumers interested in all domains.

Each message shall be acknowledged by the Accept Acknowledgment message sent by the receiver of the Patient Registry Record Revise message to its sender.

3.46.4.1.2.1 Major Components of the Patient Registry Record Revised

5020 **Patient**

The *Patient* class is the entry point to the R-MIM for the *Patient Revise (PRPA_RM201302UV02)*. This is where the updated list of patient identifiers will be present.

Person

The *Person* class contains the name of the patient for additional verification purposes.

5025 **Provider Organization**

The Patient class is optionally scoped by the provider organization where this person is a patient. The HL7 definition of the CMET requires that the provider organization needs to be identified by an id attribute, and at least one of address, telecommunications address, or contact person to be present. The id attribute SHALL have only a root, expressed as an ISO OID, and at least one 5030 of the id attributes of the Patient class SHALL have a matching root component (see ITI TF-2x: Appendix E on the use of the II data type for patient identifiers).

Other Identifiers

The *OtherIDs* class can be optionally used to capture other identifiers associated with the person such as a driver's license number or social security number. It is important to recognize that the 5035 HL7 RIM distinguishes between person-level IDs and patient-level IDs. In this transaction, however, the Patient Identity Cross-Reference Manager has the option to send all identifiers in the id attributes of the Patient class. If that is the case, the OtherIDs class shall not be used. For the purposes of interoperability where both HL7 V3 and HL7 v2.x based transactions are used, and the OtherIDs class is present, the following requirement is imposed on the OtherIDs.id 5040 attribute and on the scopingOrganization.id attribute:

      OtherIDs.id.root SHALL be identical to scopingOrganization.id.root

      scopingOrganization.id.extension SHALL NOT have any value

3.46.4.1.2.2 Message Information Model of the Patient Registry Record Revise Message

5045 Below is the Message Information Model for the Patient Identifiers message, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict subset of the *Patient Revise (PRPA_RM201302UV02)* RMIM.

The base RMIM can be found on the HL7 V3 2008 Edition CD at Edition2008/domains/uvpa/editable/PRPA_RM201302UV.htm. The following restrictions were 5050 made on the original RMIMs to arrive at the restricted model (note that the resulting model is identical to the one described in ITI TF-2b: 3.45.4.2.2.2):

      The focal entity choice is restricted to be only a person

All optional classes are removed, except for the provider organization, and other
identifiers

5055   All optional attributes in the Patient and Person class are removed
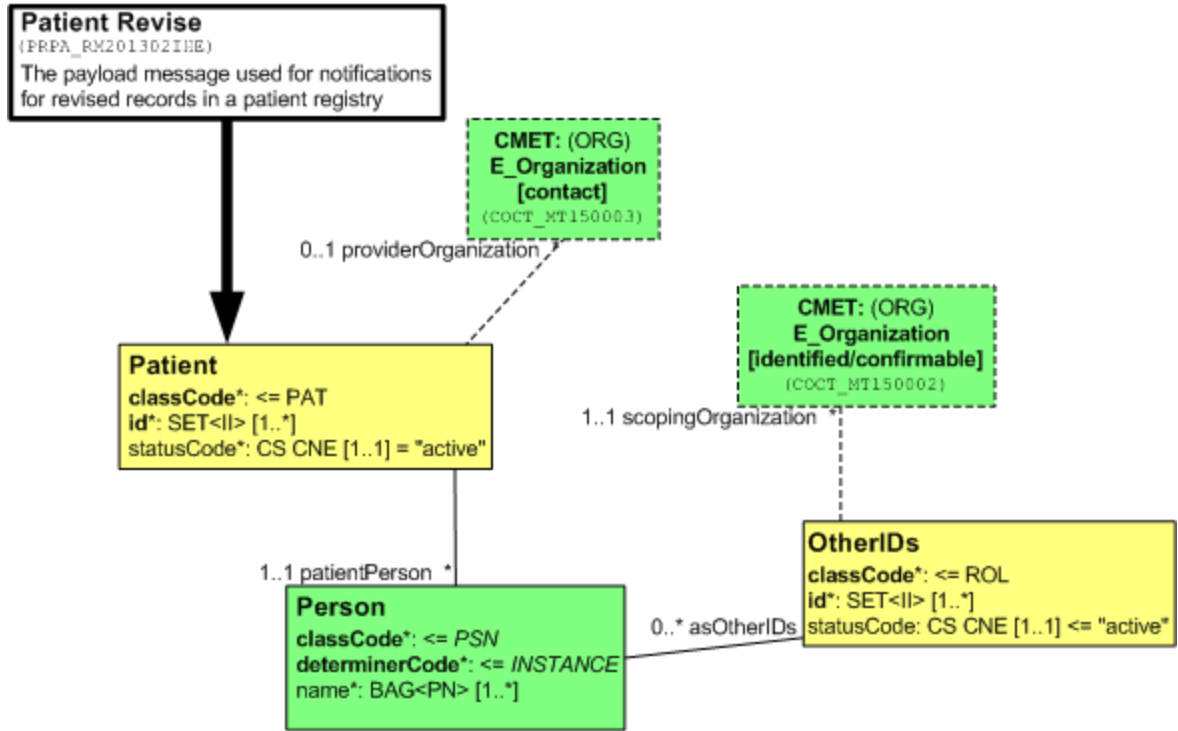
Figure 3.46.4.1.2-1

The attributes of this model are described in the following table.

5060   **Table 3.46.4.1.2-4**

PRPA_HD201302IHE PatientRevise	This HMD extract defines the message used to send a Patient Update Notification Derived from Figure 3.46.4.1.2-1 (PRPA_RM201302IHE)
Patient	The primary record for the focal person in a Patient Identity Cross-Reference Manager
classCode [1..1] (M) Patient (CS) {CNE:PAT}	Structural attribute; this is a "patient" role
id [1..*] (M) Patient (SET<II>)	Linked identifiers from one or more Identity Domains
statusCode [1..1] Patient (CS) {CNE:active, fixed value= "active"}	A value specifying the state of this record in a patient registry (based on the RIM role class state-machine). This record is active.
Person	A subtype of LivingSubject representing a human being Both Person.name and Patient.id must be non-null
classCode [1..1] (M)	Structural attribute; this is a "person" entity

PRPA_HD201302IHE PatientRevise	This HMD extract defines the message used to send a Patient Update Notification Derived from Figure 3.46.4.1.2-1 (PRPA_RM201302IHE)
Person (CS) {CNE:PSN, fixed value= "PSN"}	
determinerCode [1..1] (M) Person (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	Structural attribute; this is a specific person
name [1..*] Person (BAG<PN>)	Name(s) for this person
OtherIDs	Used to capture additional identifiers for the person such as a Drivers' license or Social Security Number.
classCode [1..1] (M) Role (CS) {CNE:ROL}	Structural attribute. This can be any specialization of "role"
id [1..*] (M) Role (SET<II>)	One or more identifiers issued to the focal person by the associated scopingOrganization (e.g., a Driver's License number issued by a DMV)

3.46.4.1.2.3 Control Act and Transmission Wrappers

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.46.4.1.2-2 contains the Transmission and Control Act wrappers used for the two interactions, and the associated constraints.

5065

Table 3.46.4.1.2-6 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000100UV01 – Send Message Payload	MFMI_MT700701UV01 – Master File / Registry Notification Control Act, Role Subject
The value of interactionId SHALL be set to PRPA_IN201302UV02 The value of processingModeCode SHALL be set to T The acceptAckCode SHALL be set to AL There SHALL be only one receiver Device	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201302UV02 RegistrationEvent.statusCode SHALL be set to "active" There SHALL be no InReplacementOf act relationship for these interactions.

The composite message schemas which describe the full payload of these interactions, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schema from the HL7 V3 2008 Normative Edition can be found at Edition2008/processable/multicacheschemas/PRPA_IN201302UV02.xsd)

5070 ### 3.46.4.1.2.4 Web Services Types and Messages

The Patient Registry Record Revised message will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL naming conventions SHALL apply:
```
        "revise" message -> "PRPA_IN201302UV02_Message"
5075    acknowledgement  -> "MCCI_IN000002UV01_Message"
```

The following WSDL snippet describes the types for these messages:

```
        …
 <types>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201302UV02.xs
d"/>
<xsd:element name="PRPA_IN201302UV02"/>
</xsd:schema>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/MCCI_IN000002UV01.xs
d"/>
<xsd:element name="MCCI_IN000002UV01"/>
</xsd:schema>
   </types>
…
```

The messages are described by the following snippet:

```
        …
   <message name="PRPA_IN201302UV02_Message">
<part element="hl7:PRPA_IN201302UV02" name="Body"/>
   </message>
   <message name="MCCI_IN000002UV01_Message">
<part element="hl7:MCCI_IN000002UV01" name="Body"/>
   </message>
        …
```

The port types for the WSDL describing the Patient Identity Feed Service are described together with the expected actions of the actors which receive these messages in section ITI TF-2b: 3.46.4.1.3.

3.46.4.1.3 Expected Actions - Patient Identifier Cross-reference Consumer

Whenever the Patient Identifier Cross-reference Consumer receives updated identifier information in a Patient Revise message that results in a change to the cross-referencing of a patient, the actor shall update its internal identifier information for the affected patient(s) in all domains in which it is interested. The identifiers found in both Patient.id and OtherIDs.id attributes shall be considered together to form a complete list of patient identifiers from the different Patient Identity domains in which this actor is interested.

In the case where the returned list of identifiers contains multiple identifiers for a single domain, the Patient Identifier Cross-reference Consumer shall either use ALL of the multiple identifiers from the given domain or it shall ignore ALL of the multiple identifiers from the given domain.

This allows Patient Identifier Cross-reference Consumers capable of handling multiple identities for a single patient within a single domain (i.e., those that can correctly aggregate the information associated with the different identifiers) to do so. For those Patient Identifier Cross-

reference Consumers not capable of handling this situation, ignoring the entire list of different identifiers prevents the consumer from presenting incomplete data.

3.46.4.1.3.1 Web Services Port Type and Binding Definitions

5125 **IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "PIXConsumer".**

The following WSDL naming conventions SHALL apply:

```
wsdl:definitions/@name="PIXConsumer":
PIX update message          -> "PRPA_IN201302UV02_Message"
acknowledgement             -> "MCCI_IN000002UV01_Message"
portType                    -> "PIXConsumer_PortType"
get identifiers operation   -> "PIXConsumer_PRPA_IN201302UV02"
SOAP 1.2 binding            -> "PIXConsumer_Binding_Soap12"
SOAP 1.2 port               -> "PIXConsumer_Port_Soap12"
```

5135 The following WSDL snippets specify the Patient Update Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

3.46.4.1.3.1.1 Port Type

```
 <portType name="PIXConsumer_PortType">
      <operation name="PIXConsumer_PRPA_IN201302UV02">
<input message="tns:PRPA_IN201302UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201302UV02"/>
<output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
org:v3:MCCI_IN000002UV01"/>
</operation>
    </portType>
```

3.46.4.1.3.1.2 Bindings

SOAP 1.2 binding:

```
…
  <binding name="PIXConsumer_Binding_Soap12" type="PIXConsumer_PortType">
     <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
     <operation name="PIXConsumer_PRPA_IN201302UV02">
       <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201302UV02"/>
       <input>
         <wsoap12:body use="literal"/>
       </input>
       <output>
         <wsoap12:body use="literal"/>
       </output>
     </operation>
   </binding>
…
```

An informative WSDL for the PIX Consumer implementing the PIXV3 profile is available 5165 online on the IHE FTP site, see ITI TF-2x: Appendix W.

_____

3.46.4.1.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.46.5 Security Requirements

No transaction specific security considerations.

5170

3.46.5.1 Audit Record Considerations

When grouped with ATNA Secure Node or Secure Application actors, this transaction is to be audited as "Patient Record" event, as defined in table 3.20.6-1. The following tables show items that are required to be part of the audit record for this transaction.

5175

3.46.5.1.1 Patient Identifier Cross-reference Manager audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"R" (Read)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-46", "IHE Transactions", "PIX Update Notification")
Source (Patient Identifier Cross-reference Manager) (1)			
Human Requestor (0..n)			
Destination (Patient Identifier Cross-reference Consumer) (1)			
Audit Source (Patient Identifier Cross-reference Manager) (1)			
Patient IDs(1..n) (represents the components of PID-3)			

Where:

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	M	the content of the <wsa:ReplyTo/> element
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.
Human **Requestor (if** **known)** **AuditMessage/** **ActiveParticipant**	UserID	M	identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

	Field Name	Opt	Value Constraints
Destination	UserID	M	SOAP endpoint URI.

_____

	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Audit Source	*AuditSourceID*	U	*not specialized.*
AuditMessage/ AuditSourceIdentification	*AuditEnterpriseSiteID*	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

5180

Patient IDs	ParticipantObjectTypeCode	M	"1" (Person)
(AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format (see ITI TF-2x: appendix E).
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	M	Type=II (the literal string), Value=the value of message.id

3.46.5.1.2 Patient Identifier Cross-reference Consumer audit message:

	Field Name	Opt	Value Constraints
Event	EventID	M	EV(110110, DCM, "Patient Record")
AuditMessage/ EventIdentification	EventActionCode	M	"U" (update)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-46", "IHE Transactions", "PIX Update Notification")
Source (Patient Identifier Cross-reference Manager) (1)			
Destination (Patient Identifier Cross-reference Consumer) (1)			
Audit Source (Patient Identifier Cross-reference Consumer) (1)			
Patient IDs(1..n) (represents the components of PID-3)			

Where:

Source	UserID	M	the content of the <wsa:ReplyTo/> element
AuditMessage/ ActiveParticipant	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Destination	UserID	M	SOAP endpoint URI.

	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	U	not specialized
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	AuditSourceID	U	not specialized.
	AuditEnterpriseSiteID	U	not specialized
	AuditSourceTypeCode	U	not specialized

5185

Patient IDs (AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	not specialized
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	not specialized
	ParticipantObjectID	M	the patient ID in HL7 CX format (see ITI TF-2x: appendix E).
	ParticipantObjectName	U	not specialized
	ParticipantObjectQuery	U	not specialized
	ParticipantObjectDetail	M	Type=II (the literal string), Value=the value of message.id

8 Patient Demographics Query (PDQ)

The Patient Demographics Query Integration Profile (PDQ) provides ways for multiple distributed
applications to query a patient information server for a list of patients, based on user-defined search
criteria, and retrieve a patient's demographic (and, optionally, visit or visit-related) information
directly into the application.

8.1 Actors/ Transactions

Figure 8.1-1 shows the actors directly involved in the Patient Demographics Query Integration
Profile and the relevant transactions between them. Other actors that may be indirectly involved
due to their participation in Patient ID Cross-referencing, etc. are not necessarily shown.
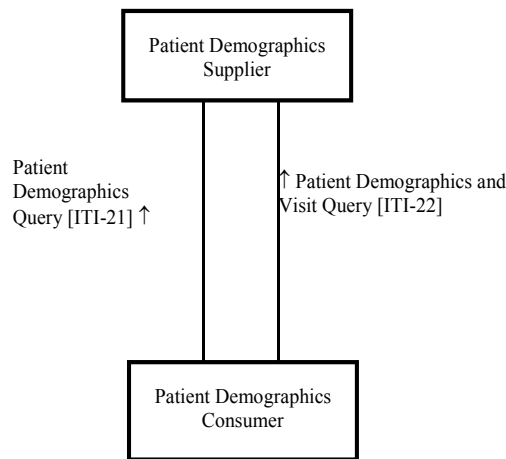
Figure 8.1-1. Patient Demographics Query Profile Actor Diagram

Table 8.1-1 lists the transactions for each actor directly involved in the Patient Demographics Query
Profile. In order to claim support of this Integration Profile, an implementation must perform the
required transactions (labeled "R"). Transactions labeled "O" are optional. A complete list of
options defined by this Integration Profile and that implementations may choose to support is listed
in ITI TF-1: 8.2.

Table 8.1-1. Patient Demographics Query Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section
Patient Demographics Consumer	Patient Demographics Query [ITI-21]	R	ITI TF-2a: 3.21
	Patient Demographics and Visit Query [ITI-22]	O	ITI TF-2a: 3.22
Patient Demographics Supplier	Patient Demographics Query [ITI-21]	R	ITI TF-2a: 3.21
	Patient Demographics and Visit Query [ITI-22]	O	ITI TF-2a: 3.22

8.2 Patient Demographics Query Integration Profile Options

Options that may be selected for this Integration Profile are listed in Table 8.2-1 along with the actors to which they apply. Dependencies between options when applicable are specified in notes.

1560

Table 8.2-1 Patient Demographics Query - Actors and Options

Actor	Options	Vol & Section
Patient Demographics Consumer	*Patient Demographics and Visit Query*	ITI TF-2a: 3.22
	Pediatric Demographics	ITI TF-1: 8.2.2
Patient Demographics Supplier	*Patient Demographics and Visit Query*	ITI TF-2a: 3.22
	Pediatric Demographics	ITI TF-1: 8.2.2

8.2.2 Pediatric Demographics

The experience of immunization registries and other public health population databases has shown
1565 that retrieving patient records for an individual person in environments with large proportions of pediatric records requires additional demographic data.

Information about the mother of the patient or a household telephone number is helpful in retrieving records in large population databases where data quality may be uneven.

Certain other demographics fields are important to include in the query response as they may be
1570 used by the Patient Demographics Consumer in verifying the identity of the patient, in particular, they aid in distinguishing records for twins, triplets, and so forth.

Pediatric Demographics makes use of the following six additional demographic fields to aid record matching in databases with many pediatric records.

Field	Reason for inclusion	Value
Mother's Maiden Name	Any information about the mother is helpful in making a match	Helps create true positive matches
Patient Home Telephone	A telecom helps match into the right household	Helps create true positive matches
Patient Multiple Birth Indicator	Indicates this person is a multiple - twin, triplet, etc.	Helps avoid false positive matches of multiples
Patient Birth Order	Distinguishes among those multiples.	Helps avoid false positive matches of multiples
Last Update Date/Time, Last Update Facility	These fields, although not strictly demographic, can effectively substitute when multiple birth indicator and birth order are not collected. They indirectly provide visit information. Provider visits on the same day may likely indicate two children brought to a doctor together.	Helps avoid false positive matches of multiples

1575 Patient Demographics Consumer actors which support the Pediatrics Demographics option will be able to provide Pediatric Demographics query parameter fields in the Patient Demographics Query transaction [ITI-21], and shall be able to receive and process any values returned for the fields identified as Pediatric Demographics.

1580 Patient Demographics Supplier actors which support the Pediatrics Demographics option will be able to match on values provided for any Pediatric Demographics fields in the Patient Demographics Query transaction [ITI-21]. and shall return values, when available, for the fields identified as Pediatric Demographics.

Pediatric Demographics query parameter fields are:

- Mother's Maiden Name
1585 - Patient Home Telephone

Pediatric Demographics are defined as all of the following:

- Mother's Maiden Name
- Patient Home Telephone
- Patient Multiple Birth Indicator
1590 - Patient Birth Order
- Last Update Date/Time
- Last Update Facility

8.3 Patient Demographics Query Process Flow

The Patient Demographics Supplier performs the following functions.

1595 - It receives patient registration and update messages from other systems in the enterprise (*e.g.*, ADT Patient Registration systems), which may or may not represent different Patient ID Domains. The method in which the Patient Demographics Supplier obtains the updated patient demographic information is not addressed by this profile.
- It responds to queries for information.

1600 Specific methods for acquiring demographic information are beyond the scope of this Profile. It is a prerequisite that the Patient Demographics Supplier possess current demographic information. One method by which current demographic information may be obtained is for the Patient Demographic Supplier to be grouped with another IHE actor, such as Order Filler, that either maintains or receives such information.

1605 In all cases, the Patient Demographics Supplier receives a Patient Demographics Query or Patient Demographics and Visit Query request from the Patient Demographics Consumer, and returns demographics (and, where appropriate, visit) information from the single domain that is associated with the application to which the query message is sent. Identifier information may be returned from multiple or single domains; see the "Using Patient Data Query (PDQ) in a Multi-Domain 1610 Environment" section (ITI TF-2x: Appendix M) for a discussion of the architectural issues involved.

Use Case 1: Patient Information Entering at Bedside

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1615 An admitted patient is assigned to a bed. The patient may or may not be able to provide positive ID information. The nurse needs to enter patient identity information into some bedside equipment to establish the relationship of the assigned bed to the patient. The equipment issues a query for a patient pick list to a patient demographics supplier that provides data for a patient pick list. Search criteria entered by the nurse might include one or more of the following:

- Partial or complete patient name (printed on the patient record or told by the patient)
1620
- Patient ID (this may be obtained from printed barcode, a bed-side chart, etc.)

- Partial ID entry or scan.

- Date of birth / age range

- Bed ID

1625 The system returns a list of patients showing the MRN, full name, age, sex, room/bed, and admit date, and displays the list to the nurse. The nurse then selects the appropriate record to enter the patient identity information into the bedside equipment application.

Use Case 2: Patient Identity Information Entering in Physician Offices

A patient visits a physician office for the first time. The nurse needs to register the patient; in doing so, it is desired to record the patient's demographic data in the practice
1630 management information system (PMIS). The physician office is connected to a hospital enterprise's central patient registry. The nurse issues a patient query request to the central patient registry, with some basic patient demographics data as search criteria. In the returned patient list, she picks up an appropriate record for the patient, including the hospital's patient ID, to enter into the PMIS. (Note that the PMIS uses a different Patient ID domain than that
1635 of the central patient registry.)

The PMIS uses its own patient identifier, coordinating this identifier with the patient identifier returned in the pick list (sharing the hospital's Patient ID Domain) to retrieve information from the hospital's clinical repository.

Use Case 3: Patient Demographics Query in an Enterprise with Multiple Patient ID Domains

1640 A lab technician enters some basic demographics data (e.g., patient name) into a lab application to query a patient demographics supplier to identify a patient for his lab exams. As the application also needs the patient identifier in another Patient ID Domain in the enterprise for results delivery, the application is configured to receive patient IDs from other domains in the query response.

1645

_____
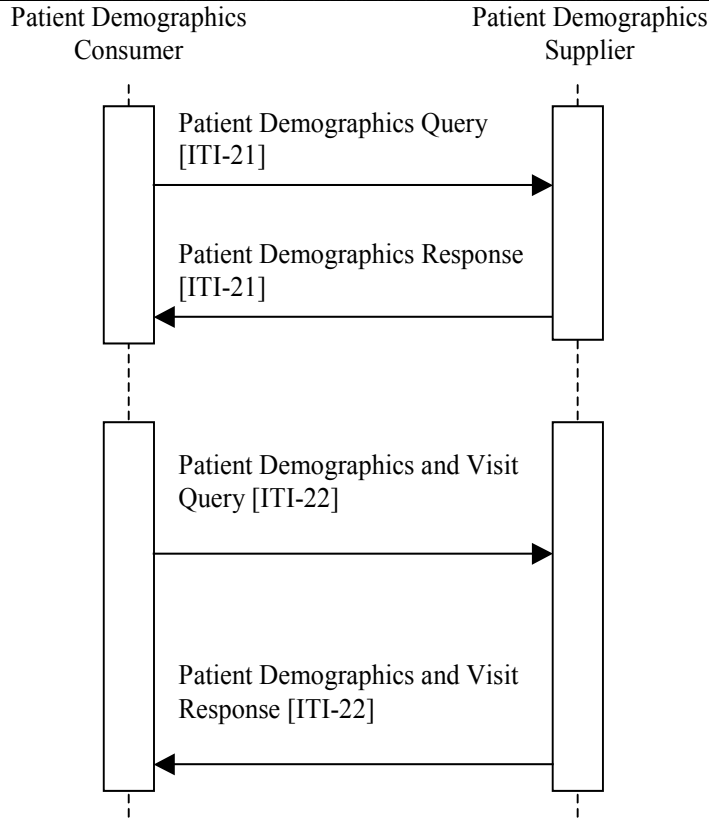
Figure 8.2-1. Basic Process Flow in Patient Demographics Query Profile

8.3.1 Combined Use of PDQ with Other IHE Workflow Profiles

When the Patient Demographics Supplier Actor is grouped with actors in other IHE profiles that perform patient information reconciliation activities (e.g., Radiology PIR), the PDQ Supplier Actor may use the updated information to respond to PDQ Queries. In addition, the Patient Demographics Query Profile may play an integral workflow role in conjunction with other IHE Profiles.

8.3.2 Supplier Data Configuration

A Patient Demographics Supplier Actor that holds demographic information for a single Patient ID domain shall provide matches in that domain.

In the case where the Patient Demographics Supplier Actor holds demographic information for multiple Patient ID domains, the Patient Demographics Supplier Actor shall return information for the domain associated with *MSH-5-Receiving Application* and *MSH-6-Receiving Facility*. See the "Using Patient Data Query (PDQ) in a Multi-Domain Environment" section (ITI TF-2x: Appendix M) for a further discussion of this case and an illustration of the supporting architecture.

3825 ## 3.21 Patient Demographics Query

This section corresponds to Transaction ITI-21 of the IHE IT Infrastructure Technical Framework. Transaction ITI-21 is used by the Patient Demographics Consumer and Patient Demographics Supplier actors.

3.21.1 Scope

3830 This transaction involves a request by the Patient Demographics Consumer Actor for information about patients whose demographic data match data provided in the query message. The request is received by the Patient Demographics Supplier Actor. The Patient Demographics Supplier Actor immediately processes the request and returns a response in the form of demographic information for matching patients.

3835 ### 3.21.2 Use Case Roles
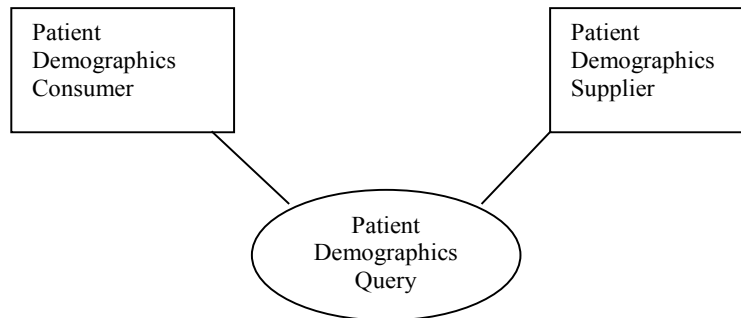
Actor: Patient Demographics Consumer

Role: Requests a list of patients matching a minimal set of demographic criteria (e.g., ID or partial name) from the Patient Demographics Supplier. Populates its attributes with
3840 demographic information received from the Patient Demographics Supplier.

Actor: Patient Demographics Supplier

Role: Returns demographic information for all patients matching the demographic criteria provided by the Patient Demographics Consumer.

3.21.3 Referenced Standards

3845 **HL7**: Version 2.5, Chapter 2 – Control

Version 2.5, Chapter 3 – Patient Administration

Version 2.5, Chapter 5 – Query

3.21.4 Interaction Diagram
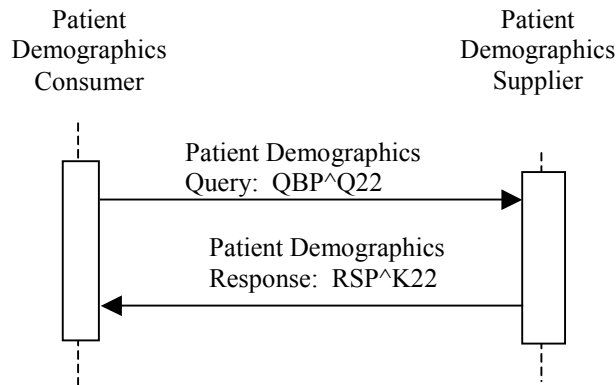
3.21.4.1 Patient Demographics Query

3.21.4.1.1   Trigger Events

A Patient Demographics Consumer's need to select a patient based on demographic information about patients whose information matches a minimal set of known data will trigger the Patient Demographics Query based on the following HL7 trigger event:

Q22 – Find Candidates

3.21.4.1.2   Message Semantics

The Patient Demographics Query is conducted by the HL7 QBP^Q22 message. The Patient Demographics Consumer actor shall generate the query message whenever it needs to select from a list of patients whose information matches a minimal set of demographic data. The segments of the message listed below are required, and their detailed descriptions are provided in the following subsections.

Table 3.21-1 QBP Query by Parameter

QBP	Query by Parameter	Chapter in HL7 2.5
MSH	Message Header	2
QPD	Query Parameter Definition	5
RCP	Response Control Parameter	5
[DSC]	Continuation Pointer	2

The receiver shall respond to the query by sending the RSP^K22 message. This satisfies the requirements of original mode acknowledgment; no intermediate ACK message is to be sent.

Each Patient Demographics Query request specifies two distinct concepts. The Patient Demographics Query is always targeted at a single source of patient demographic information (referred to in this Transaction as the ***patient information source***). A Patient Demographics Supplier may have knowledge of more than one source of demographics. A Patient Demographics Supplier shall support at least one source of patient demographics and may

3870   support multiple sources of demographics. ITI TF-2a: 3.21.4.1.2.1 describes how the Patient Demographics Consumer specifies which source of demographics are requested by the query. Each query response shall return demographics from a single patient information source.

3875   The second concept present in the query is the set of patient identifier domains referenced by the query. These patient identifier domains may or may not be associated with the patient information source. A Patient Demographics Supplier shall support at least one patient identifier domain and may support multiple identifier domains. ITI TF-2a: 3.21.4.1.2.2 describes how the Patient Demographics Consumer requests identifiers from one or more patient identifier domains. Query responses may return patient identifiers from 0, 1 or multiple patient identifier 3880   domains.

3.21.4.1.2.1 MSH Segment

The MSH segment shall be constructed as defined in the "Message Control" section (ITI TF-2x: C.2.2).

3885   The Patient Demographics Supplier is able to obtain demographics from at least one and possibly multiple patient information sources. When more than one patient information source is available, Field *MSH-5-Receiving Application* specifies the patient information source that this query is targeting. The Patient Demographics Supplier shall return this value in *MSH-3-Sending Application* of the RSP^K22 response. The value specified in MSH-5 is not related to the value requested in QPD-8 What Domains Returned.

3890   A list shall be published of all Receiving Applications that the Patient Demographics Supplier supports, for the Patient Demographics Consumer to choose from. Each query is processed against one and only one source of patient demographic information.

Field *MSH-9-Message Type* shall have all three components populated with a value. The first component shall have a value of **QBP**; the second component shall have a value of **Q22**. The 3895   third component it shall have a value of **QBP_Q21**.

3.21.4.1.2.2 QPD Segment

The Patient Demographics Consumer Actor shall send attributes within the QPD segment as described in Table 3.21-2.

Table 3.21-2. IHE Profile - QPD segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	250	CE	R	0471	01375	Message Query Name
2	32	ST	R+		00696	Query Tag
3		QIP	R			Demographics Fields
8		CX	O			What Domains Returned

3900   Adapted from the HL7 standard, version 2.5

The Consumer shall specify "IHE PDQ Query" for QPD-1 Message Query Name.

3.21.4.1.2.2.1 Populating QPD-3-Demographics Fields

Field *QPD-3-Demographics Fields* consists of one or more repetitions, each of which contains two components that together contain the name and value of a distinct parameter to the query. Acceptable segments are PID and PD1.

The first component of each parameter contains the name of an HL7 element in the form

@<seg>.<field no>.<component no>.<subcomponent no>

The above format is populated according to common HL7 usage for specifying elements used in query parameters, as follows:

<seg> represents a 3-character segment ID from the HL7 Standard.

<field no> is the number of a field within the segment as shown in the SEQ column of the segment attribute table for the segment selected.

<component no>, for fields whose data types contain multiple components, shall contain the cardinal number of the component being valued. For fields whose data types do not contain multiple components, <component no> shall not be valued and its preceding period shall not appear.

<subcomponent no>, for components whose data types contain multiple subcomponents, shall contain the cardinal number of the subcomponent being valued. For components whose data types do not contain multiple subcomponents, <subcomponent no> shall not be valued and its preceding period shall not appear.

The second subcomponent of each parameter contains the value that is to be matched. If it is desired to constrain the quality of a match within the bounds of an algorithm known to the Supplier, the algorithm and constraint values may be specified in Fields QPD-4 through QPD-7.

The Patient Demographics Consumer may specify, and the Patient Demographics Supplier shall support, the fields in Table 3.21-3. If the Pediatric Demographics option is supported, then additionally, the Patient Demographics Consumer may specify, and the Patient Demographics Supplier shall support, the fields in Table 3.21-4.

The Patient Demographics Supplier shall return demographic records that reflect the best fit to all of the search criteria.

Table 3.21-3. PDQ Profile – QPD-3 fields required to be supported

FLD	ELEMENT NAME
PID.3	Patient Identifier List
PID.5	Patient Name
PID.7	Date/Time of Birth
PID.8	Administrative Sex
PID.11	Patient Address
PID.18	Patient Account Number

Table 3.21-4. PDQ Profile – Additional QPD-3 fields required to be supported if the Pediatric Demographic Option is supported

FLD	ELEMENT NAME
PID.6	Mother's Maiden Name
PID.13	Phone Number - Home

3935

An example of parameter expressions in QPD-3:

```
@PID.5.1.1^SMITH~@PID.8^F
```

requests all patients whose family name (first subcomponent (data type ST) of the first
3940   component (data type FN) of PID-5-Patient Name (data type XPN)) matches the value 'SMITH'
and whose sex (PID-8-Sex (data type IS)) matches the value 'female'.

3.21.4.1.2.2.2   Populating QPD-8-What Domains Returned

As is specified in the discussion of the Find Candidates (Q22) Query in Chapter 3 of the HL7
Standard, field QPD-8 restricts the set of domains for which identifiers are returned in PID-3:

3945   1.   In a multiple-domain environment, QPD-8 may be used to identify one or more
domains of interest to the Patient Demographics Consumer and from which the
Consumer wishes to obtain a value for *PID-3-Patient Identifier*. Note that the patient
information source designated by MSH-5 may or may not be associated with any of the
Patient ID Domains listed in *QPD-8-What Domains Returned*.

3950   2.   If QPD-8 is empty, the Patient Demographics Supplier shall return all Patient IDs
known by the Patient Demographics Supplier for each patient that matches the search
criteria. See Case 1 in ITI TF-2a: 3.21.4.2.2.8 for details on how this information is
returned.

3.   If QPD-8 is specified and the domains are recognized, the Patient Demographics
3955   Supplier shall return the Patient IDs for each patient that matches the search criteria.
See Case 2 in ITI TF-2a: 3.21.4.2.2.8 for details on how this information is returned.

4.   Any domain not recognized by the Patient Demographics Supplier is an error condition.
See Case 3 in ITI TF-2a: 3.21.4.2.2.8 how to handle this condition.

5.   In a single-domain environment, QPD-8 may be ignored by the Patient Demographics
3960   Supplier. The Supplier shall always return the identifier from the Patient ID Domain
known by the Patient Demographics Supplier.

Within field QPD-8, only component 4 (Assigning Authority) shall be valued.

The Patient Demographics Supplier may or may not be able to supply additional identifiers from
the domains specified in QPD-8. A discussion of how QPD-8 is processed is included in the

3965 architectural discussion in the "Using Patient Data Query (PDQ) in a Multi-Domain Environment" section (ITI TF-2x: Appendix M).

The Patient Demographics Consumer shall be able to support at least one of the following mechanisms for specifying QPD-8:

1. Transmit an empty value and receive all identifiers in all domains known by the Patient
3970   Demographics Supplier (one or more domains), or

2. Transmit a single value and receive zero or more identifiers in a single domain, or

3. Transmit multiple values and receive multiple identifiers in those multiple domains.

3.21.4.1.2.3 RCP Segment

3975 The Patient Demographics Consumer Actor shall send attributes within the RCP segment as described in Table 3.21-5. Fields not listed are optional and may be ignored.

Table 3.21-5. IHE Profile - RCP segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	1	ID	R	0091	00027	Query Priority
2	10	CQ	O	0126	00031	Quantity Limited Request

Adapted from the HL7 standard, version 2.5

3.21.4.1.2.3.1   Populating RCP-1-Query Priority

3980 Field *RCP-1-Query Priority* shall always contain **I**, signifying that the response to the query is to be returned in Immediate mode.

3.21.4.1.2.3.2   Populating RCP-2-Quantity Limited Request

The Patient Demographics Consumer Actor may request that responses to the query be sent, using the HL7 Continuation Protocol, in increments of a specified number of patient records. (In
3985 the context of the HL7 query, a patient record is defined as the PID segment and any segments accompanying it for each patient.) It is desirable to request an incremental response if the query could result in hundreds or thousands of matches or "hits."

The Patient Demographics Supplier Actor shall support the HL7 Continuation Protocol.

Field RCP-2 is of data type CQ, which contains two components. The first component contains
3990 the number of increments, always expressed as an integer greater than 0, while the second component contains the kind of increment, always RD to signify that incremental replies are specified in terms of records.

For example, 50RD requests 50 records at a time.

See the "Incremental Response Processing" (ITI TF-2a: 3.21.4.1.3.3) and the "Expected
3995 Actions" section of the Patient Demographics Query Response message (ITI TF-2a: 3.21.4.2.3) for more information on the implementation of the continuation protocol.

3.21.4.1.2.4 DSC Segment

The Patient Demographics Consumer Actor may request additional increments of data by specifying this segment on the query request. This segment should be omitted on the initial query request. Its purpose is to request additional increments of the data from the Patient Demographic Supplier Actor.

Table 3.21-9. IHE Profile - DSC segment

SEQ	LEN	DT	OPT	TBL#	ITEM #	ELEMENT NAME
1	180	ST	O		00014	Continuation Pointer
2	1	ID	O	0398	01354	Continuation Style

3.21.4.1.2.4.1   Populating DSC-1 Continuation Pointer

To request additional increments of data, DSC-1 (Continuation Pointer) shall echo the value from RSP^K22 DSC-1.

3.21.4.1.2.4.2   Populating DSC-2 Continuation Style

DSC-2 (Continuation Style) shall always contain I, signifying that this is part of an interactive continuation message.

3.21.4.1.3   Expected Actions

3.21.4.1.3.1 Immediate Acknowledgement

The Patient Demographics Supplier shall immediately return an RSP^K22 response message as specified below in ITI TF-2a: 3.21.4.2, "Patient Demographics Response." The RSP^K22 response message incorporates original mode application acknowledgment as specified in the "Acknowledgment Modes" section (ITI TF-2x: C.2.3). The Supplier shall use *MSH-3-Sending Application* of the RSP^K22 to return the value it received from the Patient Demographics Consumer in Field *MSH-5-Receiving Application* of the QBP^Q22 message.

3.21.4.1.3.2 Query Parameter Processing

The Patient Demographics Supplier Actor shall be capable of accepting, searching on, and responding with attributes in the QPD segment as specified in Table 3.21-2.

The Patient Demographics Supplier Actor must be capable of receiving all possible representations of an Assigning Authority (patient identifier domain) in QPD.8.4 (What Domain Returned): 1) namespace, 2) universal id (OID) and 3) both namespace and universal id (OID).

4030 Handling of phonetic issues, alternate spellings, upper and lower case, wildcards, accented characters, etc., if deemed appropriate, is to be supported by the Patient Demographics Supplier rather than by the Patient Demographics Consumer. The Supplier shall return at least all exact matches to the query parameters sent by the Consumer; IHE does not further specify matching requirements.

3.21.4.1.3.3 Incremental Response Processing

4035 The Patient Demographics Supplier Actor shall be capable of accepting and processing attributes in the RCP segment as listed in Table 3.21-5. In particular, the Patient Demographics Supplier Actor shall respond in immediate mode (as specified by a *RCP-1-Query Priority* value of **I**).

Also, the Patient Demographics Supplier Actor shall be able to interpret *RCP-2-Quantity Limited Request* to return successive responses of partial lists of records according to the HL7
4040 Continuation Protocol, as described in ITI TF-2a: 3.21.4.2 below and in the HL7 Standard.

3.21.4.2 Patient Demographics Response

3.21.4.2.1   Trigger Events

The Patient Demographics Supplier's response to the Find Candidates message shall be the following message:

4045 K22 – Find Candidates response

3.21.4.2.2   Message Semantics

The Patient Demographics Response is conducted by the RSP^K22 message. The Patient Demographics Supplier Actor shall generate this message in direct response to the QBP^Q22 message previously received. This message satisfies the Application Level, Original Mode
4050 Acknowledgement for the HL7 QBP^Q22 message.

The segments of the message listed without enclosing square brackets in the Table below are required. Detailed descriptions of all segments listed in the table below are provided in the following subsections. Other segments of the message are optional.

Table 3.21-6 RSP Segment Pattern Response

RSP	Segment Pattern Response	Chapter in HL7 2.5
MSH	Message Header	2
MSA	Message Acknowledgement	2
[{ERR}]	Error	2
QAK	Query Acknowledgement	5
QPD	Query Parameter Definition	5
[{ PID	Patient Identification	3
[PD1]		
[QRI] }]	Query Response Instance	5
[DSC]	Continuation Pointer	2

4055 **3.21.4.2.2.1 MSH Segment**

The MSH segment shall be constructed as defined in the "Message Control" section (ITI TF-2x: C.2.2).

Field *MSH-3-Sending Application* specifies the patient information source that processed the query. The Patient Demographics Supplier shall use Field *MSH-3-Sending Application* of the
4060 RSP^K22 message to return the value it received from the Patient Demographics Consumer in Field *MSH-5-Receiving Application* of the QBP^Q22 message.

Field *MSH-9-Message Type* shall have all three components populated with a value. The first component shall have a value of **RSP**; the second component shall have a value of **K22**. The third component shall have a value of **RSP_K21**.

4065 **3.21.4.2.2.2 MSA Segment**

The Patient Demographics Supplier Actor is not required to send any attributes within the MSA segment beyond what is specified in the HL7 standard. See the "Acknowledgment Modes" section (ITI TF-2x: C.2.3) for the list of all required and optional fields within the MSA segment.

3.21.4.2.2.3 QAK Segment

4070 The Patient Demographics Supplier Actor shall send attributes within the QAK segment as defined in Table 3.21-7. For the details on filling in QAK-2 (Query Response Status) refer to the "Patient Demographics Supplier Actor Query Response Behavior" section (ITI TF-2b: 3.21.4.2.2.8).

QAK-1 (Query Tag) shall echo the same value of QPD-2 (Query Tag) of the QBP^Q22 message,
4075 to allow the Patient Demographics Query Consumer to match the response to the corresponding query request.

Table 3.21-7. PDQ Profile - QAK segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	32	ST	R		00696	Query Tag
2	2	ID	R+	0208	00708	Query Response Status

Adapted from the HL7 standard, version 2.5

4080 **3.21.4.2.2.4 QPD Segment**

The Patient Demographics Supplier Actor shall echo the QPD Segment value that was sent in the QBP^Q22 message.

3.21.4.2.2.5 PID Segment

The Patient Demographics Supplier Actor shall return one PID segment group (*i.e.*, one PID
4085 segment plus any segments associated with it in the message syntax shown in Table 3.21-5) for each matching patient record found. The Supplier shall return the attributes within the PID

segment as specified in Table 3.21-8. In addition, the Patient Demographics Supplier Actor shall return all other attributes within the PID segment for which it is able to supply values.

4090
Table 3.21-8. PDQ Profile - PID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R		00106	Patient Identifier List
5	250	XPN	R		00108	Patient Name
7	26	TS	R2		00110	Date/Time of Birth
8	1	IS	R2	0001	00111	Administrative Sex
11	250	XAD	R2		00114	Patient Address
18	250	CX	R2		00121	Patient Account Number

Adapted from the HL7 standard, version 2.5

The Patient Demographics Supplier may or may not be able to supply additional identifiers from the domains specified in QPD-8. Inability to supply an identifier in a particular domain is not an error, provided that the domain is recognized.

4095 The PID segment and its associated PD1 and QRI segments are returned only when the Patient Demographics Supplier Actor is able to associate the search information in QPD-3 with one or more patient records in the patient information source associated with *MSH-5-Receiving Application*. See the "Patient Demographics Supplier Actor Query Response Behavior" section (ITI TF-2a: 3.21.4.2.2.8) for a detailed description of how the Patient Demographics Supplier
4100 Actor responds to the query request under various circumstances.

3.21.4.2.2.6 QRI Segment

For each patient for which the Patient Demographics Supplier Actor returns a PID Segment, it may optionally return the QRI (Query Response Instance) segment, but is not required to do so. Refer to the HL7 Standard, Version 2.5, Chapter 5, Section 5.5.5, for more information.

4105 ### 3.21.4.2.2.7 DSC Segment

If the number of records is specified in *RCP-2-Quantity Limited Request*, the Patient Demographics Supplier Actor shall return an incremental response of that number of records when the number of matching records it finds exceeds the number of records specified in RCP-2.

As long as the Patient Demographics Supplier Actor has records to return in addition to those
4110 returned in the incremental response, the Supplier shall return a DSC Segment. The single field of the DSC Segment shall contain a unique alphanumeric value (the Continuation Pointer) that the Patient Demographics Consumer may return in the DSC of the QBP^Q22 message to request the next increment of responses. The Supplier shall return increments as many times as the Consumer requests them (and there are increments to return), and shall stop when the Consumer
4115 sends a cancel query (QCN^J01) message (or when there are no more increments to return).

3.21.4.2.2.8 Patient Demographics Supplier Actor Query Response Behavior

The Patient Demographics Supplier shall perform the matching of patient data based on the query parameter values it receives. The information provided by the Patient Demographics Supplier Actor to Patient Demographics Consumer Actors is a list of possible matching patients from the patient information source associated with the value that the Consumer sent in *MSH-5-Receiving Application* of the query message.

If domains are specified in *QPD-8-What Domains Returned* and are recognized by the Patient Demographics Supplier, the response will also, for each patient, contain any Patient ID values found in the specified domains.

The mechanics of the matching algorithms used are internal to the Patient Demographics Supplier Actor and are outside of the scope of this framework.

The Patient Demographics Supplier Actor shall respond to the query request as described by the following 3 cases:

Case 1: The Patient Demographics Supplier Actor finds (in the patient information source associated with *MSH-5-Receiving Application*) at least one patient record matching the criteria sent in *QPD-3-Demographics Fields*. No patient identifier domains are requested in *QPD-8-What Domains Returned*.

AA (application accept) is returned in MSA-1.

OK (data found, no errors) is returned in QAK-2.

One PID segment group (*i.e.*, one PID segment plus any segments associated with it in the message syntax shown in Table 3.21-5) is returned from the patient information source for each patient record found. If the Patient Demographics Supplier Actor returns data for multiple patients, it shall return these data in successive occurrences of the PID segment group.

Within each PID segment, field *PID-3-Patient Identifier List* contains one or more identifiers from the set of Patient ID Domains known by the Patient Demographics Supplier.

If an incremental number of records are specified in *RCP-2-Quantity Limited Request*, and the number of records to be sent exceeds that incremental number, the Supplier returns only the incremental number of records, followed by a DSC segment containing a uniquely valued Continuation Pointer.

The consumer will specify the value of the continuation pointer in the DSC segment on the subsequent query request to request the next increment of responses.

Case 2: The Patient Demographics Supplier Actor finds (in the patient information source associated with *MSH-5-Receiving Application*) at least one patient record matching the criteria sent in *QPD-3-Demographics Fields*. One or more patient identifier domains are requested in *QPD-8-What Domains Returned*; the Supplier recognizes all the requested domains.

AA (application accept) is returned in MSA-1.

OK (data found, no errors) is returned in QAK-2.

One PID segment group (*i.e.*, one PID segment plus any segments associated with it in the message syntax shown in Table 3.21-5) is returned for each matching patient record found. If the Patient Demographics Supplier Actor returns data for multiple patients, it shall return these data in successive occurrences of the PID segment group.

Within each PID segment, field *PID-3-Patient Identifier List* contains, in successive occurrences delimited by the repetition separator, the identifiers from all the Patient ID Domains requested in QPD-8. In each occurrence of PID-3, component 4 contains the assigning authority value for one Patient ID Domain, and component 1 contains the Patient ID value in that domain. If an identifier does not exist for a domain that was specified on QPD-8, nothing is returned in the list.

If an incremental number of records is specified in *RCP-2-Quantity Limited Request*, and the number of records to be sent exceeds that incremental number, the Supplier returns only the incremental number of records, followed by a DSC segment containing a uniquely valued Continuation Pointer.

The consumer will specify the value of the continuation pointer in the DSC segment on the subsequent query request to request the next increment of responses.

Case 3: The Patient Demographics Supplier Actor does not recognize one or more of the domains in *QPD-8-What Domains Returned*.

AE (application error) is returned in MSA-1 and in QAK-2.

For each domain that was not recognized, an ERR segment is returned in which the components of *ERR-2-Error Location* are valued as follows.

COMP #	COMPONENT NAME	VALUE
1	Segment ID	**QPD**
2	Sequence	**1**
3	Field Position	**8**
4	Field Repetition	*(see below)*
5	Component Number	*(empty)*
6	Subcomponent Number	*(empty)*

ERR-2.4-Field Repetition identifies the ordinal occurrence of QPD-8 that contained the unrecognized domain. As specified by HL7, *ERR-2.5-Component Number* and *ERR-2.6-Subcomponent Number* are not valued because we are referring to the entire field QPD-8.

ERR-3-HL7 Error Code is populated with the error condition code **204** (unknown key identifier). Together with the values in ERR-2, this signifies that the Patient Demographics Supplier Actor did not recognize the domain for *QPD-8-What Domains Returned*.

3.21.4.2.3   Expected Actions

The Patient Demographics Consumer will use the demographic information provided by the Patient Demographics Supplier to perform the functions for which it requested the information, e.g., providing a pick list to the user.

If the Supplier has sent a DSC segment containing a continuation pointer value, additional increments of data are available upon request by the Consumer. After receiving each increment of data that includes a DSC segment containing a continuation pointer value, the Consumer should take one of the following actions.

- If the Consumer wishes to receive another increment of the data, the Consumer reissues the query message using a new unique value in *MSH-10-message control ID* and adding the DSC segment after the RCP segment. DSC-1 shall echo the continuation pointer returned in RSP^K22 DSC-1 segment.

- If the Consumer does not wish to receive another increment of the data, the Consumer issues a cancel query (QCN^J01) message. The consumer shall echo the query tag from QAK-1 in QID-1 and the query message name from QPD-1 in QID-2.

- If the Consumer does not reissue the query or send a cancel query message, the query will eventually terminate.

If the Supplier has not sent a DSC segment containing a continuation pointer value, no more increments of data are available and no further action by the Consumer is required.

3.21.4.3 Canceling a query

The Patient Demographic Consumer can send a cancel trigger to notify the Patient Demographic Supplier that no more incremental responses will be requested, and the interactive query can be terminated. This cancellation trigger is optional. How long the Patient Demographic Supplier retains query results (for incremental response) is an implementation decision and therefore beyond the scope of IHE.

3.21.4.3.1   Trigger Events

The Patient Demographic Consumer which received a RSP^K22 response message indicating there are more incremental responses data available, can terminate the interactive query with the following HL7 trigger event:

J01 – Cancel query status

3.21.4.3.2   Message Semantics

Canceling a query is conducted by the QCN^J01 message. The Patient Demographic Consumer can generate this message to notify the Patient Demographic Supplier that no more data is desired. The segments of the message listed below are required, and their details descriptions are provided in the following subsections.

Table 3.21.10 QCN Cancel query

QCN	Cancel query	Chapter in HL7 2.5
MSH	Message Header	2

QCN	Cancel query	Chapter in HL7 2.5
QID	Query identification Segment	5

The receiver shall acknowledge this cancel by the HL7 ACK message. See ITI TF-2x: C.2.3, "Acknowledgement Modes", for definition and discussion of the ACK message.

3.21.4.3.2.1 MSH Segment

The MSH segment shall be constructed as defined in the "Message Control" section (ITI TF-2x: C.2.2).

MSH-9 (Message Type) shall have three components. The first component shall have the value of QCN; the second component shall have a value of J01. The third component shall have the value of QCN_J01.

3.21.4.3.2.2 QID Segment

The QID segment contains the information necessary to uniquely identify the query being cancelled.

Table 3.21-9. IHE Profile - QID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	32	ST	R		00696	Query Tag
2	250	CE	R	0471	01375	Message Query Name

3.21.4.3.2.2.1   Populating QID-1 Query Tag

QID-1 (Query Tag) uniquely identifies the query to be canceled. This field shall contain the same value specified in QPD-2.

3.21.4.3.2.2.2   Populating QID-2 Message Query Name

QID-2 (Message Query Name) identifies the name of the query. It is an identifier of the conformance statement for this query. This field shall contain the same value specified in QPD-1.

3.21.5 Security Considerations

3.21.5.1 Audit Record Considerations

The Patient Demographics Query Transaction is a Query Information event as defined in Table 3.20.6-1. The Actors involved shall record audit events according to the following:

3.21.5.1.1 Patient Demographics Consumer audit message:

	Field Name	Opt	Value Constraints
Event AuditMessage/ EventIdentification	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-21", "IHE Transactions", "Patient Demographics Query")
Source (Patient Demographics Consumer) (1)			
Human Requestor (0..n)			
Destination (Patient Demographics Supplier) (1)			
Audit Source (Patient Demographics Consumer) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

	Field Name	Opt	Value Constraints
Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Demographics Consumer Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) AuditMessage/ ActiveParticipant	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

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	Field Name	Opt	Value Constraints
Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Demographics Source facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source	*AuditSourceID*	U	*Not specialized.*
AuditMessage/ AuditSourceIdentification	*AuditEnterpriseSiteID*	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

Patient	ParticipantObjectTypeCode	M	"1" (Person)
(AudittMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*
Query Parameters	ParticipantObjectTypeCode	M	"2" (system object)
	ParticipantObjectTypeCodeRole	M	"24" (query)
(AudittMessage/ ParticipantObjectIdentifi cation)	*ParticipantObjectDataLifeCycle*	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-21", "IHE Transactions", "Patient Demographics Query")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	U	*not specialized*
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	M	The complete query message (including MSH and QPD segments), base64 encoded.
	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

3.21.5.1.2   Patient Demographics Source audit message:

	Field Name	Opt	Value Constraints
Event	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
AuditMessage/ EventIdentification	*EventDateTime*	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-21", "IHE Transactions", "Patient Demographics Query")
Source (Patient Demographics Consumer) (1)			
Destination (Patient Demographics Supplier) (1)			
Audit Source (Patient Demographics Supplier) (1)			
Patient (0..n)			
Query Parameters(1)			

4255   Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Demographics Consumer Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Demographics Supplier facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	U	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	U	*Not specialized.*
	AuditEnterpriseSiteID	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

Patient (AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*
Query Parameters (AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCode	M	"2" (system object)
	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-21", "IHE Transactions", "Patient Demographics Query")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	U	*not specialized*
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	M	The complete query message (including MSH and QPD segments), base64 encoded.

	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

4260

3.22 Patient Demographics and Visit Query

This section corresponds to Transaction ITI-22 of the IHE IT Infrastructure Technical Framework. Transaction ITI-22 is used by the Patient Demographics Consumer and Patient Demographics Supplier actors.

3.22.1 Scope

This transaction involves a request by the Patient Demographics Consumer Actor for information about patients whose demographic and visit data match data provided in the query message. The request is received by the Patient Demographics Supplier actor. The Patient Demographics Supplier actor immediately processes the request and returns a response in the form of demographic and visit information for matching patients.

3.22.2 Use Case Roles
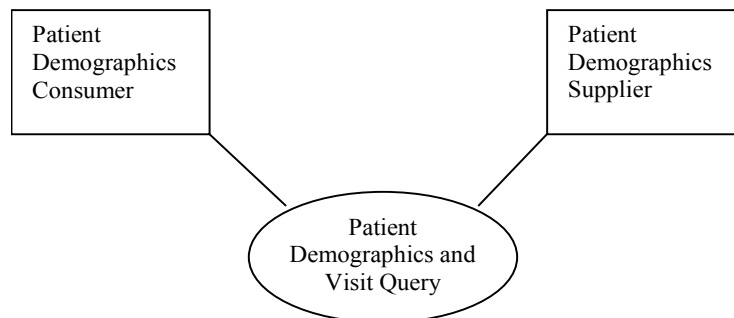
Actor: Patient Demographics Consumer

Role: Requests a list of patients matching a minimal set of demographic (e.g., ID or partial name) and visit criteria from the Patient Demographics Supplier. Populates its attributes with demographic and visit information received from the Patient Demographics Supplier.

Actor: Patient Demographics Supplier

Role: Returns demographic and visit information for all patients matching the demographic and visit criteria provided by the Patient Demographics Consumer.

3.22.3 Referenced Standards

HL7: Version 2.5, Chapter 2 – Control

Version 2.5, Chapter 3 – Patient Administration

Version 2.5, Chapter 5 – Query

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3.22.4 Interaction Diagram
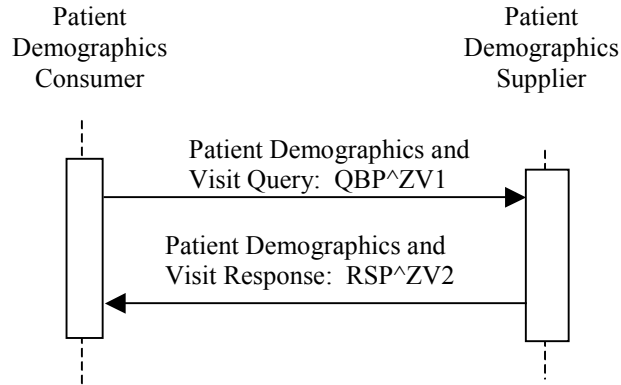
3.22.4.1 Patient Demographics and Visit Query

4290 **3.22.4.1.1 Trigger Events**

A Patient Demographics Consumer's need to select a patient based on demographic and visit information about patients whose information matches a minimal set of known data will trigger the Patient Demographics and Visit Query based on the following HL7 trigger event:

ZV1 – Find Candidates from Visit Information

4295 **3.22.4.1.2 Message Semantics**

The Patient Demographics and Visit Query transaction is conducted by the HL7 QBP^ZV1 message. The Patient Demographics Consumer actor shall generate the query message whenever it needs to select from a list of patients whose information matches a minimal set of demographic and visit data. The segments of the message listed below are required, and their detailed 4300 descriptions are provided in the following subsections.

Table 3.22-1 QBP Query by Parameter

QBP	Query by Parameter	Chapter in HL7 2.5
MSH	Message Header	2
QPD	Query Parameter Definition	5
RCP	Response Control Parameter	5
[DSC]	Continuation Pointer	2

The receiver shall respond to the query by sending the RSP^ZV2 message. This satisfies the requirements of original mode acknowledgment; no intermediate ACK message is to be sent.

Each Patient Demographics and Visit Query request specifies two distinct concepts. The Patient 4305 Demographics and Visit Query is always targeted at a single source of patient demographic

information (referred to in this Transaction as the ***patient information source***). A Patient Demographics Supplier may have knowledge of more than one source of demographics. A Patient Demographics Supplier shall support at least one source of patient demographics and may support multiple sources of demographics. ITI TF-2a: 3.21.4.1.2.1 describes how the Patient Demographics Consumer specifies which source of demographics are requested by the query. Each query response shall return demographics from a single patient information source.

The second concept present in the query is the set of patient identifier domains referenced by the query. These patient identifier domains may or may not be associated with the patient information source. A Patient Demographics Supplier shall support at least one patient identifier domain and may support multiple identifier domains. ITI TF-2a: 3.21.4.1.2.2 describes how the Patient Demographics Consumer requests identifiers from one or more patient identifier domains. Query responses may return patient identifiers from 0, 1 or multiple patient identifier domains.

3.22.4.1.2.1 MSH Segment

The MSH segment shall be constructed as defined in the "Message Control" section (ITI TF-2x: C.2.2).

The Patient Demographics Supplier is able to obtain demographics from at least one and possibly multiple patient information sources. When more than one patient information source is available, Field *MSH-5-Receiving Application* specifies the patient information source that this query is targeting. The Patient Demographics Supplier shall return this value in *MSH-3-Sending Application* of the RSP^ZV2 response. The value specified in MSH-5 is not related to the value requested in QPD-8 What Domains Returned.

A list shall be published of all Receiving Applications that the Patient Demographics Supplier supports, for the Patient Demographics Consumer to choose from. Each query is processed against one and only one source of patient demographic information.

Field *MSH-9-Message Type* shall have all three components populated with a value. The first component shall have a value of **QBP**; the second component shall have a value of **ZV1**. The third component shall have a value of **QBP_Q21**.

3.22.4.1.2.2 QPD Segment

The Patient Demographics Consumer Actor shall send attributes within the QPD segment as described in Table 3.22-2.

Table 3.22-2 PDQ Profile - QPD segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	250	CE	R	0471	01375	Message Query Name
2	32	ST	R+		00696	Query Tag
3		QIP	R			Demographics and Visit Fields
8		CX	O			What Domains Returned

Adapted from the HL7 standard, version 2.5

4340   The Consumer shall specify "IHE PDVQ Query" for QPD-1 Message Query Name.

3.22.4.1.2.2.1   Parameters in QPD-3-Demographics and Visit-Related Fields

Field *QPD-3-Demographics and Visit-Related Fields* consists of one or more repetitions, each of which contains two components that together contain the name and value of a distinct parameter
4345   to the query. Acceptable segments are PID, PD1, PV1, and PV2.

The first component of each parameter contains the name of an HL7 element in the form

@<seg>.<field no>.<component no>.<subcomponent no>

The above format is populated according to common HL7 usage for specifying elements used in query parameters, as follows:

4350   <seg> represents a 3-character segment ID from the HL7 Standard.

<field no> is the number of a field within the segment as shown in the SEQ column of the segment attribute table for the segment selected.

<component no>, for fields whose data types contain multiple components, shall contain the cardinal number of the component being valued. For fields whose data types do not contain
4355   multiple components, <component no> shall not be valued and its preceding period should not appear.

<subcomponent no>, for components whose data types contain multiple subcomponents, shall contain the cardinal number of the subcomponent being valued. For components whose data types do not contain multiple subcomponents, <subcomponent no> shall not be valued and its
4360   preceding period shall not appear.

The second subcomponent of each parameter contains the value that is to be matched. If it is desired to constrain the quality of a match within the bounds of an algorithm known to the Supplier, the algorithm and constraint values may be specified in Fields QPD-4 through QPD-7.

The Patient Demographics Consumer may specify, and the Patient Demographics Supplier shall
4365   support, the fields in Table 3.22-3. If the Pediatric Demographics option is supported, then additionally, the Patient Demographics Consumer may specify, and the Patient Demographics Supplier shall support, the fields in Table 3.22-4.

Table 3.22-3 PDQ Profile – QPD-3 fields required to be supported

FLD	ELEMENT NAME
PID.3	Patient Identifier List
PID.5	Patient Name
PID.7	Date/Time of Birth
PID.8	Administrative Sex
PID.11	Patient Address

FLD	ELEMENT NAME
PID.18	Patient Account Number

4370 **Table 3.22-4 PDQ Profile – QPD-3 fields required to be additionally supported if Pediatric Demographics is supported**

FLD	ELEMENT NAME
PID.6	Mother's Maiden Name
PID.13	Phone Number - Home

4375 In addition, the Patient Demographics Supplier should support the fields in the following table, and it shall support at least one of them. Some fields may not be relevant to particular care settings (e.g., inpatient, day patient) and will thus not be supportable by domains in those care settings.

4380 **Table 3-22.4 PDQ Profile – QPD-3 fields recommended to be supported**

FLD	ELEMENT NAME
PV1.2	Patient Class
PV1.3	Assigned Patient Location
PV1.7	Attending Doctor
PV1.8	Referring Doctor
PV1.9	Consulting Doctor
PV1.10	Hospital Service
PV1.17	Admitting Doctor
PV1.19	Visit Number

The Patient Demographics Supplier shall return demographic records that reflect the best fit to all of the search criteria.

Examples of parameter expressions in QPD-3:

4385

```
@PID.5.1.1^SMITH~@PID.8^F
```

requests all patients whose family name (first subcomponent (data type ST) of the first component (data type FN) of PID-5-Patient Name (data type XPN)) matches the value 'SMITH' and whose sex (PID-8-Sex (data type IS)) matches the value 'female'.

4390

```
@PV1.3.2^389~@PV1.3.3^2
```

requests all patients whose room number (second component (data type IS) of PV1-3-Assigned Patient Location (data type PL)) matches the value 389 and whose bed number (third component (data type IS) of PV1-3-Assigned Patient Location (data type PL)) matches the value 2.

4395 ### 3.22.4.1.2.2.2   Populating QPD-8-What Domains Returned

As in the Patient Demographics Query (Transaction ITI-21), field QPD-8 restricts the set of domains for which identifiers are returned in PID-3:

1. In a multiple-domain environment, QPD-8 may be used to identify one or more domains of interest to the Patient Demographics Consumer and from which the
4400   Consumer wishes to obtain a value for *PID-3-Patient Identifier*. Note that the patient information source designated by MSH-5 may or may not be associated with any of the Patient ID Domains listed in *QPD-8-What Domains Returned*.

2. If QPD-8 is empty, the Patient Demographics Supplier shall return all Patient IDs known by the Patient Demographics Supplier for each patient that matches the search
4405   criteria. See Case 1 in ITI TF-2a: 3.21.4.2.2.8 for details on how this information is returned.

3. If QPD-8 is specified and the domains are recognized, the Patient Demographics Supplier shall return the Patient IDs for each patient that matches the search criteria. See Case 2 in ITI TF-2a: 3.21.4.2.2.8 for details on how this information is returned.

4410

4. Any domain not recognized by the Patient Demographics Supplier is an error condition. See Case 3 in ITI TF-2a: 3.21.4.2.2.8 how to handle this condition.

5. In a single-domain environment, QPD-8 may be ignored by the Patient Demographics Supplier. The Supplier shall always return the identifier from the Patient ID Domain known by the Patient Demographics Supplier.

4415

Within field QPD-8, only component 4 (Assigning Authority) shall be valued.

The Patient Demographics Supplier may or may not be able to supply additional identifiers from the domains specified in QPD-8. A discussion of how QPD-8 is processed is included in the architectural discussion in the "Using Patient Data Query (PDQ) in a Multi-Domain Environment" section (ITI TF-2x: Appendix M).

4420

The Patient Demographics Consumer shall be able to support at least one of the following mechanisms for specifying QPD-8:

1. Transmit an empty value and receive all identifiers in all domains known by the Patient Demographics Supplier (one or more domains), or

2. Transmit a single value and receive zero or more identifiers in a single domain, or

4425

3. Transmit multiple values and receive multiple identifiers in those multiple domains.

3.22.4.1.2.3 RCP Segment

The Patient Demographics Consumer Actor shall send attributes within the RCP segment as described in Table 3.22-5. Fields not listed are optional.

Table 3.22-5 IHE Profile - RCP segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	1	ID	R	0091	00027	Query Priority
2	10	CQ	O	0126	00031	Quantity Limited Request

4430

Adapted from the HL7 standard, version 2.5

3.22.4.1.2.3.1   Populating RCP-1-Query Priority

Field *RCP-1-Query Priority* shall always contain **I**, signifying that the response to the query is to be returned in Immediate mode.

3.22.4.1.2.3.2   Populating RCP-2-Quantity Limited Request

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The Patient Demographics Consumer Actor may request that responses to the query be sent, using the HL7 Continuation Protocol, in increments of a specified number of patient records. (In the context of the HL7 query, a patient record is defined as the PID segment and any segments

accompanying it for each patient.) It is desirable to request an incremental response if the query could result in hundreds or thousands of matches or "hits."

4440   The Patient Demographics Supplier Actor shall support the HL7 Continuation Protocol.

Field RCP-2 is of data type CQ, which contains two components. The first component contains the number of increments, always expressed as an integer greater than 0, while the second component contains the kind of increment, always RD to signify that incremental replies are specified in terms of records.

4445   For example, 50RD requests 50 records at a time.

See the "Incremental Response Processing" section (ITI TF-2a: 3.22.4.1.3.3) and the "Expected Actions" section of the Patient Demographics Query Response message (ITI TF-2a: 3.22.4.2.3) for more information on the implementation of the continuation protocol.

3.22.4.1.2.4 DSC Segment

4450   The Patient Demographics Consumer Actor may request additional increments of data by specifying this segment on the query request. This segment should be omitted on the initial query request. Its purpose is to request additional increments of the data from the Patient Demographic Supplier Actor.

4455   **Table 3.22-9 IHE Profile - DSC segment**

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	180	ST	O		00014	Continuation Pointer
2	1	ID	O	0398	01354	Continuation Style

3.22.4.1.2.4.1   Populating DSC-1 Continuation Pointer

To request additional increments of data, DSC-1 (Continuation Pointer) shall echo the value from RSP^K22 DSC-1.

4460

3.22.4.1.2.4.2   Populating DSC-2 Continuation Style

DSC-2 (Continuation Style) shall always contain "I", signifying that this is part of an interactive continuation message.

4465   ### 3.22.4.1.3   Expected Actions

3.22.4.1.3.1 Immediate Acknowledgement

The Patient Demographics Supplier shall immediately return an RSP^ZV2 response message as specified below in ITI TF-2a: 3.22.4.2, "Patient Demographics Response." The RSP^ZV2 response message incorporates original mode application acknowledgment as specified in the

4470 "Acknowledgment Modes" section (ITI TF-2x: C.2.3). The Supplier shall use Field *MSH-3-Sending Application* of the RSP^ZV2 message to return the value it received from the Patient Demographics Consumer in Field *MSH-5-Receiving Application* of the QBP^ZV1 message.

3.22.4.1.3.2 Query Parameter Processing

The Patient Demographics Supplier Actor shall be capable of accepting, searching on, and
4475 responding with attributes in the QPD segment as specified in Table 3.22-2.

The Patient Demographics Supplier Actor must be capable of receiving all valid combinations of subcomponents that make up the Assigning Authority component (*i.e.*, all valid combinations of QPD-3.8).

Handling of phonetic issues, alternate spellings, upper and lower case, wildcards, accented
4480 characters, etc., if deemed appropriate, is to be supported by the Patient Demographics Supplier rather than by the Patient Demographics Consumer. The Supplier shall return at least all exact matches to the query parameters sent by the Consumer; IHE does not further specify matching requirements.

3.22.4.1.3.3 Incremental Response Processing

4485 The Patient Demographics Supplier Actor shall be capable of accepting and processing attributes in the RCP segment as listed in Table 3.22-5. In particular, the Patient Demographics Supplier Actor shall respond in immediate mode (as specified by a *RCP-1-Query Priority* value of **I**).

Also, the Patient Demographics Supplier Actor shall be able to interpret *RCP-2-Quantity Limited Request* to return successive responses of partial lists of records according to the HL7
4490 Continuation Protocol, as described in ITI TF-2a: 3.22.4.2 below and in the HL7 Standard.

3.22.4.2 Patient Demographics and Visit Response

3.22.4.2.1   Trigger Events

The Patient Demographics Supplier's response to the Find Candidates with Visit Information message shall be the following message:

4495 ZV2 – Find Candidates with Visit Information response

3.22.4.2.2   Message Semantics

The Patient Demographics and Visit Response transaction is conducted by the RSP^ZV2 message. The Patient Demographics Supplier Actor shall generate this message in direct response to the QBP^ZV1 message previously received. This message satisfies the Application
4500 Level, Original Mode Acknowledgement for the HL7 QBP^ZV1 message.

The segments of the message listed without enclosing square brackets in Table 3.22-6 are required. Detailed descriptions of all segments listed in the table below are provided in the following subsections. Other segments of the message are optional.

4505

Table 3.22-6 RSP Segment Pattern Response

RSP	Segment Pattern Response	Chapter in HL7 2.5
MSH	Message Header	2
MSA	Message Acknowledgement	2
[{ERR}]	Error	2
QAK	Query Acknowledgement	5
QPD	Query Parameter Definition	5
[{ PID	Patient Identification	3
[PD1]	Additional Patient Demographics	3
PV1	Patient Visit	3
[PV2]	Patient Visit – Additional Information	3
[QRI] }]	Query Response Instance	5
[DSC]	Continuation Pointer	2

3.22.4.2.2.1 MSH Segment

The MSH segment shall be constructed as defined in the "Message Control" section (ITI TF-2x: C.2.2).

4510 Field *MSH-3-Sending Application* specifies the patient information source that processed the query. The Patient Demographics Supplier shall use Field *MSH-3-Sending Application* of the RSP^ZV2 message to return the value it received from the Patient Demographics Consumer in Field *MSH-5-Receiving Application* of the QBP^Q22 message.

Field *MSH-9-Message Type* shall have all three components populated with a value. The first
4515 component shall have a value of **RSP**; the second component shall have a value of **ZV2**. The third component shall have a value of **RSP_ZV2**.

3.22.4.2.2.2 MSA Segment

The Patient Demographics Supplier Actor is not required to send any attributes within the MSA segment beyond what is specified in the HL7 standard. See the "Acknowledgment Modes"
4520 section (ITI TF-2x: C.2.3) for the list of all required and optional fields within the MSA segment.

3.22.4.2.2.3 QAK Segment

The Patient Demographics Supplier Actor shall send attributes within the QAK segment as defined in table 3.22-7. For the details on filling in QAK-2 (Query Response Status) refer to the "Patient Demographics Supplier Actor Query Response Behavior" section (ITI TF-2a:
4525 3.22.4.2.2.11).

QAK-1 (Query Tag) shall echo the same value of QPD-2 (Query Tag) of the QBP^Q22 message, to allow the Patient Demographics Query Consumer to match the response to the corresponding query request.

Table 3.22-7 IHE Profile - QAK segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	32	ST	R		00696	Query Tag
2	2	ID	R+	0208	00708	Query Response Status

4530   Adapted from the HL7 standard, version 2.5

3.22.4.2.2.4 QPD Segment

The Patient Demographics Supplier Actor shall echo the QPD Segment value that was sent in the QBP^ZV1 message.

3.22.4.2.2.5 PID Segment

4535   The Patient Demographics Supplier Actor shall return one PID segment group (*i.e.*, one PID segment plus any segments associated with it in the message syntax shown in Table 3.22-6) for each matching patient record found. The Supplier shall return the attributes within the PID segment as specified in Table 3.22-8. If the Pediatric Demographics option is supported, then additionally, the Supplier shall return the attributes within the PID segment as specified in Table
4540   3.22-9. In addition, the Patient Demographics Supplier Actor shall return all other attributes within the PID segment for which it is able to supply values.

Table 3.22-8 PDQ Profile - PID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
3	250	CX	R		00106	Patient Identifier List
5	250	XPN	R		00108	Patient Name
7	26	TS	R2		00110	Date/Time of Birth
8	1	IS	R2	0001	00111	Administrative Sex
11	250	XAD	R2		00114	Patient Address
18	250	CX	R2		00121	Patient Account Number

Table 3.22-9 PDQ Profile, Pediatric Demographics Option - PID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
6	250	XPN	R2		00109	Mother's Maiden Name
13	250	XTN	R2		00116	Phone Number - Home
24	1	ID	R2	0136	00127	Multiple Birth Indicator
25	2	NM	R2		00128	Birth Order (within live births)
33	26	TS	R2		01537	Last Update Date/Time
34	241	HD	R2		01538	Last Update Facility

4545   Adapted from the HL7 standard, version 2.5

The Patient Demographics Supplier may or may not be able to supply additional identifiers from the domains specified in QPD-8. Inability to supply an identifier in a particular domain is not an error, provided that the domain is recognized.

The PID segment and the PD1, PV1, PV2, and QRI segments that are associated with it are
4550   returned only when the Patient Demographics Supplier Actor is able to associate the search information in QPD-3 with one or more patient records in the patient information source associated with *MSH-5-Receiving Application*. See the "Patient Demographics Supplier Actor Query Response Behavior" section (ITI TF-2a: 3.22.4.2.2.11) for a detailed description of how the Patient Demographics Supplier Actor responds to the query request under various
4555   circumstances.

3.22.4.2.2.6 PD1 Segment

For each patient for which the Patient Demographics Supplier Actor returns a PID segment, it may optionally return the PD1 (Patient Additional Demographics) segment, but is not required to do so.

4560   ### 3.22.4.2.2.7 PV1 Segment

For each patient for which the Patient Demographics Supplier Actor returns a PID segment, it shall also return a PV1 Segment in which attributes are populated as specified in Table 3.22-9. In addition, the Patient Demographics Supplier Actor shall return all other attributes within the PV1 segment for which it is able to supply values.

4565

Table 3.22-9 PDQ Profile – PV1 segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
2	1	IS	R	0004	00132	Patient Class
3	80	PL	R2		00133	Assigned Patient Location
7	250	XCN	R2	0010	00137	Attending Doctor
8	250	XCN	R2	0010	00138	Referring Doctor
9	250	XCN	R2	0010	00139	Consulting Doctor
10	3	IS	R2	0069	00140	Hospital Service
17	250	XCN	R2	0010	00147	Admitting Doctor
19	250	CX	R2		00149	Visit Number

Adapted from the HL7 standard, version 2.5

3.22.4.2.2.8 PV2 Segment

For each patient for which the Patient Demographics Supplier Actor returns a PID segment, it
4570   may optionally return the PV2 (Patient Visit – Additional Information) segment, but is not required to do so.

3.22.4.2.2.9 QRI Segment

For each patient for which the Patient Demographics Supplier Actor returns a PID segment, it may optionally return the QRI (Query Response Instance) segment, but is not required to do so. Refer to the HL7 Standard, Version 2.5, Chapter 5, Section 5.5.5, for more information.

3.22.4.2.2.10 DSC Segment

If a number of records is specified in *RCP-2-Quantity Limited Request*, the Patient Demographics Supplier Actor shall return an incremental response of that number of records when the number of matching records it finds exceeds the number of records specified in RCP-2.

As long as the Patient Demographics Supplier Actor has records to return in additional to those returned in the incremental response, the Supplier shall return a DSC Segment. The single field of the DSC Segment shall contain a unique alphanumeric value (the Continuation Pointer) that the Patient Demographics Consumer may return in the DSC segment of the QBP^ZV1 message to request the next increment of responses. The Supplier shall return increments as many times as the Consumer requests them (and there are increments to return), and shall stop when the Consumer sends a cancel query (QCN^J01) message (or when there are no more increments to return). The Supplier shall signal no more increments by omitting the DSC segment.

3.22.4.2.2.11 Patient Demographics Supplier Actor Query Response Behavior

The Patient Demographics Supplier shall perform the matching of patient data based on the query parameter values it receives. The information provided by the Patient Demographics Supplier Actor to Patient Demographics Consumer Actors is a list of possible matching patients from the patient information source associated with the value that the Consumer sent in *MSH-5-Receiving Application* of the query message.

If domains are specified in *QPD-8-What Domains Returned* and are recognized by the Patient Demographics Supplier, the response will also, for each patient, contain any Patient ID values found in the specified domains.

The mechanics of the matching algorithms used are internal to the Patient Demographics Supplier Actor and are outside of the scope of this framework.

The Patient Demographics Supplier Actor shall respond to the query request as described by the following 3 cases:

Case 1: The Patient Demographics Supplier Actor finds (in the patient information source associated with *MSH-5-Receiving Application*) at least one patient record matching the criteria sent in *QPD-3-Demographics Fields*. No patient identifier domains are requested in *QPD-8-What Domains Returned*.

AA (application accept) is returned in MSA-1.

OK (data found, no errors) is returned in QAK-2.

One PID-PV1 segment group (*i.e.*, one PID segment and one PV1 segment, plus any segments associated with them in the message syntax shown in Table 3.22-6) is returned from the patient

information source for each patient record found. If the Patient Demographics Supplier Actor
returns data for multiple patients, it shall return these data in successive occurrences of the PID-
PV1 segment group.

Within each PID segment, field *PID-3-Patient Identifier List* contains one or more identifiers
from the set of Patient ID Domains known by the Patient Demographics Supplier.

If an incremental number of records are specified in *RCP-2-Quantity Limited Request*, and the
number of records found exceeds that incremental number, the Supplier returns only the
incremental number of records, followed by a DSC segment containing a uniquely valued
Continuation Pointer.

The consumer will specify the value of the continuation pointer in the DSC segment on the
subsequent query request to request the next increment of responses.

Case 2: The Patient Demographics Supplier Actor finds (in the patient information source
associated with *MSH-5-Receiving Application*) at least one patient record matching the criteria
sent in *QPD-3-Demographics Fields*. One or more patient identifier domains are requested in
QPD-8-What Domains Returned; the Supplier recognizes all the requested domains.

AA (application accept) is returned in MSA-1.

OK (data found, no errors) is returned in QAK-2.

One PID-PV1 segment group (*i.e.*, one PID and one PV1 segment plus any segments associated
with them in the message syntax shown in Table 3.22-6) is returned for each matching patient
record found. If the Patient Demographics Supplier Actor returns data for multiple patients, it
shall return these data in successive occurrences of the PID segment group.

Within each PID segment, field *PID-3-Patient Identifier List* contains, in successive occurrences
delimited by the repetition separator, the identifiers from all the Patient ID Domains requested in
QPD-8. In each occurrence of PID-3, component 4 contains the assigning authority value for
one Patient ID Domain, and component 1 contains the Patient ID value in that domain. If an
identifier does not exist for a domain that was specified on QPD-8, nothing is returned in the list.

If an incremental number of records is specified in *RCP-2-Quantity Limited Request*, and the
number of records to be sent exceeds that incremental number, the Supplier returns only the
incremental number of records, followed by a DSC segment containing a uniquely valued
Continuation Pointer.

The consumer will specify the value of the continuation pointer in the DSC segment on the
subsequent query request to request the next increment of responses.

Case 3: The Patient Demographics Supplier Actor does not recognize one or more of the
domains in *QPD-8-What Domains Returned*.

AE (application error) is returned in MSA-1 and in QAK-2.

For each domain that was not recognized, an ERR segment is returned in which the components of *ERR-2-Error Location* are valued as follows.

COMP #	COMPONENT NAME	VALUE
1	Segment ID	**QPD**
2	Sequence	**1**
3	Field Position	**8**
4	Field Repetition	*(see below)*
5	Component Number	*(empty)*
6	Subcomponent Number	*(empty)*

ERR-2.4-Field Repetition identifies the ordinal occurrence of QPD-8 that contained the unrecognized domain. As specified by HL7, *ERR-2.5-Component Number* and *ERR-2.6-Subcomponent Number* are not valued because we are referring to the entire field QPD-8.

ERR-3-HL7 Error Code is populated with the error condition code **204** (unknown key identifier). Together with the values in ERR-2, this signifies that the Patient Demographics Supplier Actor did not recognize the domain for *QPD-8-What Domains Returned*.

3.22.4.2.3   Expected Actions

The Patient Demographics Consumer will use the demographic information provided by the Patient Demographics Supplier to perform the functions for which it requested the information, e.g., providing a pick list to the user.

If the Supplier has sent a DSC segment containing a continuation pointer value, additional increments of data are available upon request by the Consumer. After receiving each increment of data that includes a DSC segment containing a continuation pointer value, the Consumer should take one of the following actions.

- If the Consumer wishes to receive another increment of the data, the Consumer reissues the query message using a new unique value in *MSH-10-message control ID* and adding the DSC segment after the RCP segment. DSC-1 shall echo the continuation pointer returned in RSP^K22 DSC-1 segment.

- If the Consumer does not wish to receive another increment of the data, the Consumer issues a cancel query (QCN^J01) message.

- If the Consumer does not reissue the query or send a cancel query message, the query will eventually terminate.

If the Supplier has not sent a DSC segment containing a continuation pointer value, no more increments of data are available and no further action by the Consumer is required.

4675 **3.22.4.3 Canceling a query**

The Patient Demographic Consumer can send a cancel trigger to notify the Patient Demographic Supplier that no more incremental response will be requested, and interactive query can be terminated. This cancellation trigger is optional. How long the Patient Demographic Supplier retains query results (for incremental response) is an implementation decision and therefore
4680 beyond the scope of IHE.

3.22.4.3.1   Trigger Events

The Patient Demographic Consumer which received a RSP^K22 response message indicating there more incremental response data available, can terminate the interactive query with the following HL7 trigger event:
4685

J01 – Cancel query status

3.22.4.3.2   Message Semantics

Canceling a query is conducted by the QCN^J01 message. The Patient Demographic Consumer
4690 can generate this message to notify the Patient Demographic Supplier that no more data is desired. The segments of the message listed below are required, and their details descriptions are provided in the following subsections.

Table 3.22-10 QCN Cancel query

QCN	Cancel query	Chapter in HL7 2.5
MSH	Message Header	2
QID	Query identification Segment	5

4695
The receiver shall acknowledge this cancel by the HL7 ACK message. See ITI TF-2x: C.2.3, "Acknowledgement Modes", for definition and discussion of the ACK message.

3.22.4.3.2.1 MSH Segment

The MSH segment shall be constructed as defined in the "Message Control" section (ITI TF-2x:
4700 C.2.2).

MSH-9 (Message Type) shall have three components. The first component shall have the value of QCN; the second component shall have a value of J01. The third component shall have the value of QCN_J01.
4705

3.22.4.3.2.2 QID Segment

The QID segment contains the information necessary to uniquely identify the query being cancelled.

___

4710

Table 3.22-11 IHE Profile - QID segment

SEQ	LEN	DT	OPT	TBL#	ITEM#	ELEMENT NAME
1	32	ST	R		00696	Query Tag
2	250	CE	R	0471	01375	Message Query Name

3.22.4.3.2.2.1 Populating QID-1 Query Tag

QID-1 (Query Tag) uniquely identifies the query to be canceled. This field shall contain the same value specified in QPD-2.

4715 ### 3.22.4.3.2.2.2 Populating QID-2 Message Query Name

QID-2 (Message Query Name) identifies the name of the query. It is an identifier of the conformance statement for this query. This field shall contain the same value specified in QPD-1.

3.22.5 Security Considerations

4720 ### 3.22.5.1 Audit Record Considerations

The Patient Demographics Query Transaction is a Query Information event as defined in Table 3.20.6-1. The Actors involved shall record audit events according to the following:

3.22.5.1.1 Patient Demographics Consumer audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-22", "IHE Transactions", "Patient Demographics and Visit Query")
Source (Patient Demographics Consumer) (1)			
Human Requestor (0..n)			
Destination (Patient Demographics Supplier) (1)			
Audit Source (Patient Demographics Consumer) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Demographics Consumer Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) AuditMessage/ ActiveParticipant	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

4725

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Demographics Source facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source AuditMessage/ AuditSourceIdentification	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient (AudittMessage/ ParticipantObjectIdentification)	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Query	ParticipantObjectTypeCode	M	"2" (system object)

	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-22", "IHE Transactions", "Patient Demographics and Visit Query")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	*U*	*not specialized*
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	M	the QPD segment of the query - Base64 encoded
	ParticipantObjectDetail	M	Type=MSH-10 (the literal string), Value=the value of MSH-10 (from the message content, base64 encoded)

3.22.5.1.2 Patient Demographics Source audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-22", "IHE Transactions", "Patient Demographics and Visit Query")
Source (Patient Demographics Consumer) (1)			
Destination (Patient Demographics Supplier) (1)			
Audit Source (Patient Demographics Supplier) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Demographics Consumer Actor facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

4730

	Field Name	Opt	Value Constraints
Destination **AuditMessage/** **ActiveParticipant**	UserID	M	The identity of the Patient Demographics Supplier facility and receiving application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

24 Patient Demographics Query HL7 V3 (PDQV3)

4470 The *Patient Demographics Query HL7 V3 Integration Profile (PDQV3)* provides ways for multiple distributed applications to query a patient information server for a list of patients, based on user-defined search criteria, and retrieve a patient's demographic information directly into the application. The discussion and use cases in ITI TF-1: 8 fully apply here, with the obvious adjustments to the referenced transactions.

24.1 Actors/Transactions

4475 The actors in this profile are the same as the actors defined in the PDQ profile (ITI TF-1: 8.1).

Table 24.1-1. Patient Demographics Query HL7 V3 Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section
Patient Demographics Consumer	Patient Demographics Query HL7 V3	R	ITI TF-2b: 3.47
Patient Demographics Supplier	Patient Demographics Query HL7 V3	R	ITI TF-2b: 3.47

4480 The transaction in this profile directly corresponds to one of the transactions used in the PDQ profile (ITI TF-1: 8) and provide the identical functionality. Table 24.1-2 describes this correspondence. Note that unlike the PDQ profile there is no transaction which corresponds to the Patient Demographics and Visit query (ITI-22).

4485 **Table 24.1-2 Transactions Correspondence between the PDQ and PDQV3 profiles**

Transactions in PDQ	Section in Volume	Transactions in PDQV3	Section in Volume
Patient Demographics Query [ITI-21]	ITI TF-2: 3.21	Patient Demographics Query HL7 V3 [ITI-47]	ITI TF-2b: 3.47

24.2 Patient Demographics Query HL7 V3 Integration Profile Options

Options that may be selected for this Integration Profile are listed in the Table 24.2-1 along with the 4490 Actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 24.2-1 Patient Demographics Query HL7 V3 - Actors and Options

Actor	Options	Vol & Section
Patient Demographics Consumer	Continuation Option Pediatric Demographics	ITI TF-1: 24.2.2
Patient Demographics Supplier	Continuation Option Pediatric Demographics	ITI TF-1: 24.2.2

_____

Support of continuations is described in transaction ITI-47. This option allows the Patient
Demographics Consumer to get the full set of responses in several increments, as opposed to in one
4495   single response.

24.2.1 Continuation

Support of continuations is described in transaction ITI-47. This option allows the Patient
Demographics Consumer to get the full set of responses in several increments, as opposed to in one
single response.

4500 ### 24.2.2 Pediatric Demographics Option

The experience of immunization registries and other public health population databases has shown
that matching and linking patient records from different sources for the same individual person in
environments with large proportions of pediatric records requires additional demographic data.

In particular, distinguishing records for children who are twins, triplets, etc. – that is, avoiding false
4505 positive matches - may be difficult because much of the demographic data for the two individuals
matches. For instance, twin children may have identical last names, parents, addresses, and dates of
birth; their first names may be very similar, possibly differing by only one letter. It can be very
difficult for a computer or even a human being to determine in this situation whether the slight first
name difference points to two distinct individuals or just a typographical error in one of the records.
4510 Additional information is extremely helpful in making this determination.

Pediatric Demographics makes use of the following six additional demographic fields to aid record
matching in databases with many pediatric records.

Field	**Reason for inclusion**	**Value**
Mother's Maiden Name	Any information about the mother is helpful in making a match	Helps create true positive matches
Patient Home Telephone	A telecom helps match into the right household	Helps create true positive matches
Patient Multiple Birth Indicator	Indicates this person is a multiple – twin, triplet, etc.	Helps avoid false positive matches of multiples
Patient Birth Order	Distinguishes among those multiples.	Helps avoid false positive matches of multiples
Last Update Date/Time, Last Update Facility	These fields, although not strictly demographic, can effectively substitute when multiple birth indicator and birth order are not collected. They indirectly provide visit information. Provider visits on the same day may likely indicate two children brought to a doctor together.	Helps avoid false positive matches of multiples

_____

4515 Patient Identity Source actors which support the Pediatric Demographics option are required to support the Patient Identity Management [ITI-30] transaction and shall provide values, when available, for the fields identified as Pediatric Demographics fields.

Patient Identifier Cross-reference Manager actors which support the Pediatric Demographics option are required to support the Patient Identity Management [ITI-30] transaction, and if values for one
4520 or more of the Pediatric Demographics fields are specified in the Patient Identity Management [ITI-30], they shall be considered as part of the matching algorithm of the PIX Manager.

Pediatric Demographics are defined as all of the following:

- Mother's Maiden Name
- Patient Home Telephone
4525 - Patient Multiple Birth Indicator
- Patient Birth Order
- Last Update Date/Time
- Last Update Facility

4530 ## 24.3 Patient Demographics Query HL7 V3 Process Flow

ITI TF-1: 8.3 describes use cases that this profile addresses. Figure 8.3-1 also applies to this profile with the changes to the corresponding PDQV3 transactions as specified in Table 24.1-2, and omitting transaction ITI-22, which has no correspondence in this profile.

24.3.1 Combined Use of PDQV3 with other IHE Workflow Profiles

4535 In addition to the discussion in ITI TF-1: 8.3.1, the use of web services as the transport in the transactions in this profile makes it well suited in cases where other web services-based profiles are used, like XDS.b and PIXV3.

24.3.2 Supplier Data Configuration

The Patient Demographics Supplier provides demographics information about possible matches to
4540 the parameters of the query. As described in ITI TF-2x: Appendix M, while it is possible for the supplier to have demographics information from multiple domains, only a single set of demographics shall be returned by the supplier.

If the supplier holds information for a single Patient ID domain, it shall provide the demographics information from that domain. In the case where the supplier holds demographics information from
4545 multiple Patient ID domains, the determination of which set of information to return must be based on the ID values for the Receiver's Device and Organization classes of the query transmission wrapper (the equivalent of MSH-5 and MSH-6 in the HL7 Version 2.5 corresponding message).

24.4 Intentionally left blank

4550   ## 24.5 Security Considerations

The implementer of this profile is advised that many risks cannot be mitigated by the IHE profile and instead the responsibility for mitigation is transferred to the vendor, and occasionally to the operational environment.

In order to address identified security risks:

4555
- All actors in PDQV3 should be grouped with a Consistent Time (CT) Profile - Time Client actor. This grouping will assure that all systems have a consistent time clock to assure a consistent timestamp for audit logging.

- All actors in PDQV3 should be grouped with an Audit Trail and Node Authentication (ATNA) profile - Secure Node actor or ATNA Secure Application actor. This grouping will
4560   assure that only highly trusted systems can communicate and that all changes are recorded in the audit log.

- All actors in PDQV3 should be grouped with an XUA X-Service User or X-Service Provider actor as appropriate. This grouping will enable service side access control and more detailed audit logging.

4565
- All actors in PDQV3 should be grouped with the appropriate actor from the Enterprise User Authentication (EUA) profile to enable single sign-on inside an enterprise by facilitating one name per user for participating devices and software.

3.47 Patient Demographics Query HL7 V3

This section corresponds to Transaction ITI-47 of the IHE Technical Framework. Transaction ITI-47 is used by the Patient Demographics Consumer and Patient Demographics Supplier
5190 actors. Additional components to be included if the Pediatric Demographics option is supported are also indicated in ITI TF-2b: 640 3.47.4.1.2.1 to 3.47.4.1.2.4.

3.47.1 Scope

The scope is identical to ITI TF-2a: 3.21.1.

3.47.2 Use Case Roles
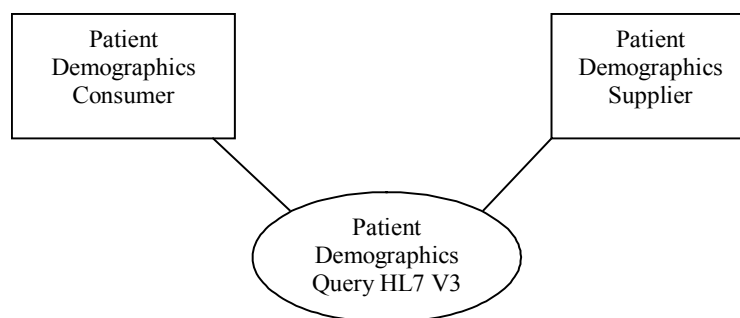
5195

Actor: Patient Demographics Consumer

Role: Requests a list of patients matching a minimal set of demographic criteria (e.g., ID or partial name) from the Patient Demographics Supplier. Populates its attributes with demographic information received from the Patient Demographics Supplier.

5200   **Corresponding HL7 v3 Application Roles:**

Person Registry Query Placer (PRPA_AR201303UV02)

Actor: Patient Demographics Supplier

Role: Returns demographic information for all patients matching the demographic criteria provided by the Patient Demographics Consumer.

5205   **Corresponding HL7 v3 Application Roles:**

Person Registry Query Fulliller (PRPA_AR201304UV02)

3.47.3 Referenced Standards

HL7 Version 3 Edition 2008, Patient Administration DSTU, Patient Topic (found at http://www.hl7.org/memonly/downloads/v3edition.cfm#V32008)

5210   Implementers of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V Web Services for IHE Transactions.

3.47.4 Interaction Diagrams
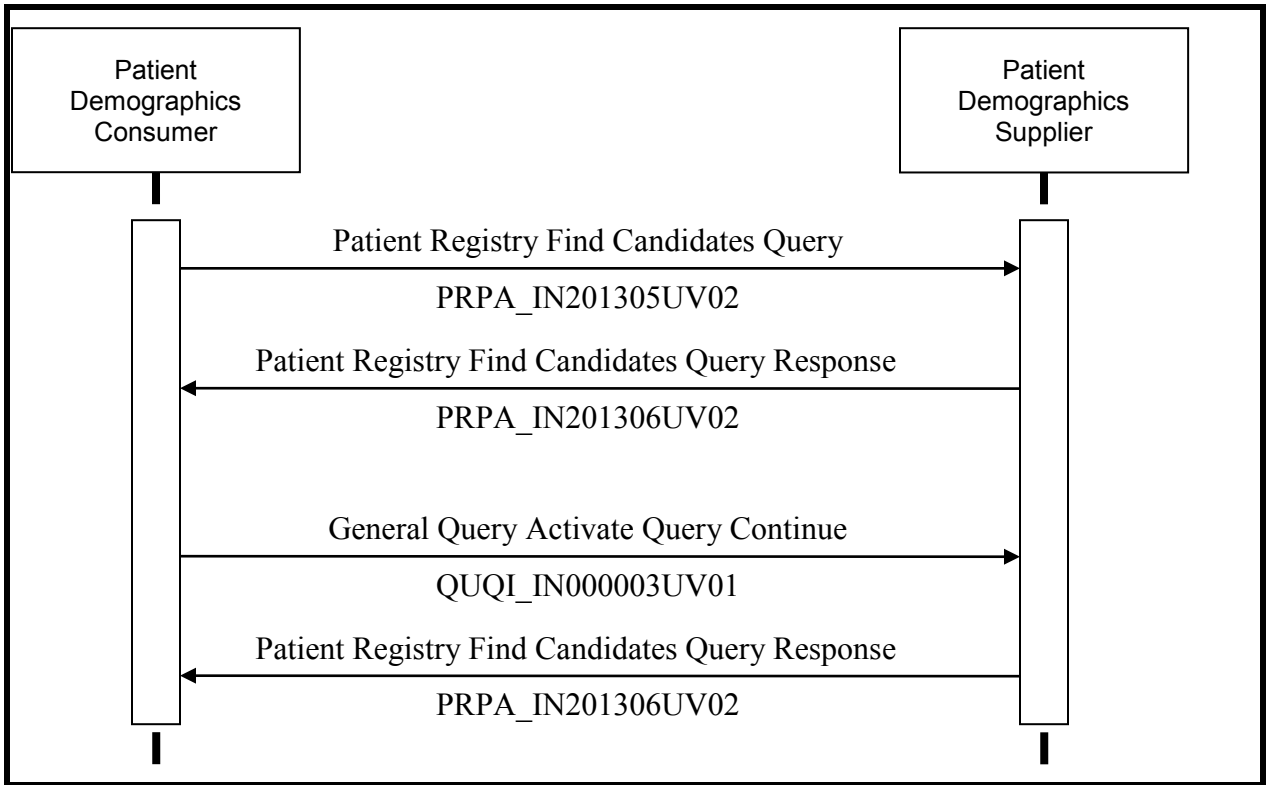
5215

Figure 3.46.4-1 Find Candidates Query

3.47.4.1 Patient Demographics Query

3.47.4.1.1 Trigger Events

A Patient Demographics Consumer's need to select a patient based on demographic information about patients whose information matches a set of known data will trigger the Patient
5220   Demographics Query based on the following HL7 trigger event:

Find Candidates Query (PRPA_TE201305UV02)

An application, in the role of Query Placer, sends a query-by-parameter message to request that the application return *all* person records that match the demographic information sent in the query parameters.

5225 ### 3.47.4.1.2 Message Semantics

The Find Candidates Query is supported by the Patient Registry Query by Demographics (PRPA_MT201306UV02) message. The Patient Demographics Consumer shall generate the query message whenever it needs to select from a list of patients whose information matches a set of demographic data.

5230   The components of the Patient Registry Query by Demographics message with cardinality greater than 0 (as shown below) are required, and the detailed description of the message is provided in ITI TF-2b: 3.47.4.1.2.1 to 3.47.4.1.2.4. Additional components to be included if the Pediatric Demographics option is supported are also indicated in ITI TF-2b: 3.47.4.1.2.1 to 3.47.4.1.2.4.

5235   The receiver shall respond to the query by sending the Patient Registry Find Candidates Response message (PRPA_MT201310UV02), which uses the Application Level Acknowledgement transmission wrapper. This satisfies the requirements of original mode acknowledgment; no intermediate Accept Acknowledgement is to be sent. The response message shall contain demographic records that reflect the best fit to all of the search criteria received in
5240   the Patient Registry Query by Demographics message.

3.47.4.1.2.1 Major Components of the Patient Registry Query by Demographics

LivingSubjectName Parameter

This optional parameter specifies the name of the person whose information is being queried. For this parameter item, a single person name (PN) data item shall be specified in the
5245   LivingSubjectName.value attribute. Only certain name parts within the PN data type (e.g., family name) may be specified. If the sender needs to indicate that the name parts specified are not limited to an exact match, then the *use* attribute of the *value* element shall be set to "SRCH". Handling of phonetic issues, alternate spellings, upper and lower case, partial matching, accented characters, etc. if deemed appropriate, is to be supported by the Patient Demographics Supplier
5250   rather than by the Patient Demographics Consumer. The Supplier shall return at least all exact matches to the query parameters sent by the Consumer. IHE does not further specify matching requirements, however, the MatchAlgorithm parameter may be used to indicate more specific requirements for the Supplier, based on an existing agreement on allowable values for MatchAlgorithm.value.

5255   **LivingSubjectAdministrativeGender Parameter**

This optional parameter specifies the administrative gender of the person whose information is being queried. For this parameter item, a single administrative gender code shall be specified in the LivingSubjectAdministrativeGender.value attribute.

LivingSubjectBirthTime Parameter

5260   This optional parameter specifies the birth data and time of the person whose information is being queried. This parameter can convey an exact moment (e.g., January 1, 1960 @ 03:00:00 EST), an approximate date (e.g., January 1960), or even a range of dates (e.g., December 1, 1959 through March 31, 1960).

5265   **PatientAddress Parameter**

This optional parameter specifies one or more addresses associated with the person whose information is being queried.

LivingSubjectId Parameter

5270 This optional repeating parameter specifies an identifier associated with the patient whose information is being queried (e.g., a local identifier, or an account identifier). If multiple instances of this parameter are provided in the query, all of the associated identifiers must match. The identifier specified in the LivingSubjectId.value attribute is expressed using the II data type. Please see Appendix E for the use of the II data type for patient identifiers.

OtherIDsScopingOrganization Parameter

5275 This optional repeating parameter specifies the assigning authority/authorities of the Patient Identity Domain(s) for which identifiers are to be returned. The identifier specified in the OtherIDsScopingOrganization.value attribute shall be expressed using the II data type, where the *root* element contains a valid ISO OID, and there is no *extension* element. If no such parameter is supplied, the patient demographics supplier is required to return the identifiers from all Patient
5280 Identity Domains known to it. Any parameter value which is not recognized by the target patient information source shall cause an error condition.

Additional components to be included if the Pediatric Demographics option is supported are also indicated below:

MothersMaidenName Parameter

5285 This optional parameter specifies the maiden name of the mother of the person whose information is being queried. For this parameter item, a single person name (PN) data item shall be specified in the Person.value attribute. Within the PN data type, the given name and family name may be specified. If the sender needs to indicate that the name parts specified are not limited to an exact match, then the use attribute of the value element shall be set to "SRCH".

5290 **PatientTelecom Parameter**

This optional parameter specifies the primary telephone number or email address of the person whose information is being queried.

Additional components to be included if the Pediatric Demographics option is supported are also indicated below:

5295 **MothersMaidenName Parameter**

This optional parameter specifies the maiden name of the mother of the person whose information is being queried. For this parameter item, a single person name (PN) data item shall be specified in the Person.value attribute. Within the PN data type, the given name and family name may be specified. If the sender needs to indicate that the name parts specified are not
5300 limited to an exact match, then the *use* attribute of the *value* element shall be set to "SRCH".

PatientTelecom Parameter

This optional parameter specifies the primary telephone number or email address of the person whose information is being queried.

3.47.4.1.2.2 Message Information Model of the Patient Registry Query by Demographics Message

Below is the Message Information Model for the Query by Demographics message, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict subset of the *Patient Registry Query by Demographics (PRPA_RM201306UV02) RMIM.* If the Pediatric Demographics option is supported, there are somewhat fewer constraints on the RMIM; these are also indicated.

The base RMIM can be found on the HL7 V3 2008 Edition CD at Edition2008/domains/uvpa/editable/PRPA_RM201306UV.htm. The following restrictions were made on the original RMIMs to arrive at the restricted model:

- Exactly one value attribute shall be present in each parameter
- Only the LivingSubjectId, OtherIDsScopingOrganization, and LivingSubjectName parameters can have more than one instance
- The optional attributes ParameterList.id, MatchCriterionList.id, QueryByParameter responseElementGroupId, QueryByParameter.modifyCode, and QueryByParameter.executionAndDeliveryTime were omitted from the model
- QueryByParameter.responsePriorityCode is required and is fixed to I (Immediate)
- QueryByParameter.responseModalityCode is required and is fixed to R (Real Time)
- QueryByParameter.statusCode is defaulted to "new".
- The data type of MatchAlgorithm.value is constrained to ST
- The data type of MinimumDegreeMatch.value is constrained to INT
- The data type of LivingSubjectName.value is constrained to PN
- The optional SortControl was omitted from the model
- The optional MatchWeight was omitted from the model
- The following optional parameters were omitted from the model:
  - PatientTelecom (not omitted if Pediatric Demographics option is supported)
  - PrincipalCareProviderId
  - PrinicpalCareProvisionId
  - MothersMaidenName (not omitted if Pediatric Demographics option is supported)
  - LivingSubjectDeceasedTime
  - PatientStatusCode
  - LivingSubjectBirthPlaceName
  - LivingSubjectBirthPlaceAddress
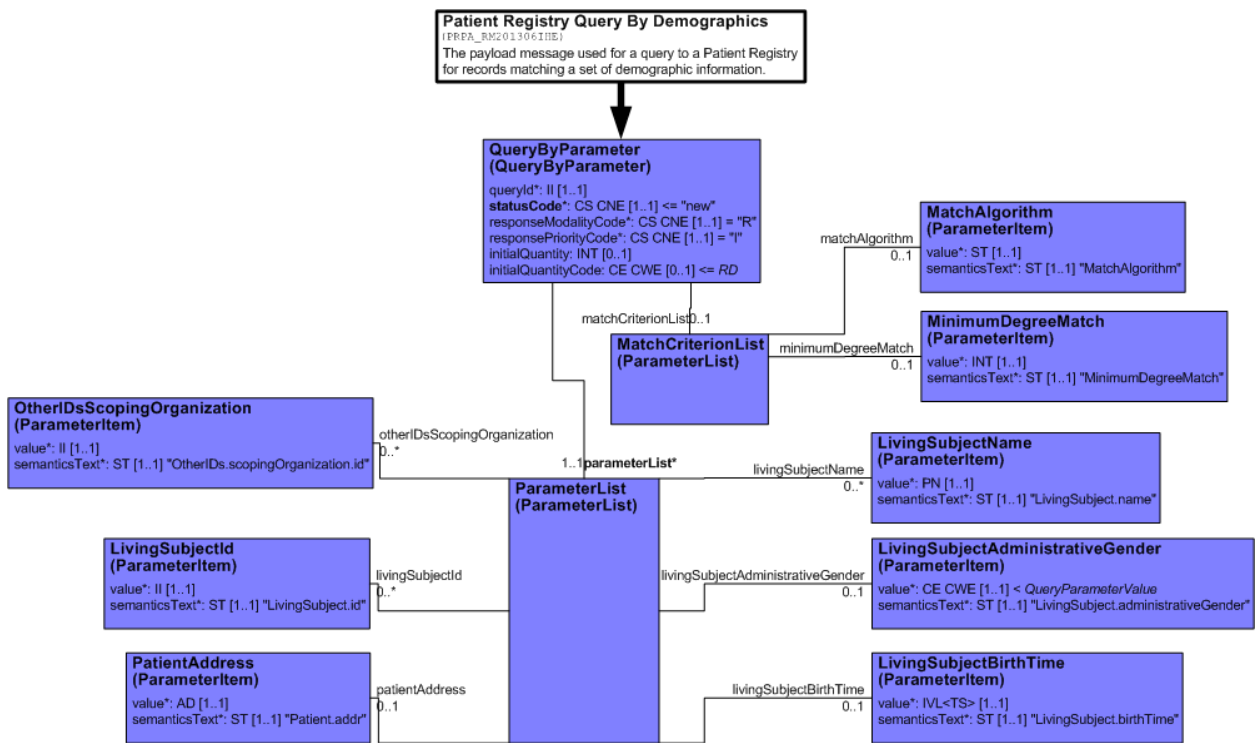
5340

Figure 3.47.4.1.2-1

The attributes of this model are described in the following table:

Table 3.47.4.1.2-1

PRPA_HD201306IHE Patient Registry Query by Demographics	This HMD extract defines the message used to query a patient registry for records matching a set of demographics information. Derived from Figure 3.47.4.1.2-1 (PRPA_RM201306IHE)
QueryByParameter	The entry point for the domain content in this query
queryId [1..1] QueryByParameter (II)	Unique identifier for the query
statusCode [1..1] (M) QueryByParameter (CS) {CNE:QueryStatusCode, default="new"}	The status of the query, default is "new"
responseModalityCode [1..1] QueryByParameter (CS) {CNE:ResponseModality, fixed value="R"}	The mode of the response – always real-time.
responsePriorityCode [1..1] QueryByParameter (CS) {CNE:QueryPriority, fixed value="I"}	The Patient Demographics Supplier is required to send an immediate response.
initialQuantity [0..1] QueryByParameter (INT)	Defines the maximum size of the response that can be accepted by the requesting application
initialQuantityCode [0..1] QueryByParameter (CE) {CWE:QueryRequestLimit, default="RD"}	Defines the units associated with the initialQuantity; default is "records".

PRPA_HD201306IHE Patient Registry Query by Demographics	This HMD extract defines the message used to query a patient registry for records matching a set of demographics information. Derived from Figure 3.47.4.1.2-1 (PRPA_RM201306IHE)
MatchAlgorithm	This parameter conveys instructions to the patient demographics supplier specifying the preferred matching algorithm to use
value [1..1] ParameterItem (ST)	The name of the algorithm
semanticsText [1..1] ParameterItem (ST){default= "MatchAlgorithm"}	
MinimumDegreeMatch	This parameter conveys instructions to the patient demographics supplier specifying minimum degree of match to use in filtering results
value [1..1] ParameterItem (INT)	The numeric value of the degree of match
semanticsText [1..1] ParameterItem (ST){default= "MatchAlgorithm"}	
LivingSubjectAdministrativeGender	This query parameter is a code representing the administrative gender of a person in a patient registry.
value [1..1] ParameterItem (CE) {CWE:AdministrativeGender}	
semanticsText [1..1] ParameterItem (ST){default= "LivingSubject.administrativeGender"}	
LivingSubjectBirthTime	This query parameter is the birth date of a living subject.
value [1..1] ParameterItem (IVL<TS>)	A date or date range. This parameter can convey an exact moment (e.g., January 1, 1960 @ 03:00:00 EST), an approximate date (e.g., January 1960), or even a range of dates (e.g., December 1, 1959 through March 31, 1960).
semanticsText [1..1] ParameterItem (ST){default= "LivingSubject.birthTime"}	
LivingSubjectId	
value [1..1] (M) ParameterItem (II)	A patient identifier, used to assist in finding a match for the query.
semanticsText [1..1] ParameterItem (ST){default= "LivingSubject.id"}	
LivingSubjectName	This query parameter is the name of a person. If multiple instances of LivingSubjectName are provided, the receiver must consider them as possible alternatives, logically connected with an "or".
value [1..1] ParameterItem (PN)	The name "use" attribute can convey that a name is to be matched using "fuzzy" matching, and does not require exact match. Only some of the name parts may be populated. If, for example, only a family name part of a person's name is sent, then the query would match all persons with that family name regardless of their given names or initials.
semanticsText [1..1] ParameterItem (ST){default= "LivingSubject.name"}	
PatientAddress	This query parameter is a postal address for corresponding with a

PRPA_HD201306IHE Patient Registry Query by Demographics	This HMD extract defines the message used to query a patient registry for records matching a set of demographics information. Derived from Figure 3.47.4.1.2-1 (PRPA_RM201306IHE)
	patient
value [1..1] ParameterItem (AD)	
semanticsText [1..1] ParameterItem (ST){default= "Patient.addr"}	
OtherIDsScopingOrganization	Optional parameter specifying the assigning authority of a Patient Identity Domain
value [1..1] ParameterItem (II)	The identifier for a Patient Identity Domain's assigning authority. IHE restriction: The value.root attribute SHALL be a valid ISO OID The value.extension attribute SHALL NOT be present
semanticsText [1..1] ParameterItem (ST){default= "OtherIDs.scopingOrganization.id"}	

5345   When Patient Demographics option is supported, the following sections may be included.

MothersMaidenName	Design Comments: This query parameter is the maiden name of a focal person's mother. It is included as a parameter because it is a common attribute for confirming the identity of persons in some registries. This parameter does not map to a single RIM attribute, instead, in RIM terms Mother's maiden name is the person name part of "family" with an EntityNamePartQualifier of "birth" for the person who is the player in a PersonalRelationship of type of "mother" to the focal person.
value [1..1] ParameterItem (PN)	Design Comments: A person name. In this case it may consist of only the given name part, the family name part, or both.
semanticsText [1..1] ParameterItem (ST){default= "Person.MothersMaidenName"}	
PatientTelecom	Design Comments: This query parameter is a telecommunications address for communicating with a living subject in the context of the target patient registry. It could be a telephone number, fax number or even an email address.
value [1..1] ParameterItem (TEL)	Design Comments: A telecommunications address. The scheme attribute specifies whether this is a telephone number, fax number, email address, etc.

3.47.4.1.2.3 Control Act and Transmission Wrappers

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.44.4.1.2-2 contains the Transmission and Control Act wrappers used for this interaction, and the associated constraints.

5350   **Table 3.47.4.1.2-7 Wrappers and Constraints**

Transmission Wrapper	Trigger Event Control Act Wrapper

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000100UV01 – Send Message Payload	QUQI_MT021001UV01 – Query Control Act Request: Query By Parameter
The value of interactionId SHALL be set to PRPA_IN201305UV02 The value of processingModeCode SHALL be set to T The acceptAckCode SHALL be set to AL There SHALL be only one receiver Device	The value of ControlActProcess.moodCode SHALL be set to EVN The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201305UV02 If an authorOrPerformer participation is present, the value of authroOrPerformer.typeCode SHALL be set to AUT

The composite message schemas which describe the full payload of this interaction, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schemas from the HL7 V3 2008 Normative Edition can be found at Edition2008/processable/multicacheschemas/PRPA_IN201305UV02.xsd)

3.47.4.1.2.4 Web Services Types and Messages

The Patient Registry Query by Demographics message will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL naming conventions SHALL apply:
```
query message    -> "PRPA_IN201305UV02_Message"
```

The following WSDL snippet describes the type for this message:
```
        …
 <types>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201305UV02.xs
d"/>
<xsd:element name="PRPA_IN201305UV02"/>
</xsd:schema>
   </types>
…
```

The message is described by the following snippet:
```
        …
  <message name="PRPA_IN201305UV02_Message">
<part element="hl7:PRPA_IN201305UV02" name="Body"/>
  </message>
        …
```

The port types for the WSDL describing the Patient Demographics Service are described together with the expected actions of the actors which receive these messages in section ITI TF-2b: 3.47.4.2.3.

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3.47.4.1.3 Expected Actions

3.47.4.1.3.1 Immediate Response

The Patient Demographics Supplier shall immediately return a Find Candidates Response message as specified below in ITI TF-2b: 3.47.4.2. The response message uses the Application Acknowledgement transmission wrapper, as specified in ITI TF-2x: Appendix O.1.3, and no other acknowledgments are part of this transaction.

3.47.4.1.3.2 Query Parameter Processing

The Patient Demographics Supplier shall be capable of accepting, searching on, and responding with attributes in the Query Person by Demographics message.

Handling of phonetic issues, alternate spellings, upper and lower case, partial matching, accented characters, etc., if deemed appropriate, is to be supported by the Patient Demographics Supplier rather than by the Patient Demographics Consumer. The Supplier shall return at least all exact matches to the query parameters sent by the Consumer; IHE does not further specify matching requirements, except as already discussed in the LivingSubjectName parameter description.

3.47.4.1.3.3 Incremental Response Processing

The Patient Demographics Supplier, which supports the Continuation Option, shall be capable of accepting and processing the *QueryByParameter.responsePriorityCode* attribute. In particular, the Patient Demographics Supplier shall respond in immediate mode.

Also, the Patient Demographics Supplier shall be able to interpret *QueryByParameter.initialQuantity* to return successive responses of partial lists of records. When processing incremental responses, the Patient Demographics Consumer shall request additional responses using the Query Control Act Request Continue/Cancel message (QUQI_MT000001UV01), as described in ITI TF-2b: 3.47.4.3.

3.47.4.1.3.4 Web Services Port Type and Binding Definitions

These definitions are part of the query response message. Please see ITI TF-2b: 3.47.4.2.3 for more information.

3.47.4.1.3.5 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.47.4.2 Patient Demographics Query Response

3.47.4.2.1 Trigger Events

The Patient Demographics Supplier's response to the Find Candidates Query message is triggered by the following trigger:

Find Candidates Response (PRPA_TE201306UV02)

5415 An application returns a Patient Registry Find Candidates Response message populated with information it holds for *each* person whose record matches the demographic information sent as parameters in a query-by-parameter message.

3.47.4.2.2 Message Semantics

The Patient Registry Find Candidates Response message (PRPA_MT201310UV02) is sent by

5420 the Patient Demographics Supplier in direct response to the query (PRPA_MT201306UV02) or, if the Continuation Option is supported, the query continuation (QUQI_MT000001UV01) message previously received. The components of the message with cardinality greater than 0 (as shown below) are required, and the detailed description of the message is provided in ITI TF-2b: 3.47.4.2.2.1 to 3.47.4.2.2.4. All other attributes of the message are optional.

5425 **3.47.4.2.2.1 Major Components of the Patient Registry Find Candidates Response Message**

This message shares all the major components of the Patient Activate/Revise messages, as described in ITI TF-2b: 3.44.4.1.2.1. The only additional component is the QueryMatchObservation class.

5430 **Query Match Observation**

The *QueryMatchObservation* class is used to convey information about the quality of the match for each record returned by the query response.

3.47.4.2.2.2 Message Information Model of the Patient Registry Find Candidates Response Message

5435 Below is the Message Information Model for the Patient Registry Find Candidates Response message, as restricted for this transaction. The purpose of the model is to describe the data elements relevant for this transaction. It is a strict common subset of the *Patient Registry Find Candidates Response (PRPA_RM201310UV02)* RMIM.

The base RMIM can be found on the HL7 V3 2008 Edition CD at

5440 Edition2008/domains/uvpa/editable/PRPA_RM201310UV.htm. The following restrictions were made on the original RMIMs to arrive at the restricted model:

- The focal entity choice is restricted to be only a person
- The relationship holder of the personal relationship is restricted to be a person (using CMET COCT_MT030207UV)

5445 - The following roles are omitted:
  - asPatientOfOtherProvider
  - birthPlace
  - guarantor
  - guardian
5450 - contactParty
  - asMember

- • careGiver
- • asStudent
- • The following participations are omitted:
5455
  - • subjectOf (administrativeObservation)
  - • coveredPartyOf (coverage)
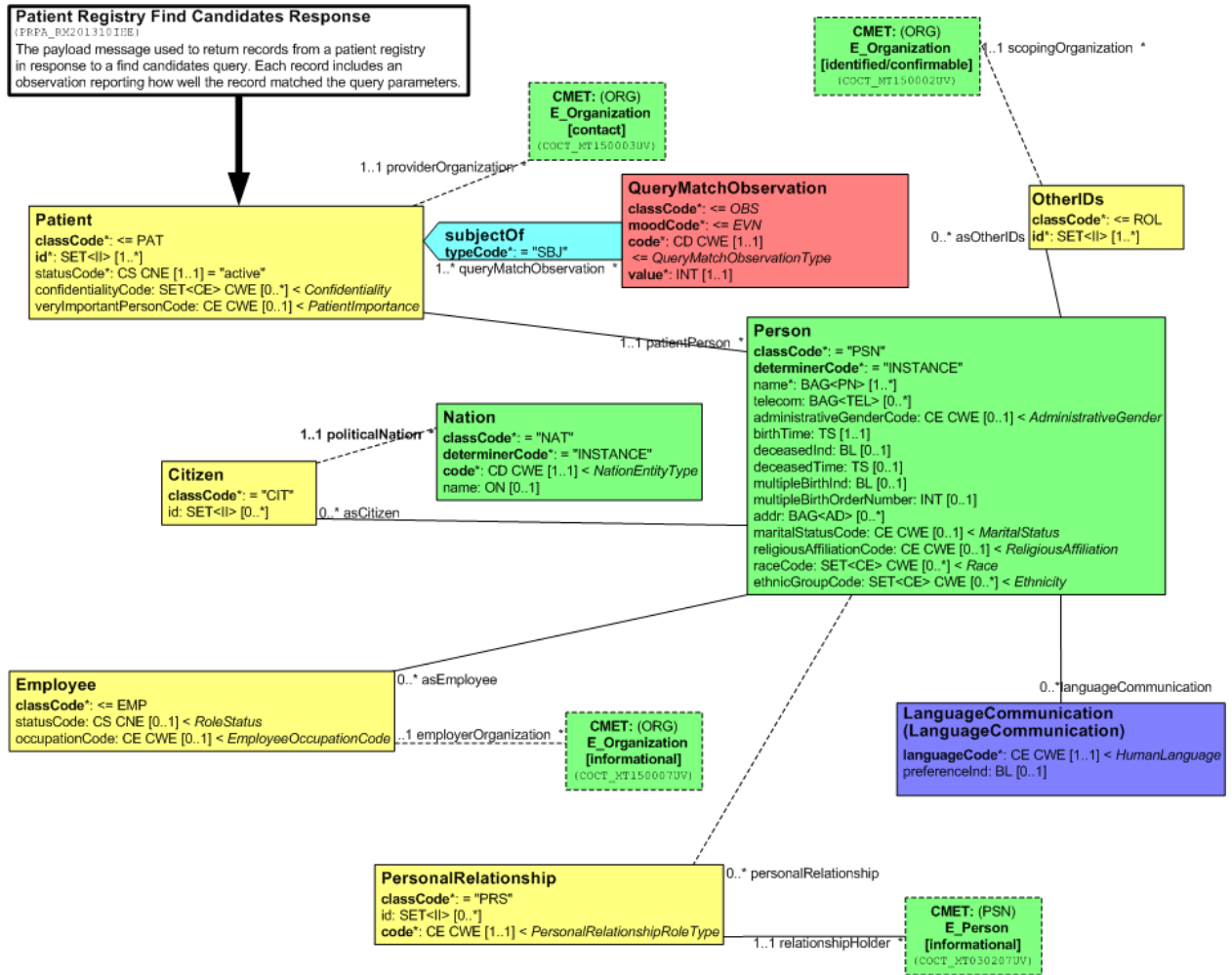
Figure 3.47.4.2.2-1

5460 The attributes of this model are described in the following table. Note that CMETs are not discussed, as the HL7 definitions for them are being used.

Table 3.47.4.2.2-8

PRPA_HD201310IHE Patient Registry Find Candidates Response	This HMD extract defines the message used to return records from a patient registry in response to a Find Candidates Query.
	Derived from Figure 3.47.4.2.2-1 (PRPA_RM201310IHE)

PRPA_HD201310IHE Patient Registry Find Candidates Response	This HMD extract defines the message used to return records from a patient registry in response to a Find Candidates Query. Derived from Figure 3.47.4.2.2-1 (PRPA_RM201310IHE)
Patient	The primary record for the focal person in a Patient Demographics Supplier
classCode [1..1] (M) Patient (CS) {CNE:PAT}	Structural attribute; this is a "patient" role
id [1..*] (M) Patient (SET<II>)	Patient identifiers. Patient Identifiers from different Identity Domains may be contained either here, or in the OtherIDs.id attributes, but not in both places. At least one Patient Identifier shall be present in this attribute
statusCode [1..1] Patient (CS) {CNE:active, fixed value= "active"}	A value specifying the state of this record in a patient registry (based on the RIM role class state-machine). This record is active.
confidentialityCode [0..*] Patient (SET<CE>) {CWE:Confidentiality}	Value(s) that control the disclosure of information about this living subject as a patient
veryImportantPersonCode [0..1] Patient (CE) {CWE:PatientImportance}	A code specifying the patient's special status granted by the scoper organization, often resulting in preferred treatment and special considerations. Examples include board member, diplomat.
Person	A subtype of LivingSubject representing a human being Either Person.name or Patient.id must be non-null
classCode [1..1] (M) Person (CS) {CNE:PSN, fixed value= "PSN"}	Structural attribute; this is a "person" entity
determinerCode [1..1] (M) Person (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	Structural attribute; this is a specific person
name [1..*] Person (BAG<PN>)	Name(s) for this person
telecom [0..*] Person (BAG<TEL>)	Telecommunication address(es) for communicating with this person
administrativeGenderCode [0..1] Person (CE) {CWE:AdministrativeGender}	A value representing the gender (sex) of this person. Note: this attribute does not include terms related to clinical gender which is a complex physiological, genetic and sociological concept that requires multiple observations in order to be comprehensively described.
birthTime [0..1] Person (TS)	The date and time this person was born
deceasedInd [0..1] Person (BL)	An indication that this person is dead
deceasedTime [0..1] Person (TS)	The date and time this person died
multipleBirthInd [0..1] Person (BL)	An indication that this person was part of a multiple birth
multipleBirthOrderNumber [0..1] Person (INT)	The order in which this person was born if part of a multiple birth

PRPA_HD201310IHE Patient Registry Find Candidates Response	This HMD extract defines the message used to return records from a patient registry in response to a Find Candidates Query. Derived from Figure 3.47.4.2.2-1 (PRPA_RM201310IHE)
addr [0..*] Person (BAG<AD>)	Address(es) for corresponding with this person
maritalStatusCode [0..1] Person (CE) {CWE:MaritalStatus}	A value representing the domestic partnership status of this person
religiousAffiliationCode [0..1] Person (CE) {CWE:ReligiousAffiliation}	A value representing the primary religious preference of this person
raceCode [0..*] Person (SET<CE>) {CWE:Race}	A set of values representing the races of this person
ethnicGroupCode [0..*] Person (SET<CE>) {CWE:Ethnicity}	A set of values representing the ethnic groups of this person
OtherIDs	Used to capture additional identifiers for the person such as a Drivers' license or Social Security Number.
classCode [1..1] (M) Role (CS) {CNE:ROL}	Structural attribute. This can be any specialization of "role" except for Citizen, or Employee.,
id [1..*] (M) Role (SET<II>)	One or more identifiers issued to the focal person by the associated scopingOrganization (e.g., identifiers from a different Patient Identity Domain).
PersonalRelationship	A personal relationship between the focal living subject and another living subject
classCode [1..1] (M) Role (CS) {CNE:PRS, fixed value= "PRS"}	Structural attribute; this is a "personal relationship" role
id [0..*] Role (SET<II>)	Identifier(s) for this personal relationship
code [1..1] (M) Role (CE) {CWE:PersonalRelationshipRoleType}	A required value specifying the type of personal relationship between the relationshipHolder and the scoping living subject drawn from the PersonalRelationshipRoleType domain, for example, spouse, parent, unrelated friend
Citizen	Used to capture person information relating to citizenship.
classCode [1..1] (M) Role (CS) {CNE:CIT, fixed value= "CIT"}	Structural attribute; this is a "citizen" role
id [0..*] Role (SET<II>)	Identifier(s) for the focal person as a citizen of a nation
Nation	A politically organized body of people bonded by territory and known as a nation.
classCode [1..1] (M) Organization (CS) {CNE:NAT, fixed value= "NAT"}	Structural attribute; this is a 'nation' type of entity
determinerCode [1..1] (M) Organization (CS) {CNE:INSTANCE, fixed value= "INSTANCE"}	Structural attribute; this is a specific entity
code [1..1] (M)	A value that identifies a nation state

PRPA_HD201310IHE Patient Registry Find Candidates Response	This HMD extract defines the message used to return records from a patient registry in response to a Find Candidates Query. Derived from Figure 3.47.4.2.2-1 (PRPA_RM201310IHE)
Organization (CD) {CWE:NationEntityType}	
name [0..1] Organization (ON)	A non-unique textual identifier or moniker for this nation
Employee	A relationship of the focal person with an organization to receive wages or salary. The purpose of this class is to identify the type of relationship the employee has to the employer rather than the nature of the work actually performed. For example, it can be used to capture whether the person is a Military Veteran or not..
classCode [1..1] (M) Employee (CS) {CNE:EMP}	Structural attribute; this is an "employee" role
statusCode [0..1] Employee (CS) {CNE:RoleStatus}	A value specifying the state of this employment relationship (based on the RIM Role class state-machine), for example, active, suspended, terminated.
occupationCode [0..1] Employee (CE) {CWE:EmployeeOccupationCode}	A code qualifying the classification of kind-of-work based upon a recognized industry or jurisdictional standard. OccupationCode is used to convey the person's occupation as opposed to jobClassCode (not used in this transaction) which characterizes this particular job. For example, it can be used to capture whether the person is a Military Veteran or not.
LanguageCommunication	A language communication capability of the focal person
languageCode [1..1] (M) LanguageCommunication (CE) {CWE:HumanLanguage}	A value representing a language for which the focal person has some level of proficiency for written or spoken communication. Examples: Spanish, Italian, German, English, American Sign
preferenceInd [0..1] LanguageCommunication (BL)	An indicator specifying whether or not this language is preferred by the focal person for the associated mode
QueryMatchObservation	Used to convey information about the quality of the match for each record.
classCode [1..1] (M) Observation (CS) {CNE:, default= "OBS"}	Structural attribute – this is an observation
moodCode [1..1] (M) Observation (CS) {CNE:, default= "EVN"}	Structural attribute – this is an event
code [1..1] (M) Observation (CD) {CWE:QueryMatchObservationType}	A code, identifying this observation as a query match observation.
value [1..1] (M) QueryMatchObservation (INT)	A numeric value indicating the quality of match for this record. It shall correspond to the MinimumDegreeMatch.value attribute of the original query, and it shall have the same meaning (e.g., percentage, indicating confidence in the match).

3.47.4.2.2.3 Control Act and Transmission Wrappers

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.44.4.1.2-2 contains the Transmission and Control Act wrappers used for this interaction, and the associated constraints.

5465

Table 3.47.4.4.2-9 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000300UV01 – Send Application Acknowledgement	MFMI_MT700711UV01 – Master File/Registry Query Response Control Act (Role Subject)
The value of interactionId SHALL be set to PRPA_IN201306UV02	The value of ControlActProcess.moodCode SHALL be set to EVN
The value of processingModeCode SHALL be set to T	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE201306UV02
The acceptAckCode SHALL be set to NE	There SHALL be zero or more RegistrationEvents present in this message.
There SHALL be only one receiver Device	For each matching record returned, there SHALL be exactly one RegistrationEvent present in this message.
	If a RegistrationEvent is part of the message, there SHALL be exactly one Patient role present in the payload.
	There SHALL be no replacementOf act-relationship present in this message
	There SHALL be a QueryByParameter copy of the original query.
	The QueryAck.resultTotalQuantity, QueryAck.resultCurrentQuantity, and QueryAck.resultRemainingQuantity attributes SHALL have the appropriate values populated.

The composite message schemas which describe the full payload of this interaction, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schemas

5470 from the HL7 V3 2008 Normative Edition can be found at Edition2008/processable/multicacheschemas/PRPA_IN201306UV02.xsd).

3.47.4.2.2.4 Web Services Types and Messages

The Patient Registry Query by Demographics message will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

5475 The following WSDL naming conventions SHALL apply:

```
response message   -> "PRPA_IN201306UV02_Message"
```

The following WSDL snippet describes the type for these message:

```
     …
 <types>
5480 <xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/PRPA_IN201306UV02.xs
5485 d"/>
<xsd:element name="PRPA_IN201306UV02"/>
</xsd:schema>
   </types>
 …
```

5490 The message is described by the following snippet:

```
     …
```

```
   <message name="PRPA_IN201306UV02_Message">
<part element="hl7:PRPA_IN201306UV02" name="Body"/>
   </message>
       …
```
5495

3.47.4.2.3 Expected Actions

The Patient Demographics Supplier shall perform the matching of patient data based on the query parameter values it receives. The information provided by the Patient Demographics Supplier to Patient Demographics Consumers is a list of possible matching patients from the patient information source associated with the value that the Consumer sent in the *Device* class of the transmission wrapper of the query message.

5500

If *OtherIDsScopingOrganization* parameters were part of the query, and they were recognized by the Patient Demographics Supplier as identifying known Patient Identity Domains, the response will also, for each patient, contain any Patient ID values found in the specified domains.

5505 The mechanics of the matching algorithms used are internal to the Patient Demographics Supplier and are outside of the scope of this framework.

The Patient Demographics Supplier shall respond to the query request as described by the following 3 cases:

Case 1 The Patient Demographics Supplier finds (in the patient information source associated
5510 with *Receiver.Device* in the query transmission wrapper) at least one patient record matching the criteria sent in the query parameters. There were no *OtherIDsScopingOrganization* parameters in the query.

AA (application accept) is returned in Acknowledgement.typeCode (transmission wrapper).

OK (data found, no errors) is returned in QueryAck.queryResponseCode (control act wrapper)

5515 One RegistrationEvent (and the associated Patient role, subject of that event) is returned from the patient information source for each patient record found. If the Patient Demographics Supplier returns data for multiple patients, it shall return these data in successive occurrences of the RegistrationEvent class within the transmission wrapper.

For each patient, one or more identifiers from the Patient ID Domain associated with the target
5520 patient information source identified by *Receiver.Device* are represented as Patient.id attributes.

If an incremental number of records are specified in *QueryByParamter.initialQuantity* (i.e., the Consumer supports the Continuation option), and the number of records to be sent exceeds that incremental number, the Supplier shall return only up to the incremental number of records. If the Supplier supports the Continuation option, it shall correctly populate the *resultTotalQuantity*,
5525 *resultCurrentQuantity*, and *resultRemainingQuantity* attributes of the *QueryAck* class in the control act wrapper. If the Supplier does not support the Continuation option, in addition to returning only up to the incremental number of records requested, it shall return AE (application error in the Acknowledgement.typeCode (transmission wrapper) and AE (application error) is returned in QueryAck.queryResponseCode (control act wrapper).

5530 The Consumer may then send a query continuation message as a subsequent query request for the next increment of responses.

Case 2: The Patient Demographics Supplier finds (in the patient information source associated with *Receiver.Device* in the query transmission wrapper) at least one patient record matching the criteria sent in the query parameters. One or more *OtherIDsScopingOrganization* parameters are present in the query; the Supplier recognizes all the requested domains.

5535

AA (application accept) is returned in *Acknowledgement.typeCode* (transmission wrapper).

OK (data found, no errors) is returned in *QueryAck.queryResponseCode* (control act wrapper)

One *RegistrationEvent* (and the associated *Patient* role, subject of that event) is returned from the patient information source for each patient record found. If the Patient Demographics Supplier returns data for multiple patients, it shall return these data in successive occurrences of the *RegistrationEvent* class within the transmission wrapper.

5540

For each patient, the identifiers from all the Patient ID Domains requested via the *OtherIDsScopingOrganization* parameter are returned either as values of the *Patient.id* attribute, or as values of the *OtherIDs.id* attribute. The same patient identifier value shall not appear in both the Patient.id and OtherIDs.id attributes. The Patient Demographics consumer shall consider the identifiers from both places as equivalently valid. If the Patient Demographics supplier cannot provide a patient ID for some of the requested Patient ID Domains, then an *OtherIDs.id* attribute shall have an appropriate null value, and the *ScopingOrganization* class shall identify the corresponding domain.

5545

If an incremental number of records are specified in *QueryByParamter.initialQuantity*, and the number of records to be sent exceeds that incremental number, and the Patient Demographics Supplier supports the Continuation Option, the Supplier returns only the incremental number of records, correctly populating the *resultTotalQuantity*, *resultCurrentQuantity*, and *resultRemainingQuantity* attributes of the *QueryAck* class in the control act wrapper. The consumer will sent a query continuation message as a subsequent query request for the next increment of responses. If the Supplier does not support the Continuation Option, then AE (application error) is returned in the Acknowledgement.typeCode (transmission wrapper) and AE (application error) is returned in QueryAck.queryResponseCode (control act wrapper).

5550

5555

Case 3: The Patient Demographics Supplier does not recognize one or more *OtherIDsScopingOrganization* parameters as representing valid Patient Identity Domains.

5560

AE (application error) is returned in *Acknowledgement.typeCode* (transmission wrapper) and in *QueryAck.queryResponseCode* (control act wrapper).

No *RegistrationEvent* is returned.

The queried-for patient identification domains are returned in the *QueryByParameter* parameter list (control act wrapper).

5565

For each domain that was not recognized, an AcknowledgmentDetail class is returned in which the attributes typeCode, code, and location are valued as follows:

Attribute	VALUE
typeCode	E
code	204 (Unknown Key Identifier)

Attribute	VALUE
location	XPath expression for the value element of the OtherIDsScopingOrganization parameter (which includes the repetition number of the parameter)

3.47.4.2.3.1 Web Services Port Type and Binding Definitions

5570 **IHE-WSP201) The attribute /wsdl:definitions/@name SHALL be "PDSupplier".**

The following WSDL naming conventions SHALL apply:

```
        wsdl:definitions/@name="PDSupplier":
        patient demographics query    -> "PRPA_IN201305UV02_Message"
        patient demographics response -> "PRPA_IN201306UV02_Message"
5575    continuation query            -> "QUQI_IN000003UV01_Message"
        accept acknowledgement        -> "MCCI_IN000002UV01_Message"
        portType                      -> "PDSupplier_PortType"
        get candidates operation      -> "PDSupplier_PRPA_IN201305UV02"
        continuation operation        ->
5580 "PDSupplier_PRPA_IN201305UV02_Continue"
        cancel operation              -> "PDSupplier_PRPA_IN201305UV02_Cancel"
        SOAP 1.2 binding              -> "PDSupplier_Binding_Soap12"
        SOAP 1.2 port                 -> "PDSupplier_Port_Soap12"
```

5585 The following WSDL snippets specify the Patient Demographics Query Port Type and Binding definitions, according to the requirements specified in ITI TF-2x: Appendix V.

3.47.4.2.3.1.1 Port Type

```
 <portType name="PDSupplier_PortType">
5590     <operation name="PDSupplier_PRPA_IN201305UV02">
<input message="tns:PRPA_IN201305UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201305UV02"/>
<output message="tns:PRPA_IN201306UV02_Message" wsaw:Action="urn:hl7-
org:v3:PRPA_IN201306UV02"/>
5595 </operation>
     <operation name="PDSupplier_QUQI_IN000003UV01_Continue">
<input message="tns:QUQI_IN000003UV01_Message" wsaw:Action="urn:hl7-
org:v3:QUQI_IN000003UV01_Continue"/>
<output message="tns:PRPA_IN201306UV02_Message" wsaw:Action="urn:hl7-
5600 org:v3:PRPA_IN201306UV02"/>
</operation>
     <operation name="PIXManager_QUQI_IN000003UV01_Cancel">
<input message="tns:QUQI_IN000003UV01_Message" wsaw:Action="urn:hl7-org:v3:
QUQI_IN000003UV01_Cancel"/>
5605 <output message="tns:MCCI_IN000002UV01_Message" wsaw:Action="urn:hl7-
org:v3:MCCI_IN000002UV01"/>
</operation>
  </portType>
```

3.47.4.2.3.1.2 Bindings

5610 SOAP 1.2 binding:

…

```
      <binding name="PDSupplier_Binding_Soap12" type="PDSupplier_PortType">
        <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
5615    <operation name="PDSupplier_PRPA_IN201305UV02">
          <wsoap12:operation soapAction="urn:hl7-org:v3:PRPA_IN201305UV02"/>
          <input>
            <wsoap12:body use="literal"/>
          </input>
5620      <output>
            <wsoap12:body use="literal"/>
          </output>
        </operation>
        <operation name="PDSupplier_QUQI_IN000003UV01_Continue">
5625      <wsoap12:operation soapAction="urn:hl7-
org:v3:QUQI_IN000003UV01_Continue"/>
          <input>
            <wsoap12:body use="literal"/>
          </input>
5630      <output>
            <wsoap12:body use="literal"/>
          </output>
        </operation>
        <operation name="PDSupplier_QUQI_IN000003UV01_Cancel">
5635      <wsoap12:operation soapAction="urn:hl7-org:v3:
QUQI_IN000003UV01_Cancel"/>
          <input>
            <wsoap12:body use="literal"/>
          </input>
5640      <output>
            <wsoap12:body use="literal"/>
          </output>
        </operation>
      </binding>
5645  …
```

An informative WSDL for the Patient Demographics Supplier implementing the PDQV3 profile is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.47.4.2.3.2 Message Examples

5650 Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.47.4.3 Patient Demographics Query HL7V3 Continuation

3.47.4.3.1 Trigger Events

A Patient Demographics Consumer's need to get another set of matching records to a previously sent Patient Demographics query will trigger the Patient Demographics Query Continuation
5655 based on the following HL7 trigger event:

Query General Activate Query Continuation (QUQI_TE000003UV01)

An application, in the role of Query Placer, sends a query continuation message to request that the application return up to a specified number of matching records based on a previous demographics query.

5660 **3.47.4.3.2 Message Semantics**

The Query continuation is supported by the Query Control Act Request Continue / Cancel (QUQI_MT000001UV01) message. The Patient Demographics Consumer shall generate the continuation message whenever it needs to receive another set of matching records based on the results of a previously sent query.

5665 If the Supplier supports the Continuation Option, it shall respond to the continuation request by sending the Patient Registry Find Candidates Response message (PRPA_MT201310), which uses the Application Level Acknowledgement transmission wrapper. This satisfies the requirements of original mode acknowledgment; no intermediate Accept Acknowledgement is to be sent.

5670 If a cancellation request is sent by the Patient Demographics Consumer, then the receiver shall respond by sending an Accept Acknowledgement (see ITI TF-2x: Appendix O for the descriptions of the Accept Acknowledgement transmission wrapper).

3.47.4.3.2.1 Major Components of the Query Continuation Message

This message contains no domain payload, it is built from a transmission and control act
5675 wrappers.

3.47.4.3.2.2 Message Information Model of the Query Continuation Message

Please see ITI TF-2x: Appendix O for the description of the transmission and control act wrappers used by this message. The next section discusses the wrappers, and the specific constraints relevant to this transaction.

5680 **3.47.4.3.2.3 Control Act and Transmission Wrappers**

Please see ITI TF-2x: Appendix O for details on the IHE guidelines for implementing the wrappers. Table 3.47.4.3.2-1 contains the Transmission and Control Act wrappers used for this interaction, and the associated constraints.

Table 3.47.4.3.2-1 Wrappers and Constraints

Transmission Wrapper	Trigger Event Control Act Wrapper
MCCI_MT000300UV01 – Send Application Acknowledgement	QUQI_MT000001UV01 – Query Control Act Request Continue / Cancel
The value of interactionId SHALL be set to QUQI_IN000003UV01	The trigger event code in ControlActProcess.code SHALL be set to PRPA_TE000003UV01
The value of processingModeCode SHALL be set to T	QueryContinuation.queryId SHALL be set to the original query identifier
The acceptAckCode SHALL be set to AL	
There SHALL be only one receiver Device	
The Acknowledgement.typeCode SHALL be set to AA	
The TargetMessage.id SHALL be the message ID of	

the immediately preceding Query response message	

5685   The composite message schemas which describe the full payload of this interaction, including the wrappers, can be found online on the IHE FTP site, see ITI TF-2x: Appendix W (the schemas from the HL7 V3 2008 Normative Edition can be found at Edition2008/processable/multicacheschemas/QUQI_IN000003UV01.xsd)

3.47.4.3.2.4 Web Services Types and Messages

5690   The Query Continuation message will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V.

The following WSDL naming conventions SHALL apply:
```
query continuation   -> "QUQI_IN000003UV01_Message"
```

The following WSDL snippet describes the type for this message:

5695
```
        …
 <types>
<xsd:schema elementFormDefault="qualified" targetNamespace="urn:hl7-org:v3"
xmlns:hl7="urn:hl7-org:v3">
<!-- Include the message schema -->
```
5700
```
<xsd:import namespace="urn:hl7-org:v3"
schemaLocation="../schema/HL7V3/NE2008/multicacheschemas/QUQI_IN000003UV01.xs
d"/>
<xsd:element name="QUQI_IN000003UV01"/>
</xsd:schema>
```
5705
```
   </types>
…
```

The message is described by the following snippet:
```
        …
   <message name="QUQI_IN000003UV01_Message">
```
5710
```
<part element="hl7:QUQI_IN000003UV01" name="Body"/>
   </message>
        …
```

The port types for the WSDL describing the Patient Demographics Service are described together with the expected actions of the actors which receive these messages in section ITI TF-
5715   2b: 3.47.4.2.3.

3.47.4.3.3 Expected Actions

If a number of records is specified in the *initialQuantity* of the original quantity, and the Patient Demographics Supplier supports the Continuation Option, the Patient Demographics Supplier Actor shall return an incremental response of that number of records when the number of
5720   matching records it finds exceeds the number of records specified. In subsequent query continuation messages, the Patient Demographics Consumer may specify a different number of records to be returned from now on for this query session by populating the *continuationQuantity* attribute. In addition, the consumer may specify from which record the next set of matches should start by populating the *startResultNumber* attribute. If the Patient Demographics Supplier
5725   does not support the Continuation Option and the number of matching records to the original

query exceeds the number specified, then, in addition to returning up to that number of records, the Supplier shall return AE (application error) in the Acknowledgement.typeCode (transmission wrapper) and AE (application error) in QueryAck.queryResponseCode (control act wrapper).

5730 The Patient Demographics Supplier shall always populate the *resultTotalQuantity*, *resultCurrentQuantity*, and *resultRemainingQuantity* in the *QueryAck* class. This information will indicate to the Patient Demographics Consumer whether there are any remaining records to be returned in subsequent continuations.

The Patient Demographics Consumer shall indicate a query session cancellation by sending a continuation message, and setting the continuationQuantity attribute to 0, and setting the
5735 statusCode to "aborted". In such case, the Patient Demographics Supplier shall respond with an Accept Acknowledgement (as described in ITI TF-2x: Appendix O).

Sending a query cancellation message is optional. The Patient Demographics Supplier may simply not send any continuation messages once a record has been selected. How long the Patient Demographic Supplier retains query results (for incremental response) is an
5740 implementation decision and therefore beyond the scope of IHE.

3.47.4.3.3.1 Web Services Port Type and Binding Definitions

This information is part of the specification of the Patient Demographics Query response in ITI TF-2b: 3.47.4.2.3.1.

An informative WSDL for the Patient Demographics Supplier implementing the PDQV3 profile
5745 is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.47.4.2.3.2 Message Examples

Message examples can be found online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.47.5 Security Requirements

No transaction specific security considerations.

5750 ### 3.47.5.1 Audit Record Considerations

When grouped with ATNA Secure Node or Secure Application actors, this transaction is to be audited as "Query Information" event, as defined in table 3.20.6-1. The following tables show items that are required to be part of the audit record for this transaction.

5755 ### 3.47.5.1.1 Patient Demographics Consumer audit message:

	Field Name	Opt	Value Constraints
Event	EventID	M	EV(110112, DCM, "Query")

	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-47", "IHE Transactions", "Patient Demographics Query")
Source (Patient Demographics Consumer) (1)			
Human Requestor (0..n)			
Destination (Patient Demographics Supplier) (1)			
Audit Source (Patient Demographics Consumer) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

Source **AuditMessage/** **ActiveParticipant**	UserID	M	the content of the <wsa:ReplyTo/> element
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.
Human **Requestor (if** **known)** **AuditMessage/** **ActiveParticipant**	UserID	M	identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination **AuditMessage/** **ActiveParticipant**	UserID	M	SOAP endpoint URI
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	*U*	*not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient	ParticipantObjectTypeCode	M	"1" (Person)

	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format (see ITI TF-2x: appendix E).
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*
Query Parameters (AuditMessage/ ParticipantObjectIdentifi cation)	ParticipantObjectTypeCode	M	"2" (system object)
	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-47", "IHE Transactions", "Patient Demographics Query")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	U	*not specialized*
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	M	the QueryByParameter segment of the query, base64 encoded
	ParticipantObjectDetail	U	not specialized

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3.47.5.1.2 Patient Demographics Source audit message:

	Field Name	Opt	Value Constraints
Event AuditMessage/ EventIdentification	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	M	*not specialized*
	EventOutcomeIndicator	M	*not specialized*
	EventTypeCode	M	EV("ITI-47", "IHE Transactions", "Patient Demographics Query")
Source (Patient Demographics Consumer) (1)			
Destination (Patient Demographics Supplier) (1)			
Audit Source (Patient Demographics Supplier) (1)			
Patient (0..n)			
Query Parameters(1)			

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	the content of the <wsa:ReplyTo/> element
	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	*not specialized*
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	the machine name or IP address, as specified in RFC 3881.

Destination	UserID	M	SOAP endpoint URI

10 Cross-Enterprise Document Sharing (XDS.b[1])

The *Cross-Enterprise Document Sharing* (XDS.b) IHE Integration Profile facilitates the registration, distribution and access across health enterprises of patient electronic health records.

Cross-Enterprise Document Sharing is focused on providing a standards-based specification for managing the sharing of documents between any healthcare enterprise, ranging from a private physician office to a clinic to an acute care in-patient facility.

In the rest of the ITI Technical Framework the term XDS refers generically to any flavor of XDS, currently only XDS.b[1].

The XDS.b IHE Integration Profile assumes that these enterprises belong to one or more XDS Affinity Domains. An XDS Affinity Domain is a group of healthcare enterprises that have agreed to work together using a common set of policies and share a common infrastructure.

Examples of XDS Affinity Domains include:

- Community of Care supported by a regional health information organization in order to serve all patients in a given region.
- Nationwide EHR
- Specialized or Disease-oriented Care
  - Cardiology Specialists and an Acute Cardiology Center
  - Oncology network
  - Diabetes network
- Federation of enterprises
  - A regional federation made up of several local hospitals and healthcare providers
- Government sponsored facilities (e.g., VA or Military)
- Insurance Provider Supported Communities

Within an XDS Affinity Domain, certain common policies and business rules must be defined. They include how patients are identified, consent is obtained, and access is controlled, as well as the format, content, structure, organization and representation of clinical information. This Integration Profile does not define specific policies and business rules, however it has been designed to accommodate a wide range of such policies to facilitate the deployment of standards-based infrastructures for sharing patient clinical documents. This is managed through federated document repositories and a document registry to create a longitudinal record of information about a patient within a given XDS Affinity Domain. These are distinct entities with separate responsibilities:

- A document repository is responsible for storing documents in a transparent, secure, reliable and persistent manner and responding to document retrieval requests.

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[1] XDS.b is used because in prior versions of the Technical Framework there was an XDS.a. With TF Version 7.0 XDS.a has been deprecated.

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2055 • A document registry is responsible for storing information about those documents so that the documents of interest for the care of a patient may be easily found, selected and retrieved irrespective of the repository where they are actually stored.

The concept of a document in XDS is not limited to textual information. As XDS is document content neutral, any type of clinical information without regard to content and representation is supported. This makes the XDS IHE Integration Profile equally able to handle documents
2060 containing simple text, formatted text (e.g., HL7 CDA Release 1), images (e.g., DICOM) or structured and vocabulary coded clinical information (e.g., CDA Release 2, CCR, CEN ENV 13606, DICOM SR). In order to ensure the necessary interoperability between the document sources and the document consumers, the XDS Affinity Domain must adopt policies concerning document format, structure and content.

2065 The XDS Integration Profile is not intended to address all cross-enterprise EHR communication needs. Some scenarios may require the use of other IHE Integration profiles, such as Patient Identifier Cross-Referencing, Audit Trail and Node Authentication, Cross-Enterprise User Authentication, and Retrieve Information for Display. Other scenarios may be only partially supported, while still others may require future IHE Integration profiles, which will be defined by
2070 IHE as soon as the necessary base standards are available. Specifically:

1. The management of dynamic information such as allergy lists, medication lists, problem lists, etc. is not addressed by XDS. However, the Retrieve Information for Display Integration Profile does provide some transactions (e.g., LIST-ALLERGIES, LIST-MEDS) that may be used to provide an elementary support of such capabilities. A
2075 complementary approach to managing updates and structured application access to such dynamic clinical information may be expected as a separate Integration Profile in the future.

2. The placing and tracking of orders (e.g., drug prescriptions, radiology orders, etc.) is not supported by XDS. This does not preclude the use of XDS to store and register orders and
2080 corresponding results when such artifacts need to be recorded in the patient's health record. However, XDS provides no facilities for tracking progress of an order through its workflow, and therefore is not intended for order management. A complementary approach to cross-enterprise order workflow (ePrescription, eReferral) may be expected as separate Integration Profiles in the future.

2085 3. The operation of any XDS Affinity Domain will require that a proper security model be put in place. It is expected that a range of security models should be possible. Although the XDS Integration Profile is not intended to include nor require any specific security model, it is expected that XDS implementers will group XDS Actors with actors from the IHE Audit Trail and Node Authentication and will need an Access Control capability that
2090 operates in such a cross-enterprise environment. Specific IHE Integration Profiles complementary to XDS are available (e.g., Cross-Enterprise User Authentication, Document Digital Signature, etc.).

4. The establishment of independent XDS Affinity Domains will call for their federation, as patients expect their records to follow them as they move from region to region, or country
2095 to country. IHE foresees a need for transferring information from one XDS Affinity Domain to another, or to allow access from one XDS Affinity Domain to documents

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managed in other XDS Affinity Domains. XDS has been designed with this extension in mind. The Cross-Community Access (XCA) Integration Profile that complements XDS provides this function.

2100   5.   XDS does not address transactions for the management or configuration of an XDS Affinity Domain. For example, the configuration of network addresses or the definition of what type of clinical information is to be shared is specifically left up to the policies established by the XDS Affinity Domain.

10.1 Actors/Transactions
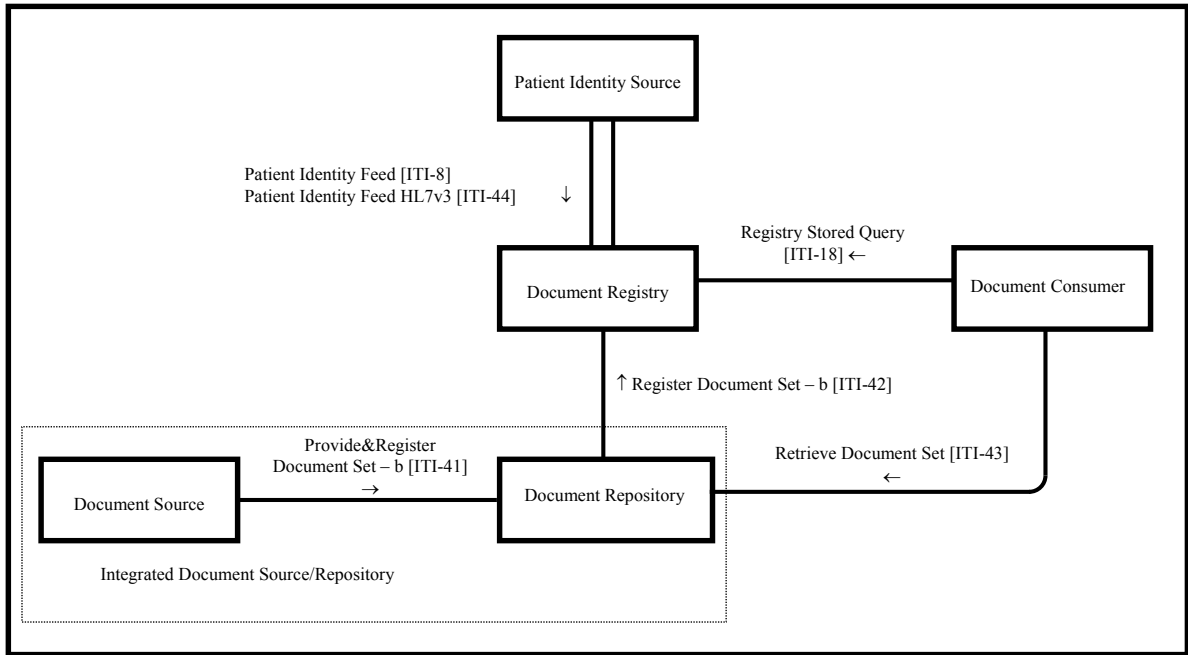
2105

Figure 10.1-1b Cross-Enterprise Document Sharing – b (XDS.b) Diagram

Table 10.1-1b XDS.b - Actors and Transactions

Actors	Transactions	Optionality	Section
Document Consumer	Registry Stored Query [ITI-18]	R	ITI TF-2a: 3.18
	Retrieve Document Set [ITI-43]	R	ITI TF-2b: 3.43
Document Source	Provide and Register Document Set-b [ITI-41]	R	ITI TF-2b: 3.41
Document Repository	Provide and Register Document Set-b [ITI-41]	R	ITI TF-2b: 3.41
	Register Document Set-b [ITI-42]	R	ITI TF-2b: 3.42
	Retrieve Document Set [ITI-43]	R	ITI TF-2b: 3.43
Document Registry	Register Document Set-b [ITI-42]	R	ITI TF-2b: 3.42
	Registry Stored Query [ITI-18]	R	ITI TF-2a: 3.18
	Patient Identity Feed [ITI-8]	O (Note 2)	ITI TF-2a: 3.8
	Patient Identity Feed HL7v3 [ITI-44]	O (Note 2)	ITI TF-2b: 3.44

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Integrated Document Source/Repository	Register Document Set-b [ITI-42]	R	ITI TF-2b: 3.42
	Retrieve Document Set [ITI-43]	R	ITI TF-2b: 3.43
Patient Identity Source	Patient Identity Feed [ITI-8]	O (Note 1,2)	ITI TF-2a: 3.8
	Patient Identity Feed HL7v3 [ITI-44]	O (Note 1,2)	ITI TF-2b :3.44

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Note 1: If Assigning Authority of Patient ID presents in the Patient Identity Feed or Patient Identity Feed HL7v3 transaction, the Patient Identity Source is required to use an OID to identify the Assigning Authority. For technical details of the assigning authority information, see ITI TF-2a: 3.8.

Note 2: Document Registry and Patient Identify Source shall implement at least one of Patient Identity Feed or Patient Identity Feed HL7v3.

10.1.1 Actors

10.1.1.1 Document Source

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The Document Source Actor is the producer and publisher of documents. It is responsible for sending documents to a Document Repository Actor. It also supplies metadata to the Document Repository Actor for subsequent registration of the documents with the Document Registry Actor.

10.1.1.2 Document Consumer

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The Document Consumer Actor queries a Document Registry Actor for documents meeting certain criteria, and retrieves selected documents from one or more Document Repository actors.

10.1.1.3 Document Registry

The Document Registry Actor maintains metadata about each registered document in a document entry. This includes a link to the Document in the Repository where it is stored. The Document

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Registry responds to queries from Document Consumer actors about documents meeting specific criteria. It also enforces some healthcare specific technical policies at the time of document registration.

10.1.1.4 Document Repository

The Document Repository is responsible for both the persistent storage of these documents as well

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as for their registration with the appropriate Document Registry. It assigns a uniqueId to documents for subsequent retrieval by a Document Consumer.

10.1.1.5 Patient Identity Source

The Patient Identity Source Actor is a provider of unique identifier for each patient and maintains a collection of identity traits. The Patient Identify Source facilitates the validation of patient

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identifiers by the Registry Actor in its interactions with other actors.

10.1.1.6 Integrated Document Source/Repository

The Integrated Document Source/Repository combines the functionality of the Document Source and Document Repository actors into a single actor that does not initiate nor accept the Provide ad

Register Document Set transaction. This actor may replace the Document Repository actor from the
2140 perspective of the Register Document Set or Retrieve Document transactions.

10.1.2 Transactions

10.1.2.1 Provide and Register Document Set

A Document Source Actor initiates the Provide and Register Document Set Transaction. For each
document in the submitted set, the Document Source Actor provides both the documents as an
2145 opaque octet stream and the corresponding metadata to the Document Repository. The Document
Repository is responsible to persistently store these documents, and to register them in the
Document Registry using the Register Documents transaction by forwarding the document metadata
received from the Document Source Actor.

10.1.2.2 Register Document Set

2150 A Document Repository Actor initiates the Register Document Set transaction. This transaction
allows a Document Repository Actor to register one or more documents with a Document Registry,
by supplying metadata about each document to be registered. This document metadata will be used
to create an XDS Document Entry in the registry. The Document Registry Actor ensures that
document metadata is valid before allowing documents to be registered. If one or more documents
2155 fail the metadata validation, the Register Document Set transaction fails as a whole.

To support composite documents, an XDS Document may be a multipart document. The Document
Repository must handle multi-part data sets as an "opaque entity". The Document Repository does
not need to analyze or process its multi-part structure nor the content of any parts in the context of
the XDS Integration Profile.

2160 ### 10.1.2.3 Intentional left blank

10.1.2.4 Registry Stored Query

The Registry Stored Query transaction is issued by the Document Consumer Actor on behalf of a
care provider (EHR-CR) to a Document Registry. The Document Registry Actor searches the
registry to locate documents that meet the provider's specified query criteria. It will return registry
2165 metadata containing a list of document entries found to meet the specified criteria including the
locations and identifier of each corresponding document in one or more Document Repositories.

In a Stored Query, the definition of the query is stored on the Registry actor. To invoke the query,
an identifier associated with the query is transmitted along with parameters defined by the query.
This has the following benefits:

2170   1. Malicious SQL transactions cannot be introduced

    2. Alternate database styles and schemas can be used to implement the Document Registry
       actor. This is because the style of SQL query statements is directly related to the table
       layout in a relational database.

This profile does not define how Stored Queries are loaded into or implemented in the Document
2175 Registry actor.

10.1.2.5 Intentionally left blank

10.1.2.6 Patient Identity Feed

The Patient Identity Feed Transaction conveys the patient identifier and corroborating demographic data, captured when a patient's identity is established, modified or merged or in cases where the key corroborating demographic data has been modified. Its purpose in the XDS Integration Profile is to populate the registry with patient identifiers that have been registered for the XDS Affinity Domains.

The Patient Identify Feed Transaction defined in ITI TF-2a:3.8 for HL7v2 and in ITI TF-2b: 3.44 for HL7v3 uses standard HL7 encoding of Patient Identifiers. This is standard encoding for HL7 applications; receiving applications are expected to extract the required data for their use.

When combined with the other XDS transactions, Document Registry actors and other actors that receive HL7 data with Patient Identifiers are required to map the data received in the HL7 message to the format specified in those other XDS transactions. In those transactions, the Patient ID is treated using ebXML encoding rules and not HL7 encoding rules. Specifically, the Patient ID will be treated as a string, and extra components entered in that string shall cause those transactions to fail. XDS actors are required to use the specified encoding for Patient ID values in other transactions and not merely copy the value received in an HL7 transaction.

XDS.b implementations shall support either Patient Identity Feed (ITI TF-2a: 3.8) or Patient Identity Feed HL7v3 (ITI TF-2b: 3.44) or both. It is important to note that the version of HL7 implemented by XDS.b and Patient Identity Feed in a single domain or community need to match in order to allow interoperability. In the case of mixed scenarios, translation between Patient Identity Feed (ITI TF-2a:3.8) and Patient Identity Feed HL7v3 (ITI TF-2b: 3.44) will be required via a bridge or interface engine.

10.1.2.7 Retrieve Document Set

A Document Consumer Actor initiates the Retrieve Document Set transaction. The Document Repository shall return the document set that was specified by the Document Consumer.

10.1.3 XDS Document Contents Support

The following table lists a few of the document contents supported in other IHE Integration Profiles, which specify concrete content types for sharing of clinical documents in various domains. These profiles are built on the XDS profile, and may define additional constraints and semantics for cross-enterprise document sharing in their specific use cases.

Table 10.1-1: List of IHE Integration Profiles and Document Types They Support

IHE Technical Framework Domain	Integration Profile Name	Document Content Supported
IT Infrastructure	An example of an ITI domain content profile defining a document that may be exchanged using XDS is Cross-Enterprise	Scanned document, plain text or PDF/A, in HL7 CDA R2 format

	Sharing of Scanned Documents (XDS-SD). Refer to ITI TF-3:5 for other ITI content specifications.	
Patient Care Coordination	An example of a PCC domain content profile defining a document that may be exchanged using XDS is Cross-Enterprise Sharing of Medical Summaries (XDS-MS). Refer to PCC TF-1 for other document content profiles.	Medical Summary in the HL7 CDA format
Radiology	Cross-Enterprise Document Sharing for Imaging (XDS-I)	Radiology Diagnostic Report in the plain text or PDF formats
		Reference to a collection of DICOM SOP Instances in a manifest document in the DICOM Key Object Selection format

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10.2 Integration Profile Options

Options that may be selected for this Integration Profile are listed in Table 10.2-1-b along with the Actors to which they apply. Dependencies between options when applicable are specified in notes.

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Table 10.2-1b XDS.b - Actors and Options

Actor	Options	Vol & Section
Document Source	Document Replacement	ITI TF-1: 10.2.1
	Document Addendum	ITI TF-1: 10.2.2
	Document Transformation	ITI TF-1: 10.2.3
	Folder Management	ITI TF-1: 10.2.4
	Basic Patient Privacy Enforcement	ITI TF-2b:3.41.4.1.3.1
	Asynchronous Web Services Exchange	ITI TF-1: 10.2.5
Document Repository	Asynchronous Web Services Exchange	ITI TF-1: 10.2.5
Document Registry (Note 2)	Patient Identity Feed (Note 1)	ITI TF-2a: 3.8
	Patient Identity Feed HL7v3 (Note 1)	ITI TF-2b: 3.44
	Asynchronous Web Services Exchange	ITI TF-1: 10.2.5
Integrated Document Source / Repository	Document Replacement	ITI TF-1: 10.2.1
	Document Addendum	ITI TF-1: 10.2.2
	Document Transformation	ITI TF-1: 10.2.3
	Folder Management	ITI TF-1: 10.2.4
	Basic Patient Privacy Enforcement	ITI TF-2b: 3.42.4.1.4.1
	Asynchronous Web Services Exchange	ITI TF-1: 10.2.5
Document Consumer	Basic Patient Privacy Enforcement	ITI TF-2a: 3.18.4.1.3.5 ITI TF-2b: 3.43.4.1.3.1
	Basic Patient Privacy Proof	ITI TF-2a: 3.18.4.1.3.6
	Asynchronous Web Services Exchange	ITI TF-1: 10.2.5
Patient Identity Source	Patient Identity Feed (Note 1)	ITI TF-2a: 3.8
	Patient Identity Feed HL7v3 (Note 1)	ITI TF-2b: 3.44

Note 1: Document Registry and Patient Identify Source shall implement at least one of Patient Identity Feed or Patient Identity Feed HL7v3.

2220 Note 2: An XDS.b Document Registry has always been required to validate that documents that are registered do contain a confidentialityCode from an XDS Affinity Domain vocabulary. The BPPC profile is giving some structure to this XDS Affinity Domain defined vocabulary.

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10.2.1 Document Replacement Option.

2225 In this option the Document Source or Integrated Document Source/Repository shall offer the ability to submit a document as a replacement for another document already in the registry/repository. Grouping with Document Consumer can be used to obtain the most recent metadata and ids to be used in the replace submission.

10.2.2 Document Addendum Option

2230 In this option the Document Source or Integrated Document Source/Repository shall offer the ability to submit a document as an addendum to another document already in the registry/repository.

10.2.3 Document Transformation Option

In this option the Document Source or Integrated Document Source/Repository shall offer the ability to submit a document as a transformation of another document already in the
2235 registry/repository.

10.2.4 Folder Management Option

In this option the Document Source offers the ability to perform the following operation:
- Create a folder[2]
- Add one or more documents to a folder

2240   Note: In order to support document addition to an existing folder, grouping with the Document Consumer may be necessary in order to Query the registry (e.g., for UUIDs of existing folder).

10.2.5 Asynchronous Web Services Exchange Option

Actors that support this option shall support the following:

- Document Source Actor shall support Asynchronous Web Services Exchange for the
2245   Provide & Register Document Set – b [ITI-41] transaction

- Document Consumer Actor shall support Asynchronous Web Services Exchange for the Registry Stored Query [ITI-18] and Retrieve Document Set [ITI-43] transactions

- Document Repository Actor shall support Asynchronous Web Services Exchange for the Provide & Register Document Set – b [ITI-41] and Register Document Set – b [ITI-42], and
2250   Retrieve Document Set [ITI-43] transactions

- Document Registry Actor shall support Asynchronous Web Services Exchange for the Registry Stored Query [ITI-18] and Register Document Set – b [ITI-42] transactions

Use of Synchronous or Asynchronous Web Services Exchange is dictated by the individual install environment and affinity domain policy. Refer to section ITI TF-2x: V.5 Synchronous and

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[2]   The term "folder" comes from the medical community which commonly places patient records in folders for specific purposes. In computer science terminology this concept is most consistent with the UNIX directory format, where a file can be simultaneously within multiple directories.

2255   Asynchronous Web Services Exchange for an explanation of Asynchronous Web Services Exchange.

10.3 Integration Profile Process Flow

A typical patient goes through a sequence of encounters in different care settings. In each care
2260   setting, the resulting patient information is created and managed by multiple care delivery information systems (EHR-CRs). Through a sequence of care delivery activities, a number of clinical documents are created. The EHR-LR provides the means to share the relevant subset of these documents, as they are contributed by the various EHR-CRs that are part of the same XDS Affinity Domain.

2265   **Example: Cardiac Patient Management Scenario**
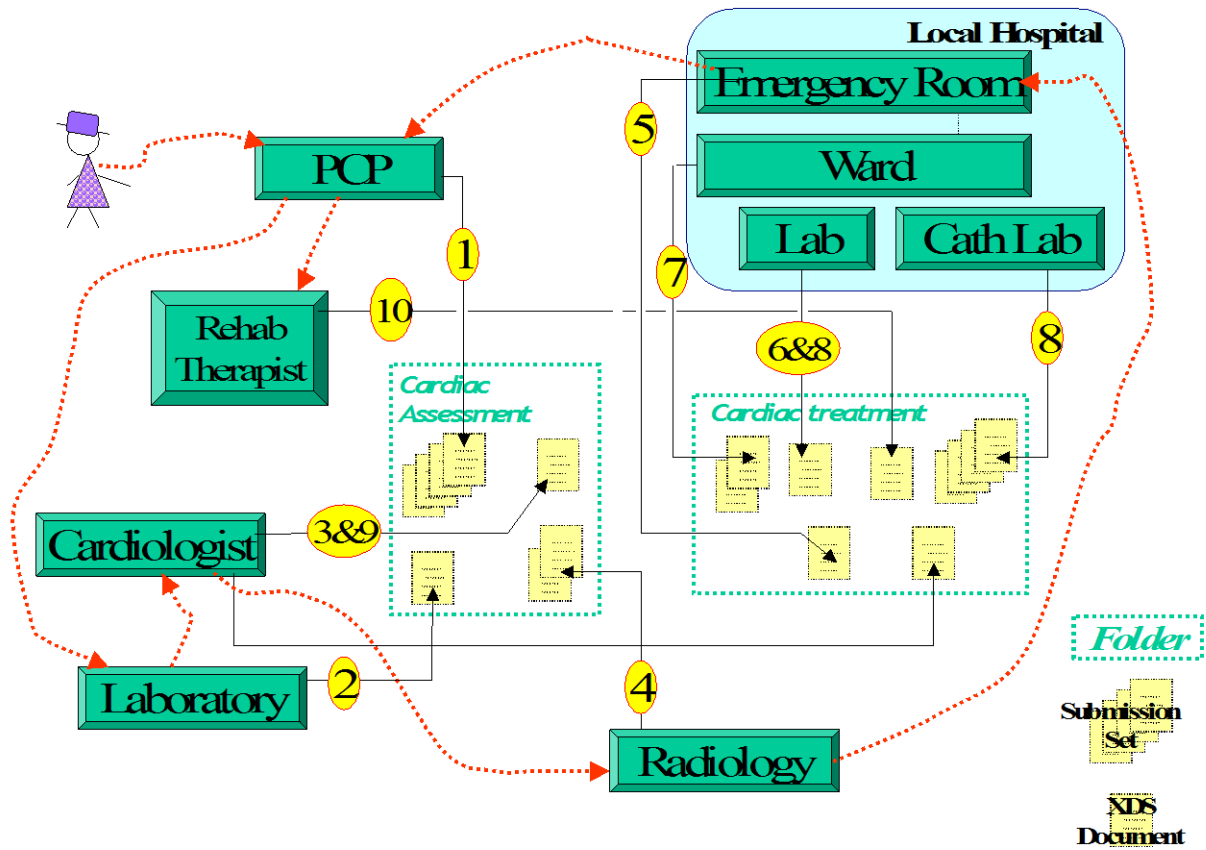
Figure 10.3-1 Cardiac Patient Management Scenario Transaction Process Flow

This scenario spans about 3 weeks of a patient's cardiac episode. The patient presents to her primary care provider (PCP) with complaints of shortness of breath, nausea, tiredness and chest
2270   pains. This doctor works closely with a local hospital that has recently established a cardiac care network that allows PCPs, cardiologists, laboratories and two local hospitals to share clinical documents to improve patient care. This cardiac network is part of a local care data exchange

community that has been set-up in this community and to which the care plan to which this patient belong has encouraged patients to subscribe. Our patient has been provided a health record account

2275   number.

1.   During the patient examination, the PCP records the complaint, and determines that he should perform an ECG. He queries the cardiac care network to see if there are prior ECG reports (step 1 in Figure 10.3-2), using a coded document class "report" and a coded practice setting "cardiology" established by the cardiac care network for ECG reports.

2280   Among the matching Documents, he locates a prior ECG report that is then retrieved (step 2 in Figure 10.3-2). He compares the two results and determines that the patient should be referred to a cardiologist. He searches for additional reports in the cardiac care network (step 3 in Figure 10.3-2) for this patient, but finds none.

Using the ambulatory EHR system, he creates a submission request onto the patients'
2285   health record account number for a "PCP office visit" that includes a submission set consisting of three new documents (visit note, referral letter, new ECG report) and of one reference to the prior ECG report (step 4 in Figure 10.3-2). Following the Cardiology Network XDS Affinity Domain policy, he creates a "cardiac assessment" Folder to contain all four documents in order to facilitate collaboration with the cardiologist.

2290   The repository used by the ambulatory EHR system will then register the documents that are part of this submission request (step 5 in Figure 10.3-2).
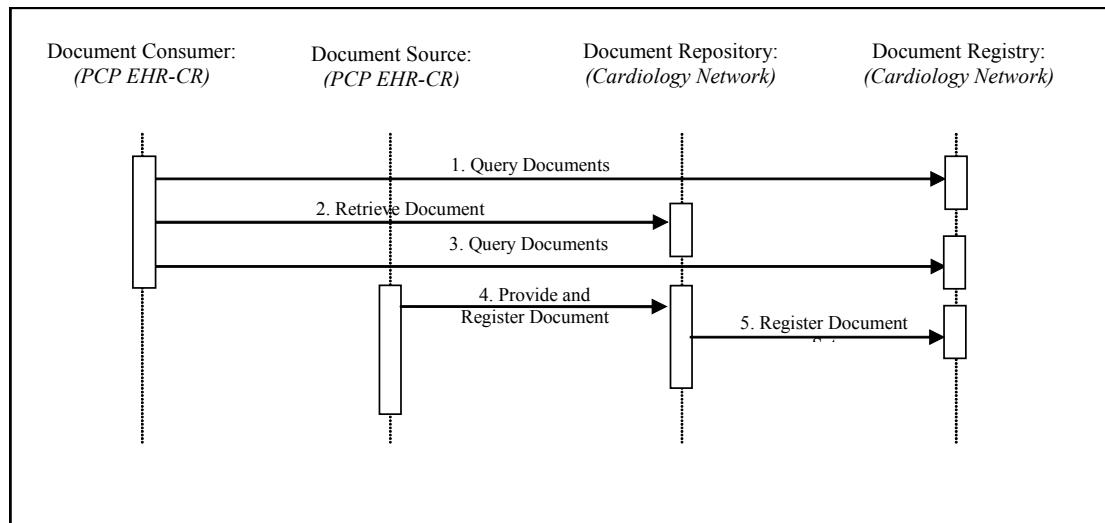
Figure 10.3-2 PCP Query Transactions Process Flow

The PCP EHR system implements the Document Consumer and Document Source actors
2295   to issue the Query, Retrieve and Provide & Register transactions as shown in Figure 10.3-2. The transactions are processed by the Document Repository and the Document Registry provided by the cardiology care network.

2.   The patient appointment with the cardiologist is scheduled. The patient goes to the lab for the lab tests required before appointment. The lab creates a submission set with a clinical
2300   code of "laboratory tests" containing the lab results. The lab is not aware of the "cardiology assessment" folder.

3. The cardiologist sees the patient. He queries the repository for any patient's records in a "cardiac assessment" folder (step 1 in Figure 10.3-3). Available are the visit note from the PCP, the ECG and prior ECG, and the referral letter, which he retrieves and reviews (steps 2-5 in Figure 10.3-3). He also queries for recent lab reports, and finds the lab results (step 6 in Figure 10.3-3). This is also retrieved and reviewed (step 7 in Figure 10.3-3).

The cardiologist performs an ultrasound, dictates a visit note, and orders a nuclear stress test. The visit note and ultrasound images and report are registered as a "cardiologist office visit" submission set and placed in the "cardiac assessment" Folder. In addition, the lab report is added to the "cardiac assessment" Folder (step 8 in Figure 10.3-3).
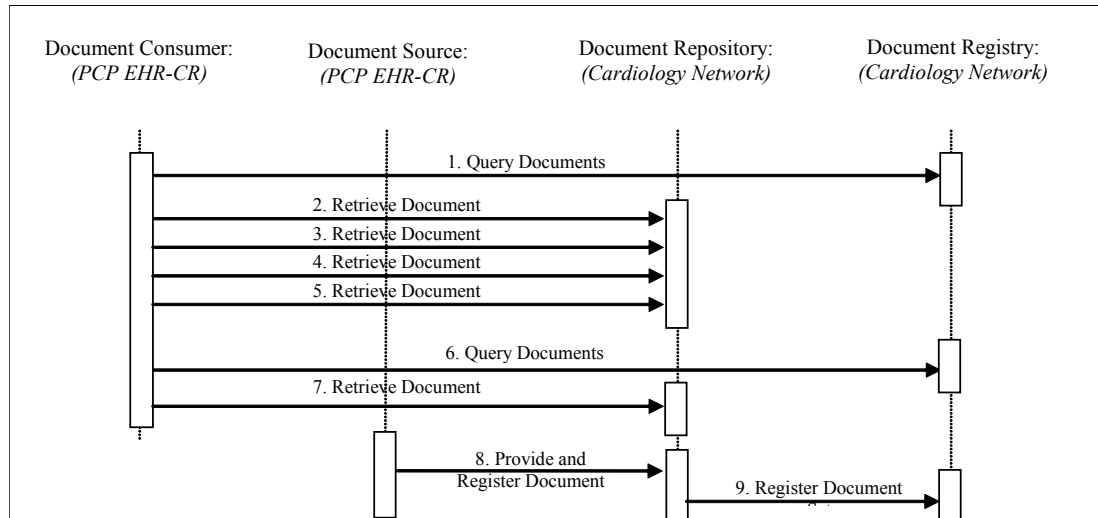
Figure 10.3-3 PCP Query Transactions Process Flow

4. The patient is seen at a radiology facility for the nuclear stress test. The test is performed, and the radiologist dictates the report. The nuclear stress test report is registered in a "radiology examination" submission set and associated with the "cardiac assessment" Folder

5. Although she has a scheduled appointment with her cardiologist in two days, she wakes up with severe chest pain. On the way to work, she decides to go to the emergency room (ER) of her local hospital. The ER doctor uses the hospital EHR system to query the cardiac care network registry and repositories for documents related to the patient in reverse chronological order (step 1 in Figure 10.3-4). Available documents from latest cardiology related Folder are the visit notes from the PCP and cardiologist, the recent and prior ECGs, the lab results, and the ultrasound images and report, and the nuclear stress test images and report.

The ER doctor retrieves and reviews the two most relevant reports (step 2 and 3 in Figure 10.3-4).

The ER doctor orders lab tests, ECG, and places the patient under monitoring. The lab tests and ECG are placed in the hospital EHR that acts as a Document Repository Actor for the cardiac network. Abnormal cardiac activity requires a catheterization, diagnostics and possibly intervention. The ER doctor admits the patient to the cardiology service and contacts the cardiologist.
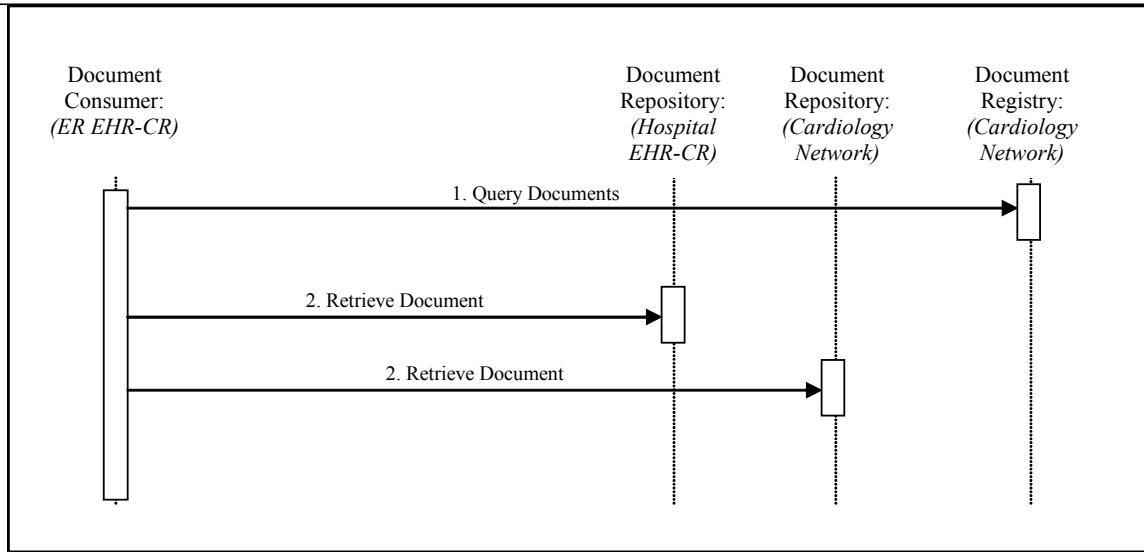
Figure 10.3-4 ER Query Transactions Process Flow

2335   6.   While talking to the ER physician, the cardiologist accesses the cardiac care network from his home office. He queries for all documents related to the patient since the last visit in his office. The nuclear stress test report that he did not previously review is available, along with lab results and ECG results from the ER. The two physicians determine a plan of care and the cardiologist makes arrangements to see the patient in the hospital.

2340   7.   As the patient is transferred from the ER, the ER visit notes are submitted as an "emergency department visit" submission set and placed in a newly created "cardiology treatment" Folder along with the earlier lab and ECG results.

        8.   The patient is transferred to an inpatient bed with the following sequence of events.

              • The patient is scheduled for a catheterization procedure in cath lab.

2345   • Additional lab tests are ordered and performed.

              • A diagnostics procedure is performed in cath lab.

              • An intervention with the placement of a stent is performed.

              • A cath intervention report is dictated.

              • Patient is returned to monitored care for recovery.

2350   • Education given to patient and family.

              • Discharge Summary dictated by cardiologist.

              • Cardiologist orders lab tests to be completed prior to scheduled follow-up visit.

              The admission assessment, lab results, cath intervention report and key images, and discharge summary form a "cardiology intervention" submission set, which is registered
2355   with the cardiac care network registry in the "cardiac treatment" Folder started by the ER.

        9.   The patient returns to the cardiologist for the post discharge follow-up visit. The resulting visit note, cardiac rehab and summary letters are placed in a "cardiology office visit" submission set and in the "cardiac treatment" Folder.

10. The patient goes to rehab sessions as scheduled by the cardiologist. The patient recovers and is seen by the PCP and cardiologist for routine visits.

2360

10.4 General Principles

10.4.1 EDR-CR Concept

An EHR-CR or Care-delivery Record abstracts the information system or systems of a care delivery organization, which may support a broad variety of healthcare facilities: private practice, nursing
2365 home, ambulatory clinic, acute care in-patient facility, etc.

Typically a patient goes through a sequence of encounters in different care settings as depicted in the figure below.
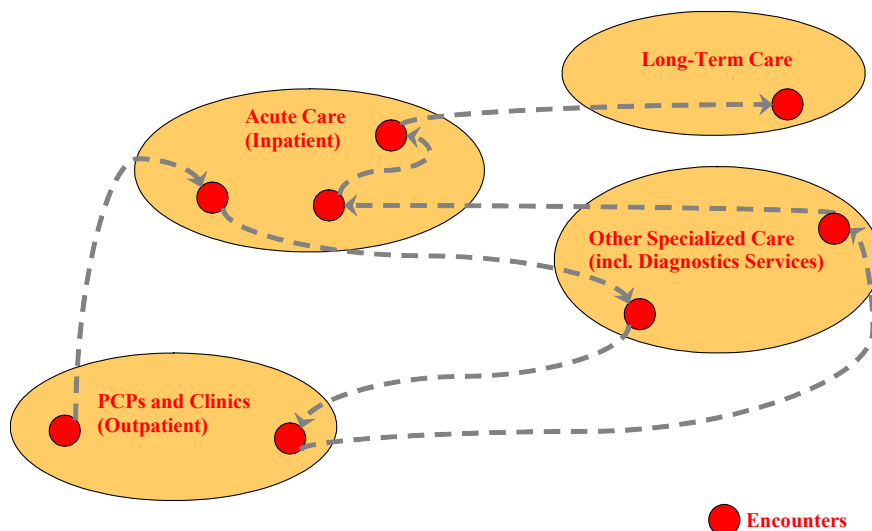
2370 **Figure 10.4.1-1 Sequence of encounters across care delivery organizations**

It is out of the scope of this IHE Integration Profile to define or restrict the type of care provided, nor the internal workflow of a care delivery organization. The EHR-CR system participates only to the cross-enterprise clinical document sharing as Document Source and Document Consumer Actors according to the following principles:

2375 1. EHR-CR as Document Source contributes documents in any one of the document formats that are supported by the XDS Affinity Domain (e.g., CDA Release 1, CDA Release 2 with specific templates, DICOM Composite SOP Classes, ASTM-CCR, CEN ENV 13606 etc.).

2. This Profile does not require that the EHR-CR as Document Sources and Consumers store and manage their internal information in the form of documents as they are shared
2380 throughout the XDS Affinity Domain.

3. By grouping a Document Source with a Document Repository, an EHR-CR may leverage existing storage provide a unified access mechanism without needing to duplicate storage.

4. EHR-CRs as Document Sources and Consumers are responsible to map their local codes
2385 into the XDS Affinity Domain codes if necessary.

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The XDS Documents shared by the EHR-CR and tracked by the XDS Registry form a Longitudinal Record for the patients that received care among the EHR-CRs of the XDS Affinity Domain.
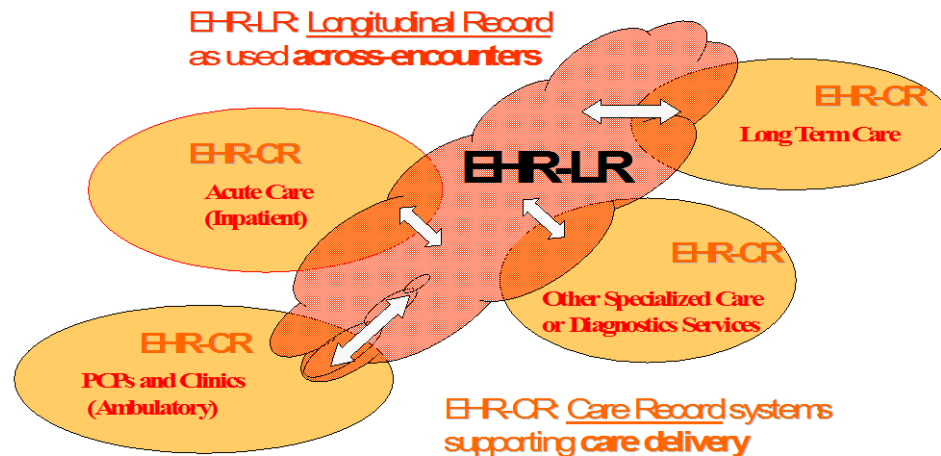
Figure 10.4.1-2 Contributing and sharing to a patients' longitudinal health record

This shared clinical record is called an EHR-LR in this Integration Profile.

10.4.2 XDS Document Concept

An XDS Document is the smallest unit of information that may be provided to a Document Repository Actor and be registered as an entry in the Document Registry Actor.

An XDS Document is a composition of clinical information that contains observations and services for the purpose of exchange with the following characteristics: Persistence, Stewardship, Potential for Authentication, and Wholeness. These characteristics are defined in the HL7 Clinical Document Architecture specification. An XDS Document may be human readable (with the appropriate application). In any case, it should comply with a published standard defining its structure, content and encoding. IHE intends to define content-oriented Integration Profiles relying on such content standards to be used in conjunction with XDS.

The XDS Integration Profile manages XDS Documents as a single unit of information; it does not provide mechanisms to access portions of an XDS Document. Only the Document Sources or Document Consumers have access to the internal information of the XDS Document. When submitted for sharing, an XDS Document is provided to the Document Repository Actor as an octet stream. When retrieved through the Retrieve Document Set transaction, it shall be unchanged from the octet stream that was submitted.

The Document Source Actor is responsible for producing the metadata that will be submitted to the Document Registry Actor to form the XDS Document Entry that will be used for query purposes by XDS Consumer Actors. The Document Source maintains responsibilities over the XDS Documents it has registered. It shall replace XDS Documents that may have been submitted in error. See ITI TF-1: Appendix K for a more detailed discussion of the concept of XDS Document.

XDS Documents are required to be globally uniquely identified. See ITI TF-2x: Appendix B for a definition of globally unique identifiers.

10.4.3 Submission Request

An XDS Submission Request is a means to share XDS Documents. It may be conveyed:

- by a Document Source Actor in a *Provide and Register Document Set Transaction* to the Document Repository Actor, or
- by a Document Repository Actor in a *Register Document Set Transaction* to the Document Registry Actor

An XDS Submission Request contains elements of information that will ensure the proper registration of XDS Documents. These are:

1. Metadata to be placed in Document Entries for new XDS Documents being submitted,

2. A Submission Set that includes the list of all new XDS Documents and Folders being submitted and optionally a list of previously submitted XDS Documents,

3. If desired, Folders to be created with the list of included XDS Documents (new document being submitted as well as previously submitted),

4. If desired, addition to previously created Folders of lists of XDS Documents (new document being submitted as well as previously submitted), and

5. Zero or more XDS Document octet streams for the new XDS Documents being submitted.

Following a successful Submission Request, new XDS Documents, Submission Set, and Folders included in the Submission Request are available for sharing in an XDS Affinity Domain. In case of failure to process a Submission Request, the Submission Set and any XDS Documents and Folders shall not be registered.

10.4.4 Submission Set Concept

An XDS Submission Set is related to care event(s) of a single patient provided by the care delivery organization EHR-CR performing the submission request. It creates a permanent record of new XDS Documents as well as pre-existing (i.e. already registered) XDS Documents that have a relationship with the same care event(s). It also includes the record of new XDS Folders creation.

An XDS Submission Set shall be created for each submission request. It is related to a single Document Source Actor and is conveyed by a single Provide & Register Document Set Transaction or a Register Document Set Transaction.

The Document Registry may be queried to find all documents registered in the same XDS Submission Set.

2445 The same XDS Document, initially registered as part of a Submission Set, may also be referenced by later XDS Submission Set. This allows older documents relevant to the present care of a patient to be associated with more recent Submission Sets.

XDS provides complete flexibility to EHR-CRs to relate Documents and Submission Sets to an encounter, a visit, an episode of care, or various workflow processes within EHR-CRs.

2450 **10.4.5 Concept of Folder**

The purpose of an XDS Folder is to provide a collaborative mechanism for several XDS Document Sources to group XDS Documents for a variety of reasons (e.g., a period of care, a problem, immunizations, etc.) and to offer the Document Consumers a means to find all Document Entries placed in the same Folder. The following principles apply to an XDS Folder:

2455 1. A Folder groups a set of XDS Documents related to the care of a single patient,

2. One or more Document Source Actors may submit documents in a given Folder,

3. A Folder may be created by a Document Source and/or predefined in an XDS Affinity Domain,

4. The content of a Folder is qualified by a list of codes/meaning,

2460 5. Document Source Actors may find existing Folders by querying the Document Registry or by means outside the scope of XDS (e.g., Cross-enterprise workflow, such ePrescription, eReferral, etc.),

6. Once created a Folder is permanently known by the Document Registry,

7. Placing previously existing Documents in Folders is not recorded as part of the
2465 Submission Set,

8. Folders in XDS may not be nested,

9. The same documents can appear in more than one Folder, and

10. Folders have a globally unique identifier.

10.4.6 Example of use of Submission Request, Submission Set and Folder

2470 The sequence of figures below shows an example of a submission request that includes two new documents, a reference to a pre-existing document and the use of two folders. The first figure depicts the initial state of a Document Registry in which two Documents have been submitted where one is associated with a Folder A. The second figure depicts a submission request that adds two new documents, placing one of them into a pre-existing folder and the other one into a new
2475 Folder B.

Document Repository and Registry – Initial State
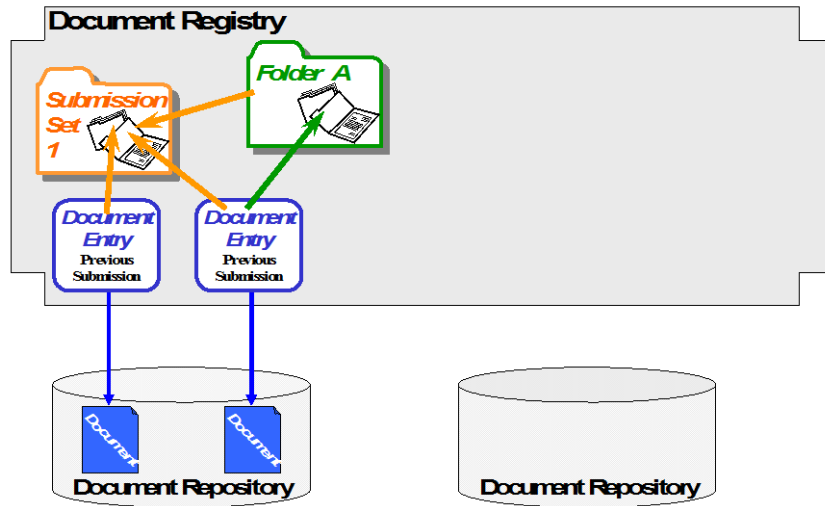
Document Repository and Registry – Submission Request
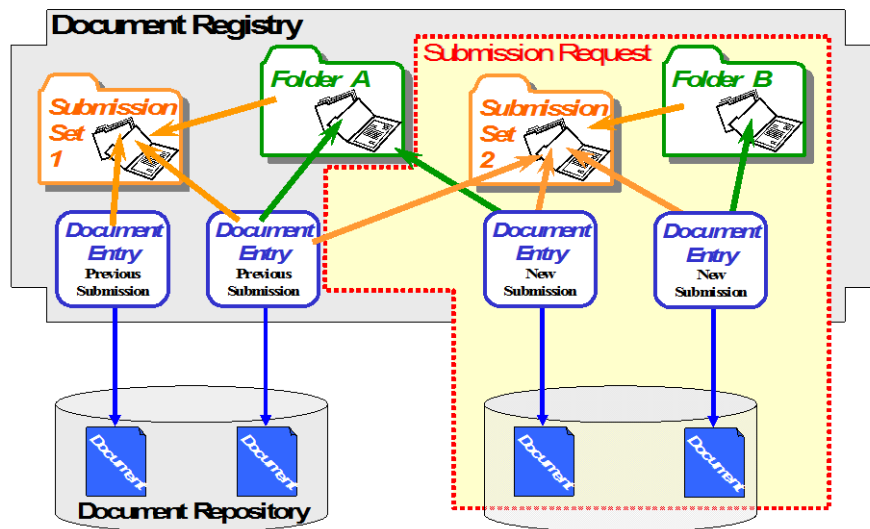
Figure 10.4.6-1 Example of a submission flow to an XDS Registry

From the above example, the contents of a Submission Set are shown by the figure below. The
2480   Document Entries associated with the Submission Set are logical part of the Submission Set.
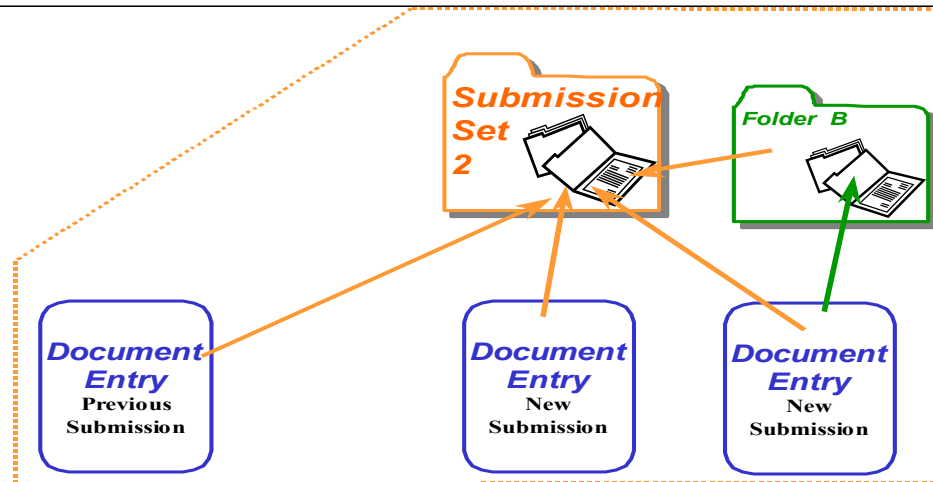
Figure 10.4.6-2 The logical content of a Submission Set

10.4.7 XDS Registry Data Model and Attributes

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The XDS Integration Profile provides a means to place documents in a repository chosen by the Document Source, and also to place information about this document (or metadata) in an entry of the Document Registry that manages the XDS Affinity Domain.

The term metadata reflects that this information is "about" the documents. The purpose of well-specified document metadata is to enable a uniform mechanism for Document Consumers to locate clinical documents of interest much in the way a card catalog in a library helps readers find the book they want.

2490

This section addresses the high-level data model in which the metadata is registered and against which queries of the XDS Document Registry are performed. Then it presents the specific attributes that may be registered and used to filter the document entries of the registry.

10.4.7.1 XDS Document Registry Data Model

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The following entities are used in the XDS Document Registry Data Model:

XDS Document Entry: Information entity managed by a Document Registry Actor that contains a set of metadata describing the major characteristics of an XDS Document along with a link to the Document Repository Actor where the actual XDS Document may be retrieved.

XDS Document: A stream of bytes stored in a Document Repository Actor and pointed to by an XDS Document Entry.

2500

XDS Folder: A logical container that groups one or more XDS Document Entries in any way required (e.g., by source care delivery activities, by episode, care team, clinical specialty or clinical condition). This kind of organizing structure is used variably: in some centers and systems the Folder is treated as an informal compartmentalization of the overall health record; in others it might represent a significant legal portion of the EHR relating to the originating enterprise or team. The Folder is a means of providing organization of XDS Documents (or Composition in EHRCOM). The same XDS Document Entry may belong to zero or more Folders.

2505

XDS Submission Set: When XDS Documents are registered by a Document Source Actor, they shall be included in one and exactly one Submission Set. An XDS Submission Set groups zero or more new XDS Documents and references to already registered XDS Documents to ensure a persistent record of their submission.

XDS Submission Request: A Submission Request includes one and only one Submission Set, zero or more new XDS Folders and assignment of XDS Documents into new or existing Folders. A Submission Request is processed in an atomic manner by the Document Repository and the Document Registry (i.e. all XDS Documents included or referenced in a Submission Set as well as the Folders and inclusion of Folders references are registered or none will). This ensures that they are all made available to Document Consumer Actors at the same time.
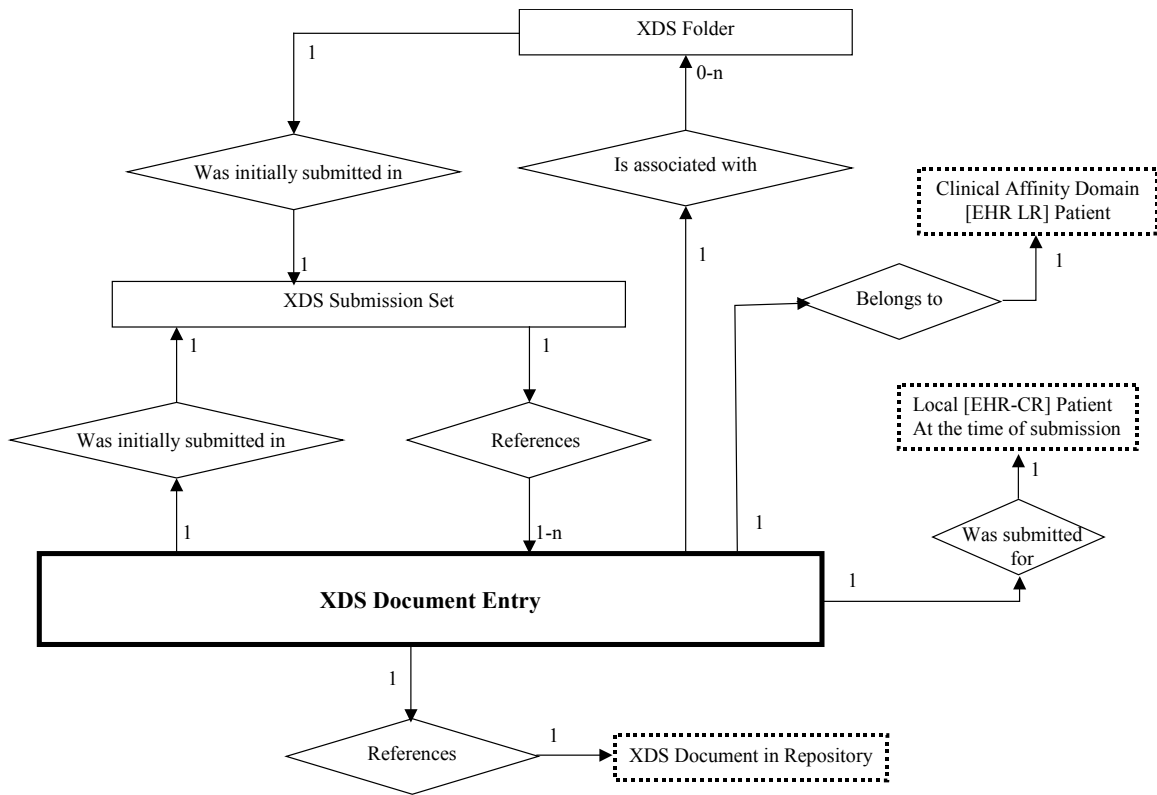
Figure 10.4.7-1 XDS Document Registry Data Model

10.4.7.2 Attributes of the XDS Document Entries

The specific attributes of each entity in the above registry data model have been selected from document header attributes from several standards (see ITI TF-2x: Appendix L), including:

- ANSI/HL7 CDA R1-2000

- HL7 CDA Release 2 (draft) Document header definition (Dec 2003 Committee Ballot)

- Composition attributes from EHR ENV 13606 (draft).

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XDS defines a well focused set of primary attributes that support the most common use cases to search the most relevant documents. These include:

Patient Id
Service Start and Stop Time
Document Creation Time
Document Class Code and Display Name
Practice Setting Code and Display Name
Healthcare Facility Type Code and Display Name
Availability Status (Available, Deprecated)
Document Unique Id

2530 The three codes (Document Class, Practice Setting and Healthcare facility Type) are code set that are expected to generally include a limited number of values (between 10 and 100), thus ensuring a reasonably easy search capability.

A number of additional query attributes or attributes used to perform a secondary selection in order to decide to retrieve a specific document are also defined by this Integration Profile. At the
2535 Document Level, these include a fine grained Document Type (e.g., LOINC classification), a list of Event Code that can be used as key word, the document author and associated institution, the document relationship to manage replacement addendum and a variety of transformations, a confidentiality code, language code, etc.

The complete list of attributes and their definition is documented in ITI TF-3: 4.1.

2540 **10.4.8 Concept of an XDS Affinity Domain**

An XDS Affinity Domain is an administrative structure made of a well-defined set of Document Source Actors, set of Document Repositories, set of Document Consumers organized around a single Document Registry Actor that have agreed to share clinical documents.

> Note: Document Sources, Repositories and Consumers may belong to more than one XDS Affinity Domain and share the
2545 same or different documents. This is an implementation strategy and will not be further described.

> Note: the XDS Integration Profile does not support the federation of XDS Affinity Domains directly, but the Cross-Community Access (XCA) profile addresses the cooperation of multiple Document Registry Actors serving different XDS Affinity Domains.

A number of policies will need to be established in an XDS Affinity Domain in order to ensure
2550 effective interoperability between Document Sources and Consumers. Some of the key technical policies include (A more extensive list of policy agreements that need to be made by XDS Affinity Domains is discussed in ITI TF-1: Appendix L):

1. The document formats that will be accepted for registration

2. The various vocabulary value sets and coding schemes to be used for the submission of
2555 metadata of document, submission set and folders registration.

3. The Patient Identification Domain (Assigning Authority) used by the Document Registry.

See ITI TF-1: Appendix K for a detailed discussion of the concepts of XDS Affinity Domain.

10.4.9 Patient Identification Management

Since the central focus of the DS Integration Profile is "sharing documents", it is critical that each document be reliably associated with the corresponding patient (Patient Id).

The XDS Document Registry is not intended to be an authority for patient identification and demographics information. This Integration Profile uses a Patient Identity Source Actor as the authoritative source of Patient Identifiers (master patient ID) for the XDS Affinity Domain.

> Note: This Integration Profile can be easily extended to support a scenario where no master patient ID is defined (i.e. no Patient Identity Source for the XDS Affinity Domain). Such an option would require the use of federated patient identities at the time of query of the XDS Document Registry.

The following principles are defined:

1.   The Patient Identifier Domain managed by the Patient Identity Source Actor in the XDS Affinity Domain is the source of patient identifiers (and merge operations) used by the XDS Document Registry to link Documents to a specific Patient. This Patient Identifier Domain is called the XDS Affinity Domain Patient Identification Domain (XAD-Pid Domain).

2.   Submission Requests for Documents related to Patients with IDs not registered in the XDS Affinity Domain Patient Identifier Domain shall be rejected by the XDS Document Registry.

3.   The XDS Document Registry will contain certain patient information (e.g., source patient ID, Surname, Given Name, Sex, Birthdate) for the purpose of audits and potential verification by Document Consumers. As this Integration Profile does not make any assumptions about the referential integrity and update of this information, these fields[3] shall not be used as query matching keys.

4.   As XDS Document Sources and Consumers may belong to different Patient Identification Domains, these systems need to cross-reference their own local Patient ID to the corresponding patient ID in the XAD-Pid Domain of the Registry. Preferably, these systems may choose to use the IHE Patient Identifier Cross-referencing Integration Profile (See ITI TF-1: Appendix E.3) for this purpose.

5.   The XDS Document Registry is responsible for validating Document metadata in accordance with the XDS Affinity Domain's policies. The Document Registry should reject submissions Requests that do not conform to these policies.

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[3]   It is possible to submit a new document to replace a previously submitted one, with a new document entry created in the registry to correct for errors in the submitted document in the original submission request. However this is not a mechanism that updates only the metadata, as the replaced document is only deprecated and remains pointed by the original metadata.

2590 The figure below depicts an example of an XDS Affinity Domain with its Patient Identifier Domain (called XAD) and two EHR-CRs where the cross-referencing is performed internally to the Document Source and the Document Consumer Domains (Domain C and Domain D2 respectively).
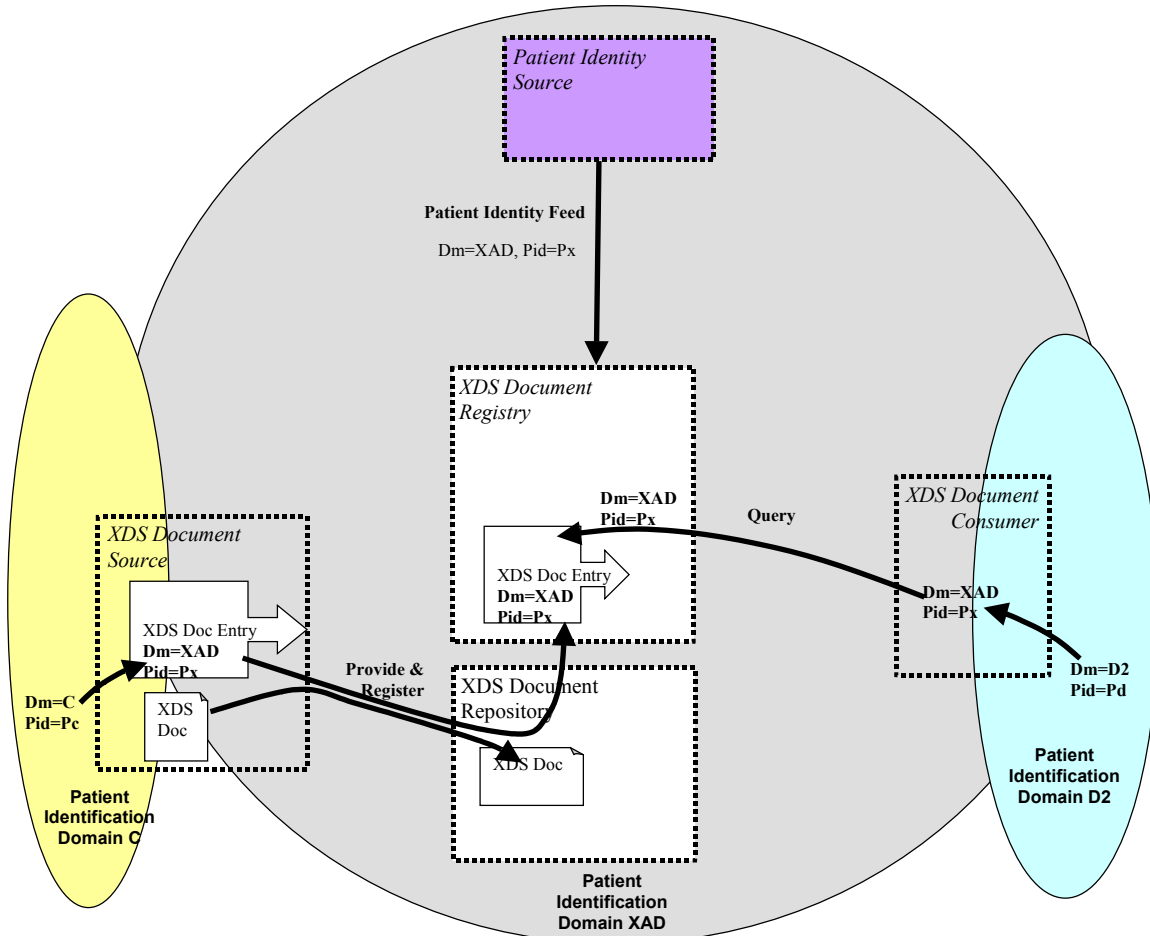
Figure 10.4.9-1 XDS Affinity Domain with patient ID cross-referencing internal to the EHR-CRs

2595

10.4.10   Document Lifecycle

10.4.10.1   Document Availability Status

Each XDS Document contained in a XDS Document Registry will be assigned one of the following Availability Status codes:

2600   Approved: Available for patient care (assumes that it is authenticated, if applicable)

Deprecated: Obsolete, but may still be queried and retrieved

The XDS Document availability status is set to "approved" after the XDS Document Repository and the XDS Document Registry have successfully processed a submission request.

2605

Note: ebXML Registry Services defines a Status of Submitted, which is used in a transient manner to provide an atomic submission. It is not significant to make this specific status externally visible.

An "approved" XDS Document may be changed to "deprecated" under the primary responsibility of its original Document Source with possible patient supervision. It is part of security policies that are beyond the scope of the XDS Integration Profile to have the XDS Repository/Registry enforce this ownership. The reason and responsible party for deprecating a document are tracked as part of

2610 the XDS Document Registry audit trail, which is a required capability. A "deprecated" Document remains available for Document Consumer queries. Except for the status change, a "deprecated" Document Entry metadata remains the same as when it was in the "approved" status.

An "approved" or "deprecated" XDS Document Entry may be deleted. This change is associated with the decision to completely remove a Document from an XDS Document Repository and the

2615 corresponding Document Entry from the XDS Document Registry. The XDS Affinity Domain shall establish the security policies associated with Document deletion. There are no transactions defined by this Integration Profile to support such operation.

See ITI TF-1: Appendix K for a detailed discussion of the concepts of XDS Document life cycle.

10.4.10.2   Document Relationships

2620 XDS Documents may be related to predecessor documents by one of three methods:

- Replacement,
- Addendum
- Transformation
- Transformation-Replacement

2625 These relationships between XDS Documents are tracked in the XDS Document Registry. The parent relationship attribute contained in the metadata of such Documents is a coded value that describes the type of relationship. An original Document has no parent and consequently its parent Id and parent relationship are absent. XDS Document Registry shall reject submissions that contain relationships to documents that are not registered or have been "deprecated". Document stubs are

2630 supported by XDS to allow for a valid relationship to a known but not registered Document.

A replacement document is a new version of an existing document. The replacement document has a new document Id; its parent Id attribute contains the document Id of the Document Entry associated with the previous version of the XDS Document, and parent relationship contains the code "RPLC". The Document Entry for the previous version shall have its Availability Status

2635 changed to "deprecated".

An addendum is a separate XDS Document that references a prior document, and may extend or alter the observations in the prior document. It modifies the parent document, but the parent document remains a valid component of the patient record and shall remain in the state "approved" or available for care. The addendum XDS Document metadata contains the identifier of the

2640 previous XDS Document version in parent Id, and its parent relationship contains the code "APND".

A <u>transformed</u> document is derived by a machine translation from some other format. Examples of transformed documents could be CDA documents converted from DICOM Structured Reporting (SR) reports, or a rendering of a report into a presentation format such as PDF. The transform XDS
2645 Document contains the document Id of the previous version in parentId, and its parent relationship contains the code "XFRM". XDS Affinity Domains may define rules that determine whether or not a transformed XDS Document replaces the source, but typically this would not be the case. If it is, an additional parent relationship of type "RPLC" is to be used.

10.4.11 Document Query

2650 Query return info shall be either:

- a list of Registry Objects Values (e.g., XDS Document Entries)
- a list of Registry Objects UUIDs. This allows an XDS Document Consumer to receive a potentially long list of matching entries and to request them by subsets.

10.5 Implementation Strategies

2655 The XDS Integration profile addresses the requirements of three major implementation strategies reflecting different groupings of actors within an EHR-CR as well as different configurations of the EHR-LR. This range of implementation strategies reflects the need to accommodate a variety of workflows and configurations. These implementation strategies may coexist in some environments. Other implementation strategies are possible.

2660 - Strategy 1: Repository at the Source. A single information system acts as both the Document Source and Document Repository for the documents it creates and registers with the Document Registry

- Upon completion of a phase of care, an EHR-CR will register a submission-set of documents in a Document Repository Actor with which it is grouped (same system). Then it registers this set
2665   of documents (newly created and priors documents of interest) with the Document Registry Actor [2].

- Any other Document Consumer Actor in the XDS Affinity Domain may query the Document Registry Actor to find documents related to all phases of care for the patient [3]. It may choose to retrieve some of these documents from any Document Repository Actor [4].
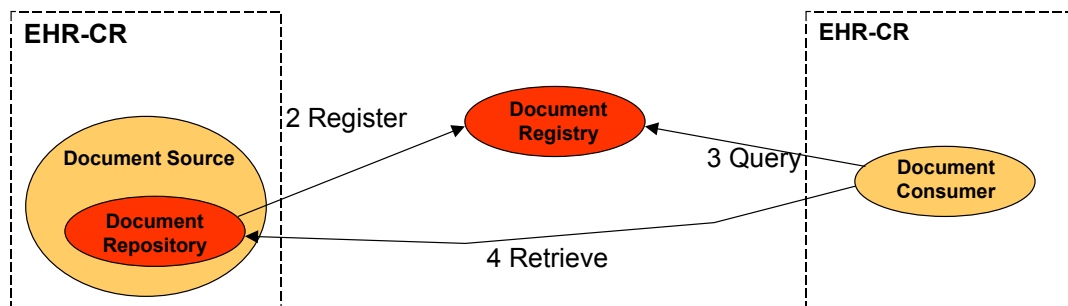
2670
Figure 10.5-1 Implementation Strategy with Repository at the Source

- Strategy 2: Third Party Repository. The EHR-CR does not wish to be a Document Repository Actor, but rather uses the services of a third party Document Repository Actor to which it

2675 entrusts the documents it creates. First it provides both the metadata and the set of documents to this Document Repository Actor [1], which in turn forwards the registration request for the set of documents (newly created and prior documents of interest) to the Document Registry Actor [2].

- Any other Document Consumer Actor may query the Document Registry Actor to find out about documents related to all phases of care for the patient [3]. It may choose to retrieve some
2680 of these documents from any Document Repository Actor [4].

Figure 10.5-2 Implementation Strategy with 3rd party repository
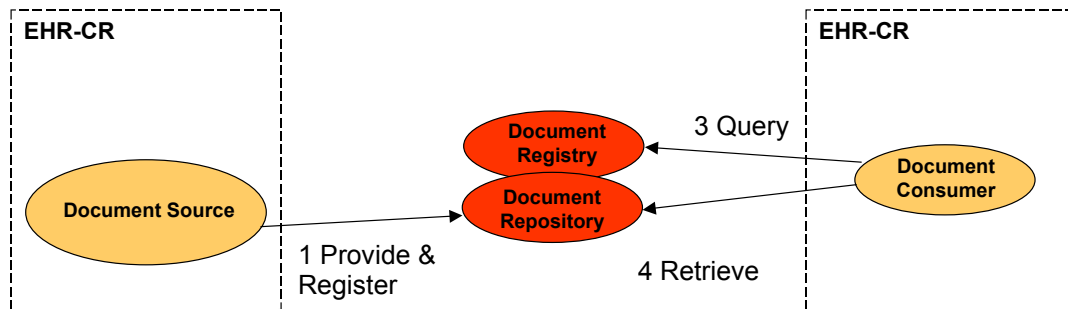
2685 **Figure 10.5-3 Implementation Strategy with 3rd party central repository and registry**

- Strategy 3: Direct Patient Transfer-Referral. The Document Source Actor completes a phase of care for a patient. It decides to directly provide and register [1] the set of documents (newly created and prior documents of interest) with a Document Repository [2] that has been grouped
2690 along with the Document Registry with the EHR-CR Document Consumer (Grouped Actors).

- In this case the span of the XDS Affinity Domain may be quite limited as it could be defined to cover only the two EHR-CRs. However the same transaction [1] applies. Note that, in this implementation strategy the other transactions, although supported by the actors, are not used by the Document Consumer since the Document Registry and Document Repository reside within
2695 the Document Consumer.

Figure 10.5-4 Direct patient referral with registry and repository at consumer

Patient access to an EHR-LR may be supported by a specialized EHR-CR (i.e. a portal)
implementing the Document Source and Document Consumer Actors.

10.6 Patient Identifier Communication Requirements

When using ITI Transaction 8 as the patient identity feed, ITI TF-2a: 3.8 defines the format
requirements for the patient identifier in PID-3. Specifically, the value for PID-3.4, Assigning
Authority can be omitted, expressed using the first subcomponent (namespace ID) or the second and
third subcomponents (universal ID and universal ID type). These rules shall apply in this profile:

1. If the Patient Identity Source does not include a value for PID-3.4, Assigning Authority,
   then

   a. PID-3, Patient Identifier List, is constrained to include one entry referring to one
      identifier.

   b. The Patient Identity Source and Document Registry shall agree that all messages
      from this source shall refer to a single assigning authority.

2. If PID-3.4 does contain a value for PID-3.4, Assigning Authority, then

   a. The Patient Identifier Source may send multiple patient identifiers with properly
      formatted components. The Document Registry shall be responsible for selecting the
      one identifier from the Patient Identifier List (not necessarily in the first position)
      that is too used to register the selected patient.

   b. As specified in ITI TF-2a: 3.8, the value for PID-3.4, Assigning Authority, can be
      expressed using the first subcomponent (namespace ID) or the second and third
      subcomponents (universal ID and universal ID type). Both methods shall be accepted
      by the Document Registry and shall be considered as equivalent.

When using ITI Transaction 44 The Assigning Authority is required.

ITI Transactions 18, 41 and 42 express patient ID as a string that is not parsed using typical HL7
parsing logic; please refer to requirements for Patient ID in those transactions. Document Registry
actors will have to map between the Patient ID feed provided in ITI-8 or ITI-44 as described above
and the PID provided by those transactions in this profile.

XDS.b implementations shall support either Patient Identity Feed (ITI TF-2a: 3.8) or Patient
Identity Feed HL7v3 (ITI TF-2b: 3.44) or both. It is important to note that the version of HL7

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implemented by XDS.b and Patient Identity Feed in a single domain or community need to match in order to allow interoperability. In the case of mixed scenarios, translation between Patient Identity
2730   Feed (ITI TF-2a: 3.8) and Patient Identity Feed HL7v3 (ITI TF-2b: 3.44) will be required via a bridge or interface engine.

10.7 Security Considerations

Coordinating the security and privacy policies of all the care delivery organizations in an XDS Affinity Domain may be a challenge. An agreement is needed on security procedures, goals,
2735   auditing, record keeping, etc. This can result in changes to other enterprise policies, such as human resources procedures. XDS Affinity Domain members are trusting to some extent the access of their published data by other members of the XDS Affinity Domain. The level of control is dependent on Policies and application of other security and privacy profiles offered by IHE. This relationship requires a close ongoing partnership that ensures ongoing maintenance of policies,
2740   procedures, and activities.   If laws change, relevant policies must be adjusted throughout the group. Corporate changes to group members affect the policies. Security events must be managed as a group. This must be managed as a long-term activity, not a one-time event.

Particular problem areas are likely to be:

- Authorized access and modification policies. The details of access policies are likely to
2745   have enterprise differences and conflicts that must be resolved. The XDS Affinity Domain relationships also introduce new policy requirements. For example, changes to employment (e.g., employee hiring and firing) must now include suitably rapid notifications to other XDS Affinity Domain members. (See ATNA and XUA)

- Changes to privacy restrictions (e.g., divorces) now require full XDS Affinity Domain
2750   notifications, not merely enterprise notifications. (See BPPC)

- Audit trail and access record keeping are often quite sensitive internal enterprise activities that must now be appropriately coordinated with the full XDS Affinity Domain. (See ATNA and section 10.8.1)

- Changes to laws and regulations now affect not only the policies of the individual
2755   enterprises; they also must be reflected in the XDS Affinity Domain relationship contracts, policies, and procedures.

- Patient identity management. (See PIX/PDQ/XCPD)

- Patients may have access through an authorized Document Consumer or Document Source implemented in an application such as a PHR.

2760   - Trans-border communication of Personal Health Information (PHI) often presents legal and regulatory issues.

ITI TF-2x: Appendix K goes into more detail listing many of the threats, objectives, policies, and mitigations that need to be coordinated among XDS Affinity Domain members.

The XDS Integration Profile for two main reasons does not prescribe such Security and Privacy
2765   policies. First, it is clear that the broad range of possible solutions to these policies that will depend on the legal framework and the types of healthcare system, calls for XDS to be offer such

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flexibility. Decisions in this domain will have some impact on the implementations of XDS Actors, but it is expected that these will be minimal.

2770 ## 10.7.1 Use of ATNA to address Basic Security

The XDS profile requires all actors be grouped with a Secure Node Actor as defined in the IHE Audit Trail and Node Authentication Integration profile. This use of the ATNA profile in an XDS Affinity Domain does not require a centralized XDS Affinity Domain Audit Repository Actor.

The use of ATNA along with XDS does require that each member of the XDS Affinity Domain
2775 does have audit and security mechanisms in place. See ITI TF-2x: Appendix K.

The individual actors involved are often members of different secure domains, as illustrated in Figure 3.14.5.1-2.   The data transfers between different secure domains need different protection than transfers within a secure domain. The transactions used between different secure domains shall use the ATNA Encryption Option.

2780 Transfers within a single secure domain may choose to omit encryption if it is unnecessary, so it is recommended that the online transfer security mechanisms be configurable. Certificate management and exchange is defined as part of the XDS Affinity Domain business relationships and no IHE Integration Profile is specified at this time, see ITI TF-1: Appendix L.

Each transaction will result in audit records describing the transaction. Each secure domain has its
2785 own audit server to capture the records for the actors that are within that domain. Access to audit records by other enterprises within the XDS Affinity Domain is managed and controlled by the business relationship terms of the XDS Affinity Domain. There is no automatic IHE transaction for such access.

The audit records that shall be generated (references IHE ATNA Integration Profile) by normal
2790 XDS activities are defined in the appropriate Security Considerations section of each transaction:
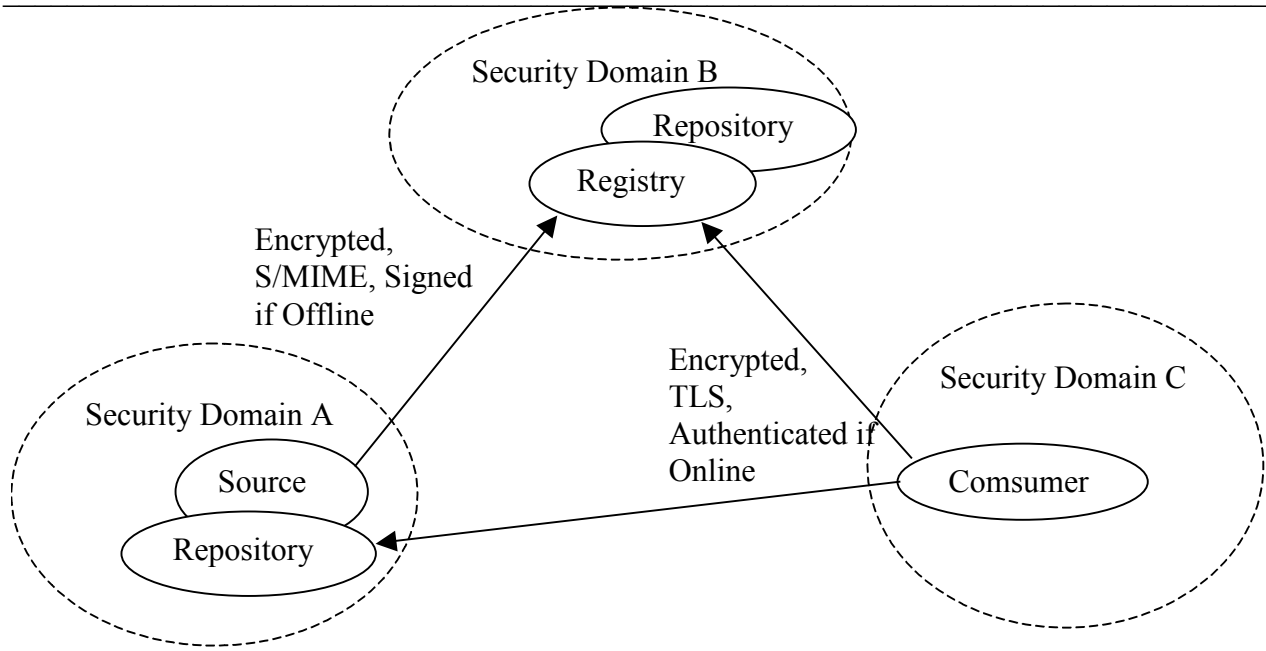
All Actors are part of the same Clinical Affinity Domain

Figure 10.7-1 - Example Security Domain Relationships

2795

Security and Privacy can be further addressed through the application of IHE-BPPC, IHE-XUA. See these profiles for their impact and use.

10.8 Intentionally Left blank

3.18 Registry Stored Query

2205 This section corresponds to Transaction 18 of the IHE Technical Framework. Transaction 18 is used by the Document Registry and Document Consumer actors.

Actors that support the Asynchronous Web Services Exchange option and implement the Registry Stored Query transaction shall support the following:

2210
- Document Consumer Actor shall support Asynchronous Web Services Exchange for the Registry Stored Query [ITI-18] and Retrieve Document Set [ITI-43] transactions
- Document Registry Actor shall support Asynchronous Web Services Exchange for the Registry Stored Query [ITI-18] and Register Document Set – b [ITI-42] transactions

Refer to section ITI TF-2x: V.5 Synchronous and Asynchronous Web Services Exchange for an explanation of Asynchronous Web Services Exchange.

2215 ### 3.18.1 Scope

The Registry Stored Query transaction supports a variety of types of queries. Examples include the following:

Query by patient (Id) for a time interval, by document type(s), by practice setting(s), by author person

2220 Query by Document Source

Query for XDS Folders updated during a time interval

Query for all documents in a Folder or Submission Set

Query by time of submission

The list of XDS registry entries attributes that can be the target of a query are defined in ITI TF-3: 4.1.7 through 4.1.9. This transaction will document the basic syntax and semantics of XDS
2225 Document Registry queries.

All queries return:
- Metadata for one or more registry objects, or
- Object references for one or more registry objects (registry UUIDs).

2230 ### 3.18.2 Use Case Roles
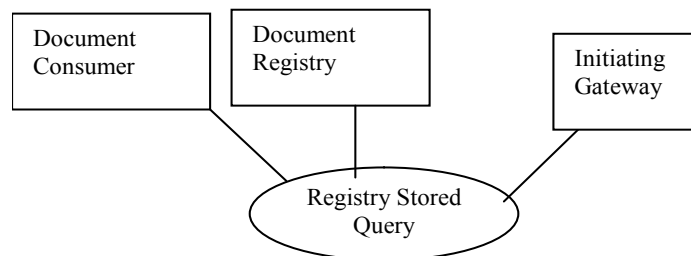
Actor: Document Consumer

Role: Requests a query by identifier (UUID), and passes parameters to the query. A parameter controlling the format of the returned data is passed, it selects either object references or full objects.

Actor: Document Registry

Role: Services the query using its stored definitions of the queries defined for XDS.

Actor: Initiating Gateway

Role: Services the stored query by initiating transactions with a selected set of Responding Gateways, Document Registries or other appropriate systems.

3.18.3 Referenced Standards

Implementors of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V: Web Services for IHE Transactions.

ebRIM   OASIS/ebXML Registry Information Model v3.0

ebRS   OASIS/ebXML Registry Services Specifications v3.0

3.18.4 Interaction Diagram
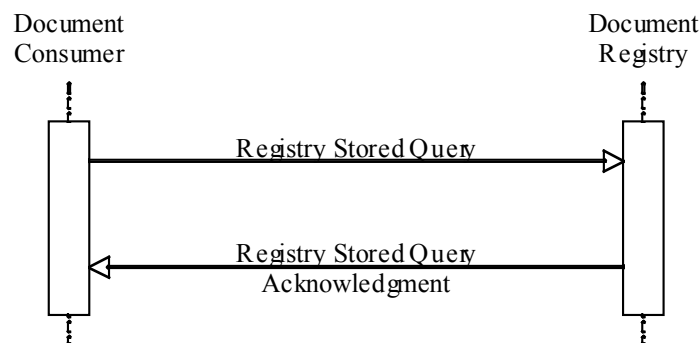
3.18.4.1 Registry Stored Query

This is a query request to the Document Registry from a Document Consumer. The query request contains:

- A reference to a pre-defined query stored on the Document Registry actor.
- Parameters to the query. The query parameters are matched up with the query variables defined in the query definition on the Document Registry actor.

3.18.4.1.1 Trigger Events

This message is initiated when the Document Consumer wants to query/retrieve document metadata.

3.18.4.1.2 Message Semantics

2260 The semantics of Stored Query are defined in section 6.3. *Stored Query Support* of ebRS version 3.0. This transaction corresponds to section 6.3.2 *Invoking a Stored Query* and 6.3.3 *Response to a Stored Query Invocation.* This profile does not specify how the queries come to be stored in the Registry actor nor how they are to be translated for other database architectures.

3.18.4.1.2.1 Version 3.0 ebXML Registry Standard

2265 This transaction uses ebXML Registry version 3.0. The Invoke Stored Query message and the Invoke Stored Query Acknowledgement message shall be in version 3.0 format and be consistent with version 3.0 ebRIM and ebRS standards.

Version 3.0 ebXML Registry XML Schemas shall be used to validate the messages of this transaction. The major differences between version 2.1 and 3.0 of the Schema are:

2270
- Different XML namespaces
- LeafRegistryObjectList element becomes RegistryObjectList
- ObjectType attribute changes format, changing from a text name to a UUID. For example, RegistryPackage becomes urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:RegistryPackage

2275
- Status attribute value format changes from Approved to urn:oasis:names:tc:ebxml-regrep:StatusType:Approved
- Order of elements changes – Name, Description, Slot, Classification, ExternalIdentifier ordering becomes Slot, Name, Description, Classification, ExternalIdentifier.
- Id attribute is required for Classification, ExternalIdentifier, and Association

2280
- The registryObject attribute is required on the ExternalIdentifier element.
- Association Types must be namespace qualified. For details see ITI TF-3: 4.1.6.3 Association type formatting.

It is the responsibility of the Document Registry actor to translate between version 2.1 and version 3.0 formats when returning v2.1 objects in v3.0 query responses.

2285 ### 3.18.4.1.2.2 Sample Query Request

The sample query is included under the ITI TF-2a: 3.18.4.1.3 Expected Actions.

3.18.4.1.2.3 Query Request Parameters – Coding Style

The ebXML Registry stored query facility (Invoke Stored Query transaction) accepts the following parameters:

2290
- returnType – 'LeafClass' or 'ObjectRef'
- Query ID – a UUID from the Stored Query IDs section (ITI TF-2a: 3.18.4.1.2.4) below
- Query Parameters – as defined in the Query Parameters section (ITI TF-2a: 3.18.4.1.2.3.7) below

3.18.4.1.2.3.1 Parameter returnType

2295   Registry Stored Query supports the following values for the parameter returnType:

- ObjectRef – a list of object UUIDs (references)
- LeafClass – list of XML elements representing the leaf class of the object returned

The 'LeafClass' returnType is meant for returning a small amount of fully specified ebXML objects (such as a list of ExtrinsicObject (XDSDocumentEntry) elements with full contents:
2300   slots, external identifiers, classifications etc.). This type of query result is self-contained, everything known about the object(s) is returned. The specific query documented in this section describes which object types will be included. ObjectRef elements are also returned. These represent objects not included in the returned object list that are referenced by objects in the returned object list. These ObjectRefs are optional by the registry standard version 3.0.

2305   The 'ObjectRef' returnType returns references to the registry objects that match the query. This type query is recommended when the returned object list could be large. An initial query returning ObjectRefs for all objects of interest followed by secondary queries requesting full metadata (query type LeafClass) is an efficient way to query for large bodies of metadata. This strategy is particularly easy to use when querying for a single object type (XDSDocumentEntry
2310   or XDSSubmissionSet are examples) since only a single object type is involved.

An ObjectRef looks like:

```
<ObjectRef id="urn:uuid:58a6f841-87b3-4a3e-92fd-a8ffeff98427"/>
```

3.18.4.1.2.3.2 Parameter Query ID

This parameter holds the UUID assigned to the query to be invoked. UUIDs are assigned by this
2315   profile (see ITI TF-2a: 3.18.4.1.2.4) to each of the queries defined in ITI TF-2a: 3.18.4.1.2.3.7.

3.18.4.1.2.3.3 Date/Time Coding

All Date/time values are to be inclusive, interpreted as:

$XDSDocumentEntryCreationTimeFrom <= XDSDocumentEntry.creationTime < $XDSDocumentEntryCreationTimeTo

2320   for example. The 'From' time or the 'To' time may be omitted.

3.18.4.1.2.3.4 Coding of Code/Code-Scheme

When specifying a coded value parameter, an abbreviated form of the HL7 V2.5 CE format shall be used. Only the first (identifier) and third (coding scheme) elements shall be specified. Both are required. The second element shall be empty. The HL7 V2.5 length limits shall not apply.
2325   The ebRIM limit on Slot Value size does apply. An example of this format is:

code^^coding-scheme

This style parameter always accepts multiple values so example codings in context look like:

<Value>('code1^^coding-scheme1')</Value>

or

2330   <Value>('code1^^coding-scheme1','code2^^coding-scheme2')</Value>

within the parameter Slot.

3.18.4.1.2.3.5 Coding of Single/Multiple Values

Single values are coded as

2335
- 123 - without quotes for numbers
- 'urn:oasis:names:tc:ebxml-regrep:StatusType:Approved' - in single quotes for strings.
- 'Children''s Hospital' – a single quote is inserted in a string by specifying two single quotes

Within the LIKE predicate

- Underscore ('_') matches an arbitrary character

2340
- Percent ('%') matches an arbitrary string

Format for multiple values is

- (value, value, value, …) OR
- (value) if only one value is to be specified.

where each value is coded as described above for single values.

2345   When coding multiple values there is a potential conflict between needing to code a long list of values and the length restriction imposed by Schema on the size of the value of the <Value/> element. Slot values shall never exceed the Schema-enforced limit. Therefore, the use of multiple Value elements within the Slot shall be acceptable. Splits may occur only between values, where each Value element is surrounded by parentheses. The following example shows multiple values,

2350   split across multiple Value elements:

<Slot name="$uuid">

  <ValueList>

    <Value>('urn:uuid:a96d7361-6617-488a-891c-ee3f37d1f218','urn:uuid: 5655a680-1b6a-11dd-bd0b-0800200c9a66')</Value>

2355   <Value>('urn:uuid:ae315e81-2056-4829-a5b4-cf9531941f96')</Value>

  </ValueList>

</Slot>

This example shall be treated as equivalent to:

<Slot name="$uuid">

2360   <ValueList>

        `<Value>('urn:uuid:a96d7361-6617-488a-891c-ee3f37d1f218','urn:uuid: 5655a680-1b6a-11dd-bd0b-0800200c9a66','urn:uuid:ae315e81-2056-4829-a5b4-cf9531941f96')</Value>`

    `</ValueList>`

`</Slot>`

2365 Character comparisons shall be performed in accordance with the rules in 4.2.

And/or semantics for the coding of parameters shall be available only on parameters for multi-valued metadata elements (such as $XDSDocumentEntryEventCodeList). Multi-valued parameters shall be coded in two ways with different interpretations.

A parameter specified as a Slot with multiple values shall be interpreted as disjunction (OR
2370 semantics). For example:

```
<rim:Slot name="$XDSDocumentEntryEventCodeList">
  <rim:ValueList>
     <rim:Value>('a')</rim:Value>
     <rim:Value>('b')</rim:Value>
  </rim:ValueList>
</rim:Slot>
```

shall match an XDSDocumentEntry object with an eventCodeList attribute containing either 'a' or 'b'. The following coding of the parameter shall yield the same results:

```
<rim:Slot name="$XDSDocumentEntryEventCodeList">
  <rim:ValueList>
     <rim:Value>('a','b')</rim:Value>
  </rim:ValueList>
</rim:Slot>
```

A parameter specified as multiple Slots shall be interpreted as conjunction (AND semantics). For
2385 example:

```
<rim:Slot name="$XDSDocumentEntryEventCodeList">
  <rim:ValueList>
     <rim:Value>('a')</rim:Value>
  </rim:ValueList>
</rim:Slot>
<rim:Slot name="$XDSDocumentEntryEventCodeList">
  <rim:ValueList>
      <rim:Value>('b')</rim:Value>
  </rim:ValueList>
</rim:Slot>
```

shall match an XDSDocumentEntry object with an eventCodeList attribute containing both 'a' and 'b'.

Furthermore, the following specification of the $XDSDocumentEntryEventCodeList parameter:

```
<rim:Slot name="$XDSDocumentEntryEventCodeList">
  <rim:ValueList>
     <rim:Value>('a','b')</rim:Value>
  </rim:ValueList>
</rim:Slot>
<rim:Slot name="$XDSDocumentEntryEventCodeList">
  <rim:ValueList>
     <rim:Value>('c')</rim:Value>
  </rim:ValueList>
</rim:Slot>
```

shall be interpreted as matching a document having eventCode (a OR b) AND c.

2410 **3.18.4.1.2.3.6 Valid Document Status Values**

The Registry Object status values, in ebRIM v 3.0 format, used by XDS are:
```
urn:oasis:names:tc:ebxml-regrep:StatusType:Submitted
urn:oasis:names:tc:ebxml-regrep:StatusType:Approved
urn:oasis:names:tc:ebxml-regrep:StatusType:Deprecated
```

2415 If the Document Registry receives in a Registry Stored Query transaction a value for the $XDSDocumentEntryStatus parameter that it does not understand then the Document Registry shall ignore the value and process the Registry Stored Query transaction as if the not understood value were not specified. This means that if the only value present is one that is not understood an error will be generated because the $XDSDocumentEntryStatus parameter is required.

2420 **3.18.4.1.2.3.6.1 Valid AdhocQueryResponse Status Values**

The status attribute of AdhocQueryResponse shall contain one of the following values:
```
urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success
urn:ihe:iti:2007:ResponseStatusType:PartialSuccess
urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Failure
```

2425 See ITI TF-3: 4.1.13 Error Reporting for the interpretation of these values.

3.18.4.1.2.3.7 Parameters for Required Queries

The sections below document the queries defined in the Registry Stored Query transaction [ITI-18]. These sections document a collection of Stored Queries. Document Registry actors implementing this transaction shall support all queries in this collection and all parameters
2430 defined for each query. Document Consumer actors implementing this transaction shall implement one or more of these queries as needed to support the use cases it implements.

Note that dollar sign ($) prefix on query parameters is required by ebRS 3.0.

In the query parameter tables below, each row represents a query parameter. Optional parameters which are not included in the query invocation have no effect on the query. Queries return
2435 registry objects that match all the supplied parameters. When multiple values are included for a parameter, objects are returned that match any included value (within the context of the larger query).

3.18.4.1.2.3.7.1 FindDocuments

2440 Find documents (XDSDocumentEntry objects) in the registry for a given patientID with a matching 'status' attribute. The other parameters can be used to restrict the set of XDSDocumentEntry objects returned.

Returns: XDSDocumentEntry objects matching the query parameters

Parameter Name	Attribute	Opt	Mult

Parameter Name	Attribute	Opt	Mult
$XDSDocumentEntryPatientId	XDSDocumentEntry. patientId	R	--
$XDSDocumentEntryClassCode[1]	XDSDocumentEntry. classCode	O	M
$XDSDocumentEntryTypeCode[1]	XDSDocumentEntry.typeCode	O	M
$XDSDocumentEntryPracticeSettingCode[1]	XDSDocumentEntry. practiceSettingCode	O	M
$XDSDocumentEntryCreationTimeFrom	Lower value of XDSDocumentEntry. creationTime	O	--
$XDSDocumentEntryCreationTimeTo	Upper value of XDSDocumentEntry. creationTime	O	--
$XDSDocumentEntryServiceStartTimeFrom	Lower value of XDSDocumentEntry. serviceStartTime	O	--
$XDSDocumentEntryServiceStartTimeTo	Upper value of XDSDocumentEntry. serviceStartTime	O	--
$XDSDocumentEntryServiceStopTimeFrom	Lower value of XDSDocumentEntry. serviceStopTime	O	--
$XDSDocumentEntryServiceStopTimeTo	Upper value of XDSDocumentEntry. serviceStopTime	O	--
$XDSDocumentEntryHealthcareFacilityTypeCode[1]	XDSDocumentEntry. healthcareFacilityTypeCode	O	M
$XDSDocumentEntryEventCodeList[1]	XDSDocumentEntry. eventCodeList[3]	O	M
$XDSDocumentEntryConfidentialityCode[1]	XDSDocumentEntry. confidentialityCode[3]	O	M
$XDSDocumentEntryAuthorPerson[4]	XDSDocumentEntry. author	O	M
$XDSDocumentEntryFormatCode[1]	XDSDocumentEntry. formatCode	O	M
$XDSDocumentEntryStatus	XDSDocumentEntry. status	R	M

2445 [1]Shall be coded according to specification in ITI TF-2a: 3.18.4.1.2.3.4 Coding of Code/Code-Scheme.

[3]Supports AND/OR semantics as specified in ITI TF-2a: 3.18.4.1.2.3.5.

[4]The value for this parameter is a pattern compatible with the SQL keyword LIKE which allows the use of the following wildcard characters: % to match any (or no) characters and _ to match a
2450 single character. The match shall be applied to the text contained in the Value elements of the authorPerson Slot on the author Classification (value strings of the authorPerson sub-attribute)

3.18.4.1.2.3.7.2 FindSubmissionSets

2455 Find submission sets (XDSSubmissionSet objects) in the registry for a given patientID with matching 'status' attribute. The other parameters can be used to restrict the collection of XDSSubmissionSet objects returned.

Returns: XDSSubmissionSet objects matching the query parameters

Parameter Name	Attribute	Opt	Mult
$XDSSubmissionSetPatientId	XDSSubmissionSet. patientId	R	--
$XDSSubmissionSetSourceId	XDSSubmissionSet. sourceId	O	M
$XDSSubmissionSetSubmissionTimeFrom	XDSSubmissionSet. submissionTime Lower value	O	--
$XDSSubmissionSetSubmissionTimeTo	XDSSubmissionSet. submissionTime Upper value	O	--
$XDSSubmissionSetAuthorPerson[1]	XDSSubmissionSet. authorPerson	O	--
$XDSSubmissionSetContentType[2]	XDSSubmissionSet. contentTypeCode	O	M
$XDSSubmissionSetStatus	XDSSubmissionSet. status	R	M

[1]The value for this parameter is a pattern compatible with the SQL keyword LIKE which allows the use of the following wildcard characters: % to match any (or no) characters and _ to match a 2460 single character. The match shall be applied to the text contained in the Value elements of the authorPerson Slot on the author Classification (value strings of the authorPerson sub-attribute).

[2]Shall be coded according to specification in ITI TF-2a: 3.18.4.1.2.3.4 Coding of Code/Code-Scheme.

3.18.4.1.2.3.7.3 FindFolders

2465 Find folders (XDSFolder objects) in the registry for a given patientID with matching 'status' attribute. The other parameters can be used to restrict the collection of XDSFolder objects returned.

Returns: XDSFolder objects matching the query parameters

Parameter Name	Attribute	Opt	Mult
$XDSFolderPatientId	XDSFolder.patientId	R	--
$XDSFolderLastUpdateTimeFrom	XDSFolder. lastUpdateTime lower value	O	--
$XDSFolderLastUpdateTimeTo	XDSFolder. lastUpdateTime upper bound	O	--
$XDSFolderCodeList[1,3]	XDSFolder. codeList	O	M
$XDSFolderStatus	XDSFolder.status	R	M

[1]Shall be coded according to specification in ITI TF-2a: 3.18.4.1.2.3.4 Coding of Code/Code-2470 Scheme.

[3]Supports AND/OR semantics as specified in ITI TF-2a: 3.18.4.1.2.3.5.

3.18.4.1.2.3.7.4 GetAll

Get all registry content for a patient given the indicated status, format codes, and confidentiality codes.

2475 **Returns:**

- XDSSubmissionSet, XDSDocumentEntry, and XDSFolder objects with patientId attribute matching $patientId parameter

- Association objects with sourceObject or targetObject attribute matching one of the above objects

Parameter Name	Attribute	Opt	Mult
$patientId	XDSFolder. patientId, XDSSubmissionSet. patientId, XDSDocumentEntry. patientId	R	--
$XDSDocumentEntryStatus	XDSDocumentEntry. status	R	M
$XDSSubmissionSetStatus	XDSSubmissionSet. status	R	M
$XDSFolderStatus	XDSFolder. status	R	M
$XDSDocumentEntryFormatCode[2]	XDSDocumentEntry. formatCode	O	M
$XDSDocumentEntryConfidentialityCode[1, 2]	XDSDocumentEntry. confidentialityCode[1]	O	M

2480 [1]Supports AND/OR semantics as specified in ITI TF-2a: 3.18.4.1.2.3.5.

[2]Shall be coded according to specification in ITI TF-2a: 3.18.4.1.2.3.4 Coding of Code/Code-Scheme

3.18.4.1.2.3.7.5 GetDocuments

Retrieve a collection of XDSDocumentEntry objects. XDSDocumentEntry objects are selected
2485 either by their entryUUID or uniqueId attribute.

Returns: XDSDocumentEntry objects requested

Parameter Name	Attribute	Opt	Mult
$XDSDocumentEntryEntryUUID[3]	XDSDocumentEntry. entryUUID	O[1]	M
$XDSDocumentEntryUniqueId[3]	XDSDocumentEntry. uniqueId	O[1]	M
$homeCommunityId	None	O[2]	--

[1]Either $XDSDocumentEntryEntryUUID or $XDSDocumentEntryUniqueId shall be specified. This transaction shall return an error if both parameters are specified.

[2]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of
2490 the query request, as in: <AdhocQuery id="…" home="urn:oid:1.2.3" … >. Document Consumer actors shall specify the homeCommunityId value if they received a value for this attribute as part of the previous Registry Stored Query response entry which contained the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

Note: A query for a single XDSDocumentEntry.uniqueId can return multiple results. See ITI TF-3: 4.1.4 under the topic of
2495 Document metadata duplication for explanation.

[3]If the Stored Query specifies a returnType of LeafClass then the Document Registry actor shall verify that all requested DocumentEntry objects to be returned will contain the same Patient ID. If this validation fails an XDSResultNotSinglePatient error shall be returned and no metadata shall be returned.

2500

3.18.4.1.2.3.7.6 GetFolders

Retrieve a collection of XDSFolder objects. XDSFolder objects are selected either by their entryUUID or uniqueId attribute.

Returns: XDSFolder objects requested.

Parameter Name	Attribute	Opt	Mult
$XDSFolderEntryUUID[3]	XDSFolder. entryUUID	O[1]	M
$XDSFolderUniqueId[3]	XDSFolder. uniqueId	O[1]	M
$homeCommunityId	None	O[2]	--

2505 [1]Either $XDSFolderEntryUUID or $XDSFolderUniqueId shall be specified. This transaction shall return an error if both parameters are specified.

[2]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of the query request, as in: <AdhocQuery id="…" home="urn:oid:1.2.3" … >. Document Consumer actors shall specify the homeCommunityId value if they received a value for this
2510 attribute as part of the previous Registry Stored Query response entry which contained the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

[3]If the Stored Query specifies a returnType of LeafClass then the Document Registry actor shall verify that all requested DocumentEntry objects to be returned will contain the same Patient ID. If this validation fails an XDSResultNotSinglePatient error shall be returned and no metadata
2515 shall be returned.

3.18.4.1.2.3.7.7 GetAssociations

Retrieve Association objects whose sourceObject or targetObject attribute match $uuid.

Returns: Association objects

Parameter Name	Attribute	Opt	Mult
$uuid	None	R	M
$homeCommunityId	None	O[1]	-

[1]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of
2520 the query request, as in: <AdhocQuery id="…" home="urn:oid:1.2.3" … >. Document Consumer actors shall specify the homeCommunityId value if they received a value for this attribute as part of the previous Registry Stored Query response entry which contained the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

3.18.4.1.2.3.7.8 GetDocumentsAndAssociations

Retrieve a collection of XDSDocumentEntry objects and the Association objects surrounding them. XDSDocumentEntry objects are selected either by their entryUUID or uniqueId attribute. This is the GetDocuments query and GetAssociations query combined into a single query.

Returns:

- XDSDocumentEntry objects

- Association objects whose sourceObject or targetObject attribute matches one of the above objects

Parameter Name	Attribute	Opt	Mult
$XDSDocumentEntryEntryUUID[3]	XDSDocumentEntry. entryUUID	O[1]	M
$XDSDocumentEntryUniqueId[3]	XDSDocumentEntry. uniqueId	O[1]	M
$homeCommunityId	None	O[2]	--

[1]Either $XDSDocumentEntryEntryUUID or $XDSDocumentEntryUniqueId shall be specified. This transaction shall return an error if both parameters are specified.

[2]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of the query request, as in: <AdhocQuery id="…" home="urn:oid:1.2.3" … >. Document Consumer actors shall specify the homeCommunityId value if they received a value for this attribute as part of the previous Registry Stored Query response entry which contained the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

[3]If the Stored Query specifies a returnType of LeafClass then the Document Registry actor shall verify that all requested DocumentEntry objects to be returned will contain the same Patient ID. If this validation fails an XDSResultNotSinglePatient error shall be returned and no metadata shall be returned.

3.18.4.1.2.3.7.9 GetSubmissionSets

Retrieve the XDSSubmissionSet objects used to submit a collection of XDSDocumentEntry and XDSFolder objects. The XDSDocumentEntry and XDSFolder objects of interest are identified by their UUIDs in the $uuid parameter.

Selection: XDSSubmissionSet objects are selected because Association objects exist that have:

- Type HasMember

- targetObject attribute containing one of the UUIDs provided in the $uuid parameter

- sourceObject attribute referencing an XDSSubmissionSet object

Returns:

- XDSSubmissionSet objects described above

- Association objects described in the Selection section above

Parameter Name	Attribute	Opt	Mult
$uuid[2]	XDSDocumentEntry. entryUUID and	R	M

Parameter Name	Attribute	Opt	Mult
	XDSFolder. entryUUID		
$homeCommunityId	None	O[1]	--

[1]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of
2555 the query request, as in: `<AdhocQuery id="…" home="urn:oid:1.2.3" … >`.
Document Consumer actors shall specify the homeCommunityId value if they received a value
for this attribute as part of the previous Registry Stored Query response entry which contained
the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

[2]If the Stored Query specifies a returnType of LeafClass then the Document Registry actor shall
2560 verify that all requested Submission Set objects to be returned will contain the same Patient ID.
If this validation fails an XDSResultNotSinglePatient error shall be returned and no metadata
shall be returned.

3.18.4.1.2.3.7.10 GetSubmissionSetAndContents

Retrieve a SubmissionSet and its contents. SubmissionSet objects is selected either by its
2565 entryUUID or uniqueId attribute. The DocumentEntry objects returned may be constrained by
their formatCode and confidentialityCode attributes. More specifically, the DocumentEntries
returned shall be limited by the following rules:

- If the $XDSDocumentEntryConfidentialityCode parameter is present in the query, then
  DocumentEntries shall be returned only if they match this parameter.

2570 - If the $XDSDocumentEntryFormatCode parameter is present in the query, then
  DocumentEntries shall be returned only if they match this parameter

Returns:

- SubmissionSet identified

- DocumentEntries linked to the SubmissionSet by HasMember Associations
2575 (DocumentEntries shall pass the above rules)

- The HasMember Associations identified in the previous rule

- Folders linked to the SubmissionSet by HasMember Associations

- The HasMember Associations identified in the previous rule

- Associations linked to the SubmissionSet by HasMember Associations where the
2580 Associations link two objects already in the return set

- The HasMember Associations identified in the previous rule

In the above rules, Associations are only returned if both of the objects they connect are part of
the return set.

2585

Parameter Name	Attribute	Opt	Mult
$XDSSubmissionSetEntryUUID[5]	XDSSubmissionSet. entryUUID	O[1]	--
$XDSSubmissionSetUniqueId[5]	XDSSubmissionSet. uniqueId	O[1]	--

Parameter Name	Attribute	Opt	Mult
$XDSDocumentEntryFormatCode[4]	XDSDocumentEntry. formatCode	O	M
$XDSDocumentEntryConfidentialityCode[4]	XDSDocumentEntry. confidentialityCode[2]	O	M
$homeCommunityId	None	O[3]	--

[1]Either $XDSSubmissionSetEntryUUID or $XDSSubmissionSetUniqueId shall be specified. This transaction shall return an error if both parameters are specified.

[2]Supports AND/OR semantics as specified in ITI TF-2a: 3.18.4.1.2.3.5.

[3]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of the query request, as in: <AdhocQuery id="…" home="urn:oid:1.2.3" … >. Document Consumer actors shall specify the homeCommunityId value if they received a value for this attribute as part of the previous Registry Stored Query response entry which contained the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

[4]Shall be coded according to specification in ITI TF-2a: 3.18.4.1.2.3.4 Coding of Code/Code-Scheme.

[5]If the Stored Query specifies a returnType of LeafClass then the Document Registry actor shall verify that all requested Submission Set, Folder, and DocumentEntry objects to be returned will contain the same Patient ID. If this validation fails an XDSResultNotSinglePatient error shall be returned and no metadata shall be returned.

3.18.4.1.2.3.7.11 GetFolderAndContents

Retrieve a Folder and its contents. The Folder object is selected either by its entryUUID or uniqueId attribute. The DocumentEntry objects returned may be constrained by their formatCode and confidentialityCode attributes. More specifically, the DocumentEntries shall **shall be limited by the following rules:**

- If the $XDSDocumentEntryConfidentialityCode parameter is present in the query, then DocumentEntries shall be returned only if they match this parameter.
- If the $XDSDocumentEntryFormatCode parameter is present in the query, then DocumentEntries shall be returned only if they match this parameter

Returns:

- Folder identified
- DocumentEntries linked to the Folder by HasMember Associations (DocumentEntries shall pass the above rules)
- The HasMember Associations identified in the previous rule

In the above rules, Associations are only returned if both of the objects they connect are part of the return set.

Parameter Name	Attribute	Opt	Mult
$XDSFolderEntryUUID[5]	XDSFolder. entryUUID	O[1]	--

Parameter Name	Attribute	Opt	Mult
$XDSFolderUniqueId[5]	XDSFolder. uniqueId	O[1]	--
$XDSDocumentEntryFormatCode[4]	XDSDocumentEntry. formatCode	O	M
$XDSDocumentEntryConfidentialityCode[4]	XDSDocumentEntry. confidentialityCode[2]	O	M
$homeCommunityId	None	O[3]	--

[1]Either $XDSFolderEntryUUID or $XDSFolderUniqueId shall be specified. This transaction shall return an error if both parameters are specified.

[2]Supports AND/OR semantics as specified in ITI TF-2a: 3.18.4.1.2.3.5.

2620 [3]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of the query request, as in: `<AdhocQuery id="…" home="urn:oid:1.2.3" … >`. Document Consumer actors shall specify the homeCommunityId value if they received a value for this attribute as part of the previous Registry Stored Query response entry which contained the specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

2625 [4]Shall be coded according to specification in ITI TF-2a: 3.18.4.1.2.3.4 Coding of Code/Code-Scheme.

[5]If the Stored Query specifies a returnType of LeafClass then the Document Registry actor shall verify that all requested Folder, and DocumentEntry objects to be returned will contain the same Patient ID. If this validation fails an XDSResultNotSinglePatient error shall be returned and no
2630 metadata shall be returned.

3.18.4.1.2.3.7.12 GetFoldersForDocument

Retrieve XDSFolder objects that contain the XDSDocumentEntry object provided with the query. XDSDocumentEntry objects are selected either by their entryUUID or uniqueId attribute.

Returns: XDSFolder objects that contain specified XDSDocumentEntry object. More
2635 specifically, for each Association object of type HasMember that has a targetObject attribute referencing the target XDSDocumentEntry object, return the object referenced by its sourceObject if it is of type XDSFolder.

Parameter Name	Attribute	Opt	Mult
$XDSDocumentEntryEntryUUID	XDSDocumentEntry. entryUUID	O[1]	--
$XDSDocumentEntryUniqueId	XDSDocumentEntry. uniqueId	O[1]	--
$homeCommunityId	None	O[2]	--

[1]Either $XDSDocumentEntryEntryUUID or $XDSDocumentEntryUniqueId shall be specified.
2640 This transaction shall return an error if both parameters are specified.

[2]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of the query request, as in: `<AdhocQuery id="…" home="urn:oid:1.2.3" … >`. Document Consumer actors shall specify the homeCommunityId value if they received a value for this

---

attribute as part of the previous Registry Stored Query response entry which contained the
2645   specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

> Note: A query for a single XDSDocumentEntry.uniqueId can return multiple results. See ITI TF-3: 4.1.4 under the topic of
> Document metadata duplication for explanation.

3.18.4.1.2.3.7.13 GetRelatedDocuments

Retrieve XDSDocumentEntry objects that are related to the specified document via Association
2650   objects. Also return the Association objects. The specified document is designated by UUID or
uniqueId. The query shall return

- Association objects where:
    - The sourceObject attribute OR the targetObject attribute references the specified
document AND
2655   - Both sourceObject attribute and targetObject attribute reference documents AND
    - The associationType attribute matches a value included in the $AssociationTypes
parameter
- XDSDocumentEntry objects referenced by the targetObject attribute OR the sourceObject
attribute of an Association object matched above.

2660   > Note: A side effect of the query is that the specified document is returned in the results if at least one Association is
> returned.

> Note: A side effect of this query is that if the document specified by the $XDSDocumentEntryUUID or
> $XDSDocumentEntryUniqueId parameters has no associations linking it to other documents, then no documents
> and no associations are returned.

2665   See ITI TF-3: 4.1.6 Document Relationships and Associations for background.

Returns: Association objects and related XDSDocumentEntry objects

Given : An XDSDocumentEntry object and a collection of association types.

Parameter Name	Attribute	Opt	Mult
$XDSDocumentEntryEntryUUID	XDSDocumentEntry. entryUUID	O[1]	--
$XDSDocumentEntryUniqueId	XDSDocumentEntry. uniqueId	O[1]	--
$AssociationTypes	Not a named attribute	R	M
$homeCommunityId	None	O[2]	--

[1]Either $XDSDocumentEntryEntryUUID or $XDSDocumentEntryUniqueId shall be specified.
2670   This transaction shall return an error if both parameters are specified.

[2]The homeCommunityId value is specified as the home attribute on the AdhocQuery element of
the query request, as in: <AdhocQuery id="…" home="urn:oid:1.2.3" … >. Document
Consumer actors shall specify the homeCommunityId value if they received a value for this
attribute as part of the previous Registry Stored Query response entry which contained the
2675   specified EntryUUID or UniqueID. See ITI TF-2a: 3.18.4.1.2.3.8 for more details.

> Note: A query for a single XDSDocumentEntry.uniqueId can return multiple results. See ITI TF-3: 4.1.4 under the topic of
> Document metadata duplication for explanation.

3.18.4.1.2.3.8 Use of homeCommunityId

2680 The Registry Stored Query makes use of the homeCommunityId which is a globally unique identifier for a community and is used to obtain the Web Services endpoint of services that provide access to data in that community. homeCommunityId is structured as an OID limited to 64 characters and specified in URI syntax, for example the homeCommunityId of 1.2.3 would be formatted as `urn:oid:1.2.3`.

Its use is as follows:

2685 • It is returned within the response to Registry Stored Query and Cross Gateway Query transactions to indicate the association of a response element with a community. It is specified as the ebRIM 'home' attribute within the ExtrinsicObject, RegistryPackage and ObjectRef elements. Document Consumers process the value as an opaque unique identifier.

• It is an optional parameter to Registry Stored Query requests, not requiring a patient id
2690 parameter, and Retrieve Document Set requests to indicate which community to direct the request.

For stored queries which do not require the patient id as a parameter , meaning query by EntryUUID or UniqueID:

• If the Registry Stored Query is being addressed to an Initiating Gateway then the Document
2695 Consumer may have previously sent a Registry Stored Query to the Initiating Gateway which included a patient id and saved the homeCommunityId which was returned on the element containing the EntryUUID or uniqueID. If this is not the case the Document Consumer shall have access to the correct homeCommunityId through some other means.

• If the Document Consumer received the EntryUUID or uniqueID in a previous Registry
2700 Stored Query response which contained a homeCommunityId, then the Document Consumer shall specify the homeCommunityId parameter.

• The homeCommunityId value is specified as the home attribute on the AdhocQuery element of the query request, as in:
<AdhocQuery id="…" home="urn:oid:1.2.3" … >

2705 • Each query request can have at most one homeCommunityId value. If the Document Consumer specifies multiple entryUUID or uniqueID values they must all be associated with the same homeCommunityId value. Multiple individual query requests can be used to retrieve data associated with different homeCommunityIds.

3.18.4.1.2.4 Stored Query IDs

2710 The standard XDS queries are assigned the following Query IDs. These IDs are used in the AdhocQueryRequest to reference queries stored on the Document registry actor. Query IDs are in UUID format (RFC4122). An error shall be returned when an unsupported stored query ID is received.

Note: This query mechanism can be extended by adding a query by allocating a Query ID, defining query parameters, and
2715 implementing the query in the Document Registry.

Query Name	Query ID
FindDocuments	`urn:uuid:14d4debf-8f97-4251-9a74-a90016b0af0d`
FindSubmissionSets	`urn:uuid:f26abbcb-ac74-4422-8a30-edb644bbc1a9`
FindFolders	`urn:uuid:958f3006-baad-4929-a4de-ff1114824431`
GetAll	`urn:uuid:10b545ea-725c-446d-9b95-8aeb444eddf3`
GetDocuments	`urn:uuid:5c4f972b-d56b-40ac-a5fc-c8ca9b40b9d4`
GetFolders	`urn:uuid:5737b14c-8a1a-4539-b659-e03a34a5e1e4`
GetAssociations	`urn:uuid:a7ae438b-4bc2-4642-93e9-be891f7bb155`
GetDocumentsAndAssociations	`urn:uuid:bab9529a-4a10-40b3-a01f-f68a615d247a`
GetSubmissionSets	`urn:uuid:51224314-5390-4169-9b91-b1980040715a`
GetSubmissionSetAndContents	`urn:uuid:e8e3cb2c-e39c-46b9-99e4-c12f57260b83`
GetFolderAndContents	`urn:uuid:b909a503-523d-4517-8acf-8e5834dfc4c7`
GetFoldersForDocument	`urn:uuid:10cae35a-c7f9-4cf5-b61e-fc3278ffb578`
GetRelatedDocuments	`urn:uuid:d90e5407-b356-4d91-a89f-873917b4b0e6`

3.18.4.1.2.5 Intentionally Left Blank

3.18.4.1.2.6 Managing Large Query Responses

2720 EbXML version 3.0 supports query results pagination (ebRS version 3.0 chapter 6.2). The interactions between the stored query capability and the query results pagination capability within the standard have never been reconciled and are not recommended for use together. It is recommended instead that query pagination be implemented within the Document Consumer actor.

2725 This can be accomplished by specifying returnType="ObjectRef" on all large queries. This returns a list of references (UUIDs) instead of full objects (large XML structures). This is practical for queries returning thousands of objects. To construct a page for display, a small number of objects can be retrieved through a second query. This is repeated for each page. As an example, the following sequence of queries could be used to list a large number of documents:

2730 • FindDocuments query with returnType="ObjectRef" which returns a large collections of ObjectRefs (UUIDs)

• GetDocuments query with returnType="LeafClass" issued with a subset of the above returned UUIDs which returns the details to construct one page of listing

OR

2735 GetDocumentsAndAssocations query with returnType="LeafClass" issued with a subset of the above returned UUIDs which returns the details to construct one page of listing. By retrieving the Association objects, the existence of document replacement, transformation, and amendment can be included into the display.

3.18.4.1.2.7 Web Services Transport

2740 The query request and response will be transmitted using Web Services, according to the requirements specified in ITI TF-2x: Appendix V. The specific values for the WSDL describing the Stored Query Service are described in this section.

The Document Registry actor shall accept a Registry Stored Query Request formatted as a SIMPLE SOAP message and respond with a Registry Stored Query Response formatted as a
2745 SIMPLE SOAP message. The Document Consumer actor shall generate the Registry Stored Query Request formatted as a SIMPLE SOAP message and accept a Registry Stored Query Response formatted as a SIMPLE SOAP message.

IHE-WSP201) The attribute /wsdl:definitions/@name shall be "DocumentRegistry".

The following WSDL naming conventions shall apply:
```
2750    wsdl:definitions/@name="DocumentRegistry":
        query message     -> "RegistryStoredQuery_Message"
        query response    -> "RegistryStoredQuery_Response_Message"
        portType          -> "DocumentRegistry_PortType"
        operation         -> "RegistryStoredQuery"
2755    SOAP 1.2 binding -> "DocumentRegistry_Binding_Soap12"
        SOAP 1.2 port    -> "DocumentRegistry_Port_Soap12"
```

IHE-WSP202) The targetNamespace of the WSDL shall be "urn:ihe:iti:xds-b:2007"

Document Registry: These are the requirements for the Registry Stored Query transaction
2760 presented in the order in which they would appear in the Document Registry WSDL definition:

• The following types shall be imported (xsd:import) in the /definitions/types section:

• namespace=" urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0", schemaLocation="query.xsd"

• The /definitions/message/part/@element attribute of the Registry Stored Query Request
2765 message shall be defined as "query:AdhocQueryRequest"

• The /definitions/message/part/@element attribute of the Registry Stored Query Response message shall be defined as "query:AdhocQueryResponse"

• Refer to Table 3.18.4.1.2.7.ba below for additional attribute requirements

- 2770
- To support the Asynchronous Web Services Exchange option on the Document Consumer, the Document Registry shall support the use of a non-anonymous response EPR in the WS-Addressing replyTo header.

Table 3.18.4.1.2.7.~~b~~a Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	DocumentRegistry_ RegistryStoredQuery
/definitions/portType/operation/input/ @wsaw:Action	urn:ihe:iti:2007: RegistryStoredQuery
/definitions/portType/operation/output/ @wsaw:Action	urn:ihe:iti:2007: RegistryStoredQuery Response
/definitions/binding/operation/soap12:o peration/@soapAction	Urn:ihe:iti:2007: RegistryStoredQuery

2775 The following WSDL fragment shows an example of Registry Stored Query transaction definition:

```
<?xml version="1.0" encoding="utf-8"?>
<definitions ...>
2780  ...
  <types>
    <xsd:schema elementFormDefault="qualified" targetNamespace="urn:ihe:iti:xds-b:2007">
      <xsd:import
        namespace="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
2785        schemaLocation="schema\query.xsd"/>
      ...
    </xsd:schema>
  </types>
  <message name="RegistryStoredQuery_Message">
2790    <documentation>Registry Stored Query</documentation>
    <part name="body" element="query:AdhocQueryRequest"/>
  </message>
  <message name="RegistryStoredQueryResponse_Message">
    <documentation>Registry Stored Query Response</documentation>
2795    <part name="body" element="query:AdhocQueryResponse"/>
  </message>
  ...
  <portType name="DocumentRegistry_PortType">
    <operation name="DocumentRegistry_RegistryStoredQuery">
2800      <input message="ihe:RegistryStoredQuery_Message"
          wsaw:Action="urn:ihe:iti:2007:RegistryStoredQuery"/>
      <output message="ihe:RegistryStoredQueryResponse_Message"
          wsaw:Action="urn:ihe:iti:2007:RegistryStoredQueryResponse"/>
    </operation>
2805    ...
  </portType>
  ...
</definitions>
```

A full WSDL for the Document Repository and Document Registry actors is found in ITI TF-2x:
2810 Appendix W.

3.18.4.1.2.7.1 Sample SOAP Messages

The samples in the following two sections show a typical SOAP request and its relative SOAP response. The sample messages also show the WS-Addressing headers <a:Action/>, <a:MessageID/>, <a:ReplyTo/>…; these WS-Addressing headers are populated according to the IHE ITI TF-2x: Appendix V: Web Services for IHE Transactions. The body of the SOAP message is omitted for brevity; in a real scenario the empty element will be populated with the appropriate metadata.

Samples presented in this section are also available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.18.4.1.2.7.1.1 Sample Registry Stored Query SOAP Request

3.18.4.1.2.7.1.1.1 Synchronous Web Services Exchange

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegistryStoredQuery</a:Action>
    <a:MessageID>urn:uuid:def119ad-dc13-49c1-a3c7-e3742531f9b3</a:MessageID>
    <a:ReplyTo s:mustUnderstand="1">>
     <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
    </a:ReplyTo>
    <a:To>http://localhost/service/IHEXDSRegistry.svc</a:To>
  </s:Header>
  <s:Body>
      <query:AdhocQueryRequest
                  xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
                  xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
                  xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
          <query:ResponseOption returnComposedObjects="true" returnType="LeafClass"/>
          <rim:AdhocQuery id=" urn:uuid:14d4debf-8f97-4251-9a74-a90016b0af0d ">
                  <rim:Slot name="$XDSDocumentEntryPatientId">
                      <rim:ValueList>

      <rim:Value>'st3498702^^^&amp;1.3.6.1.4.1.21367.2005.3.7&amp;ISO'</rim:Value>
                      </rim:ValueList>
                  </rim:Slot>
                  <rim:Slot name="$XDSDocumentEntryStatus">
                      <rim:ValueList>
                          <rim:Value>('urn:oasis:names:tc:ebxml-
regrep:ResponseStatusType:Approved')</rim:Value>
                      </rim:ValueList>
                  </rim:Slot>
                  <rim:Slot name="$XDSDocumentEntryCreationTimeFrom">
                      <rim:ValueList>
                          <rim:Value>200412252300</rim:Value>
                      </rim:ValueList>
                  </rim:Slot>
                  <rim:Slot name="$XDSDocumentEntryCreationTimeTo">
                      <rim:ValueList>
                          <rim:Value>200501010800</rim:Value>
                      </rim:ValueList>
                  </rim:Slot>
                  <rim:Slot name="$XDSDocumentEntryHealthcareFacilityTypeCode">
                      <rim:ValueList>
                          <rim:Value>('Emergency Department')</rim:Value>
                      </rim:ValueList>
                  </rim:Slot>
          </rim:AdhocQuery>
      </query:AdhocQueryRequest>
```

```
      </s:Body>
</s:Envelope>
```

2870 3.18.4.1.2.7.1.1.2 Asynchronous Web Services Exchange

```
<s:Envelope
            xmlns:s="http://www.w3.org/2003/05/soap-envelope"
            xmlns:a="http://www.w3.org/2005/08/addressing">
2875    <s:Header>
            <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegistryStoredQuery</a:Action>
            <a:MessageID>urn:uuid:a02ca8cd-86fa-4afc-a27c-616c183b2055</a:MessageID>
            <a:ReplyTo>
                    <a:Address> http://192.168.2.4:9080/XDS/DocumentConsumerReceiver.svc
2880 </a:Address>
            </a:ReplyTo>
            <a:To
s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentRegistryReceiver.svc</a:To>
        </s:Header>
2885    <s:Body>
            <query:AdhocQueryRequest
                        xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
                        xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
                        xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
2890            <query:ResponseOption returnComposedObjects="true"
returnType="LeafClass"/>
                    <rim:AdhocQuery id=" urn:uuid:14d4debf-8f97-4251-9a74-a90016b0af0d ">
                        <rim:Slot name="$XDSDocumentEntryPatientId">
                            <rim:ValueList>
2895
        <rim:Value>st3498702^^^&amp;1.3.6.1.4.1.21367.2005.3.7&amp;ISO</rim:Value>
                            </rim:ValueList>
                        </rim:Slot>
                        <rim:Slot name="$XDSDocumentEntryStatus">
2900                        <rim:ValueList>
                                <rim:Value>('urn:oasis:names:tc:ebxml-
regrep:ResponseStatusType:Approved')</rim:Value>
                            </rim:ValueList>
                        </rim:Slot>
2905                    <rim:Slot name="$XDSDocumentEntryCreationTimeFrom">
                            <rim:ValueList>
                                <rim:Value>200412252300</rim:Value>
                            </rim:ValueList>
                        </rim:Slot>
2910                    <rim:Slot name="$XDSDocumentEntryCreationTimeTo">
                            <rim:ValueList>
                                <rim:Value>200501010800</rim:Value>
                            </rim:ValueList>
                        </rim:Slot>
2915                    <rim:Slot name="$XDSDocumentEntryHealthcareFacilityTypeCode">
                            <rim:ValueList>
                                <rim:Value>('Emergency Department')</rim:Value>
                            </rim:ValueList>
                        </rim:Slot>
2920                </rim:AdhocQuery>
            </query:AdhocQueryRequest>
        </s:Body>
</s:Envelope>
```

3.18.4.1.2.7.1.2 Sample Registry Stored Query SOAP Response

2925 3.18.4.1.2.7.1.2.1 Synchronous Web Services Exchange

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
```

```
2930    <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegistryStoredQueryResponse</a:Action>
        <a:RelatesTo>urn:uuid:def119ad-dc13-49c1-a3c7-e3742531f9b3</a:RelatesTo>
      </s:Header>
      <s:Body>
        <query:AdhocQueryResponse xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"/>
      </s:Body>
2935  </s:Envelope>
```

3.18.4.1.2.7.1.2.2 Asynchronous Web Services Exchange

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
            xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
2940            <a:Action
s:mustUnderstand="1">urn:ihe:iti:2007:RegistryStoredQueryResponse</a:Action>
            <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-821622C099DB</a:MessageID>
            <a:RelatesTo>urn:uuid:a02ca8cd-86fa-4afc-a27c-616c183b2055</a:RelatesTo>
                    <a:To
2945  s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentConsumerReceiver.svc</a:To>
      </s:Header>
        <s:Body>
            <query:AdhocQueryResponse status="Success"
                        xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
2950                    xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0">

                    <!—Rest of AdhocQueryResponse message goes here -->

            </query:AdhocQueryResponse>
2955        </s:Body>
      </s:Envelope>
```

3.18.4.1.3 Expected Actions

The Document Registry actor shall

2960   1.   Accept a parameterized query in an AdhocQueryRequest message

     2.   Verify the required parameters are included in the request. Additionally, special rules documented in the above section 'Parameters for Required Queries' shall be verified.

     3.   Errors shall be returned for the following conditions:

- Unknown query ID (error code XDSUnknownStoredQuery)

2965   - Required parameter missing (error code XDSStoredQueryParamNumber)

       See ITI TF-3: 4.1.13 Error Reporting for additional error codes and general information on formatting error responses.

     4.   Process the query as appropriate:

- For Document Registry Actors: Retrieve the internal implementation template of the
2970   query based on the Query ID supplied in the query request. Substitute appropriate parameters as indicated in ITI TF-2a: 3.18.4.1.2.3.7 Parameters for Required Queries and execute the query. The Document Registry shall accept the homeCommunityId value if it is specified in a Registry Stored Query request. If a patient identifier specified as a parameter to the query is unknown to the Document Registry it shall
2975   return a successful response with no elements.

- For Initiating Gateway Actors:

- Initiating Gateway receives a Registry Stored Query by patient id: It shall determine a) which Responding Gateways this request should be sent to and b) what patient id to use in the Cross Gateway Query. Detailed specification of these steps is not in the intended scope of this profile. Combination of this profile with other existing profiles (e.g., PIX/PDQ), future profiles or configuration mechanisms is possible. Please refer to ITI TF-1: E.7 XCA and Patient Identification Management for possible use of existing profiles PIX and PDQ. For each Responding Gateway identified, the Initiating Gateway shall update the query with the correct patient identifier corresponding to the Responding Gateway's community and initiates a Cross Gateway Query transaction to the Responding Gateway. If the Initiating Gateway is grouped with a Document Consumer it will also initiate a Registry Stored Query to the local Document Registry.

- Initiating Gateway receives a Registry Stored Query by entryUUID or uniqueID: Verify homeCommunityId has been specified. If missing return Failure status with XDSMissingHomeCommunityId error code. If homeCommunityId not recognized return a Failure or PartialSuccess status with XDSUnknownCommunity error code. Determine which Responding Gateway to contact by using the homeCommunityId to obtain the Web Services endpoint of the Responding Gateway. The process of obtaining the Web Services endpoint is not further specified in this profile. If the homeCommunityId represents the local community the Initiating Gateway shall initiate a Registry Stored Query to the local Document Registry. The Initiating Gateway shall specify the homeCommunityId in the Cross Gateway Query by entryUUID or uniqueID which identifies the community associated with the Responding Gateway. For details regarding the homeCommunityId see ITI TF-2a: 3.18.4.1.2.3.8 and ITI TF-2b: 3.38.4.1.2.1.

5. Return XML formatted metadata in an AdhocQueryResponse message.

- The Document Registry may specify the homeCommunityID attribute on any appropriate elements

- The Initiating Gateway shall specify the homeCommunityID attribute on all appropriate elements. If the Initiating Gateway contacted a Document Registry, the Document Registry response might not contain the homeCommunityId. In this case the Initiating Gateway shall add the homeCommunityId of its local community to the Document Registry response prior to including it in the consolidated response to the Document Consumer. The homeCommunityId attribute corresponds to the 'home' attribute specified in the ebRIM standard. For more information on homeCommunityId see ITI TF-2a: 3.18.4.1.2.3.8 and ITI TF-2b: 3.38.4.1.2.1. The elements that shall include the home attribute are:

- If returntype="LeafClass" the ExtrinsicObject and RegistryPackage elements shall contain the home attribute.

- If returnType="ObjectRef" the ObjectRef element shall contain the home attribute

- If the Initiating Gateway is unable to get an appropriate response from a selected Responding Gateway it shall include in its response to the Document Consumer an

3020 XDSUnavailableCommunity error code where the context identifies the unavailable Responding Gateway. In this case, and any other error from a Responding Gateway, the Initiating Gateway shall return to the Document Consumer either a Failure status (if no part was successful) or a PartialSuccess status.

6. When the Document Consumer receives the query response from the Initiating Gateway it must account for two aspects of the response; namely that a) the
3025 homeCommunityId attribute will be specified b) the Document Consumer may not be able to map the repository id value directly to the Document Repository. XCA assumes a common coding/vocabulary scheme is used across all communities. For example, all communities shall have common privacy consent vocabularies. The Document Consumer shall retain the values of the homeCommunityId attribute for future
3030 interaction with the Initiating Gateway.

This transaction may return both errors and results in an AdhocQueryResponse message. To do this, the returned AdhocQueryResponse message would contain both a RegistryObjectList element and a RegistryErrorList element. See ITI TF-3: 4.1.13 for additional details on formatting of error responses.

3035 **3.18.4.1.3.1 Sample Query Request**

This example query specifies:

- The FindDocuments query (id attribute of AdhocQuery element)
- patientID st3498702^^^&1.3.6.1.4.1.21367.2005.3.7&ISO
- Return Approved documents only
3040 - Time range (creation time) 200412252300 to 200501010800
- Healthcare Facility Type Code of Emergency Department

Note that ebRS 3.0 specifies the use of Slot to specify name/value(s) pairs as parameters to a Stored Query.

Note: query parameter names are highlighted for readability.

3045

```
<query:AdhocQueryRequest
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
    xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
3050    xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
  <query:ResponseOption returnComposedObjects="true" returnType="LeafClass"/>
  <rim:AdhocQuery id="urn:uuid:14d4debf-8f97-4251-9a74-a90016b0af0d">
    <rim:Slot name="$XDSDocumentEntryPatientId">
      <rim:ValueList>
3055        <rim:Value>'st3498702^^^&amp;1.3.6.1.4.1.21367.2005.3.7&amp;ISO'</rim:Value>
      </rim:ValueList>
    </rim:Slot>
    <rim:Slot name="$XDSDocumentEntryStatus">
      <rim:ValueList>
3060        <rim:Value>('urn:oasis:names:tc:ebxml-regrep:StatusType:Approved')</rim:Value>
      </rim:ValueList>
    </rim:Slot>
    <rim:Slot name="$XDSDocumentEntryCreationTimeFrom">
      <rim:ValueList>
```

3065
```
        <rim:Value>200412252300</rim:Value>
      </rim:ValueList>
    </rim:Slot>
    <rim:Slot name="$XDSDocumentEntryCreationTimeTo">
      <rim:ValueList>
```
3070
```
        <rim:Value>200501010800</rim:Value>
      </rim:ValueList>
    </rim:Slot>
    <rim:Slot name="$XDSDocumentEntryHealthcareFacilityTypeCode">
      <rim:ValueList>
```
3075
```
        <rim:Value>('Emergency Department')</rim:Value>
      </rim:ValueList>
    </rim:Slot>
  </rim:AdhocQuery>
</query:AdhocQueryRequest>
```

3080   The following example shows a get documents query for XDSDocumentEntry objects for a
        specified list of entryUUIDs (urn:uuid:aff99222-18e3-4812-bc71-c410b2860e18,
        urn:uuid:aff99222-18e3-4812-bc71-c410b2860e19, urn:uuid:aff99222-18e3-4812-bc71-
        c410b2860e20) and corresponding homeCommunityId value (urn:oid:1.2.3):

3085
```
        <query:AdhocQueryRequest … >
            <query:ResponseOption returnComposedObjects="true"
        returnType="LeafClass"/>
            <rim:AdhocQuery id="urn:uuid:5c4f972b-d56b-40ac-a5fc-c8ca9b40b9d4"
        home="urn:oid:1.2.3">
```
3090
```
                <rim:Slot name="$XDSDocumentEntryEntryUUID">
                    <rim:ValueList>
                      <rim:Value>
                       ("urn:uuid:aff99222-18e3-4812-bc71-c410b2860e18",
                        "urn:uuid:aff99222-18e3-4812-bc71-c410b2860e19",
```
3095
```
                        "urn:uuid:aff99222-18e3-4812-bc71-c410b2860e20")
                      </rim:Value>
                    </rim:ValueList>
                </rim:Slot>
            </rim:AdhocQuery>
```
3100
```
        </query:AdhocQueryRequest>
```

3.18.4.1.3.2 Intentionally Left Blank

3.18.4.1.3.3 Sample Query Response

This sample query response corresponds to the above query. Note that the query response
3105   message is coded in version 3.0 ebRIM and ebRS. This sample response and the ebXML
        Registry version 3.0 schema files are available online. The Implementation Guide found at
        http://wiki.ihe.net/index.php?title=ITI_Implementation_Guide contains such supplemental
        material.

3110
```
<?xml version="1.0" encoding="UTF-8"?>
<AdhocQueryResponse
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0
```

```
                file:/Users/bill/RegSchema/V3.0/query.xsd"
3115      xmlns="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
          xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
          status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success">
        <rim:RegistryObjectList>
         <rim:ExtrinsicObject
3120         xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
             xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
             id="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
             isOpaque="false"
             mimeType="text/xml"
3125         objectType="urn:uuid:7edca82f-054d-47f2-a032-9b2a5b5186c1"
             status="urn:oasis:names:tc:ebxml-regrep:StatusType:Approved">
          <rim:Slot name="URI">
           <rim:ValueList>
            <rim:Value>http://localhost:8080/XDS/Repository/08a15a6f-5b4a-42de-8f95-
3130   89474f83abdf.xml</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="authorInstitution">
           <rim:ValueList>
3135        <rim:Value>Some Hospital^^^^^^^^^1.2.3.4.5.6.7.8.9.1789.45</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="creationTime">
           <rim:ValueList>
3140        <rim:Value>200412261119</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="hash">
           <rim:ValueList>
3145        <rim:Value>4cf4f82d78b5e2aac35c31bca8cb79fe6bd6a41e</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="languageCode">
           <rim:ValueList>
3150        <rim:Value>en-us</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="serviceStartTime">
           <rim:ValueList>
3155        <rim:Value>200412230800</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="serviceStopTime">
           <rim:ValueList>
3160        <rim:Value>200412230801</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="size">
           <rim:ValueList>
3165        <rim:Value>54449</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="sourcePatientId">
           <rim:ValueList>
3170        <rim:Value>jd12323^^^wsh</rim:Value>
           </rim:ValueList>
          </rim:Slot>
          <rim:Slot name="sourcePatientInfo">
           <rim:ValueList>
3175        <rim:Value>PID-3|pid1^^^domain</rim:Value>
            <rim:Value>PID-5|Doe^John^^^</rim:Value>
            <rim:Value>PID-7|19560527</rim:Value>
            <rim:Value>PID-8|M</rim:Value>
            <rim:Value>PID-11|100 Main St^^Metropolis^Il^44130^USA</rim:Value>
3180       </rim:ValueList>
          </rim:Slot>
```

```
           <rim:Name>
             <rim:LocalizedString charset="UTF-8" value="Sample document 1" xml:lang="en-us"/>
           </rim:Name>
3185       <rim:Description/>
           <rim:Classification
              classificationScheme="urn:uuid:41a5887f-8865-4c09-adf7-e362475b143a"
              classifiedObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
              id="urn:uuid:ac872fc0-1c6e-439f-84d1-f76770a0ccdf"
3190          nodeRepresentation="Education"
              objectType="Urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:Classification">
            <rim:Slot name="codingScheme">
             <rim:ValueList>
               <rim:Value>Connect-a-thon classCodes</rim:Value>
3195         </rim:ValueList>
            </rim:Slot>
            <rim:Name>
             <rim:LocalizedString charset="UTF-8" value="Education" xml:lang="en-us"/>
            </rim:Name>
3200        <rim:Description/>
           </rim:Classification>
           <rim:Classification
              classificationScheme="urn:uuid:f4f85eac-e6cb-4883-b524-f2705394840f"
              classifiedObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
3205          id="urn:uuid:f1a8c8e4-3593-4777-b7e0-8b0773378705"
              nodeRepresentation="C"
              objectType="Urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:Classification">
            <rim:Slot name="codingScheme">
             <rim:ValueList>
3210           <rim:Value>Connect-a-thon confidentialityCodes</rim:Value>
             </rim:ValueList>
            </rim:Slot>
            <rim:Name>
             <rim:LocalizedString charset="UTF-8" value="Celebrity" xml:lang="en-us"/>
3215        </rim:Name>
            <rim:Description/>
           </rim:Classification>
           <rim:Classification
              classificationScheme="urn:uuid:a09d5840-386c-46f2-b5ad-9c3699a4309d"
3220          classifiedObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
              id="urn:uuid:b6e49c73-96c8-4058-8c95-914d83bd262a"
              nodeRepresentation="CDAR2/IHE 1.0"
              objectType="Urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:Classification">
            <rim:Slot name="codingScheme">
3225         <rim:ValueList>
               <rim:Value>Connect-a-thon formatCodes</rim:Value>
             </rim:ValueList>
            </rim:Slot>
            <rim:Name>
3230         <rim:LocalizedString charset="UTF-8" value="CDAR2/IHE 1.0" xml:lang="en-us"/>
            </rim:Name>
            <rim:Description/>
           </rim:Classification>
           <rim:Classification
3235          classificationScheme="urn:uuid:f33fb8ac-18af-42cc-ae0e-ed0b0bdb91e1"
              classifiedObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
              id="urn:uuid:61e2b376-d74a-4984-ac21-dcd0b8890f9d"
              nodeRepresentation="Emergency Department"
              objectType="Urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:Classification">
3240        <rim:Slot name="codingScheme">
             <rim:ValueList>
               <rim:Value>Connect-a-thon healthcareFacilityTypeCodes</rim:Value>
             </rim:ValueList>
            </rim:Slot>
3245        <rim:Name>
             <rim:LocalizedString charset="UTF-8" value="Assisted Living" xml:lang="en-us"/>
            </rim:Name>
            <rim:Description/>
           </rim:Classification>
```

```
3250        <rim:Classification
               classificationScheme="urn:uuid:cccf5598-8b07-4b77-a05e-ae952c785ead"
               classifiedObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
               id="urn:uuid:fb7677c5-c42f-485d-9010-dce0f3cd4ad5
               nodeRepresentation="Cardiology"
3255           objectType="Urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:Classification">
             <rim:Slot name="codingScheme">
               <rim:ValueList>
                 <rim:Value>Connect-a-thon practiceSettingCodes</rim:Value>
               </rim:ValueList>
3260         </rim:Slot>
             <rim:Name>
               <rim:LocalizedString charset="UTF-8" value="Cardiology" xml:lang="en-us"/>
             </rim:Name>
             <rim:Description/>
3265       </rim:Classification>
           <rim:Classification
               classificationScheme="urn:uuid:f0306f51-975f-434e-a61c-c59651d33983"
               classifiedObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
               id="urn:uuid:0a8a8ed9-8be5-4a63-9b68-a511adee8ed5"
3270           nodeRepresentation="34098-4"
               objectType="Urn:oasis:names:tc:ebxml-regrep:ObjectType:RegistryObject:Classification">
             <rim:Slot name="codingScheme">
               <rim:ValueList>
                 <rim:Value>LOINC</rim:Value>
3275           </rim:ValueList>
             </rim:Slot>
             <rim:Name>
               <rim:LocalizedString
                   charset="UTF-8"
3280               value="Conference Evaluation Note" xml:lang="en-us"/>
             </rim:Name>
             <rim:Description/>
           </rim:Classification>
           <rim:ExternalIdentifier
3285           id="urn:uuid:db9f4438-ffff-435f-9d34-d76190728637"
               registryObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
               identificationScheme="urn:uuid:58a6f841-87b3-4a3e-92fd-a8ffeff98427"
               objectType="ExternalIdentifier"
               value="st3498702^^^&amp;1.3.6.1.4.1.21367.2005.3.7&amp;ISO">
3290         <rim:Name>
               <rim:LocalizedString
                   charset="UTF-8"
                   value="XDSDocumentEntry.patientId"
                   xml:lang="en-us"/>
3295         </rim:Name>
             <rim:Description/>
           </rim:ExternalIdentifier>
           <rim:ExternalIdentifier
               id="urn:uuid:c3fcbf0e-9765-4f5b-abaa-b37ac8ff05a5"
3300           registryObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
               identificationScheme="urn:uuid:2e82c1f6-a085-4c72-9da3-8640a32e42ab"
               objectType="ExternalIdentifier"
               value="1.3.6.1.4.1.21367.2005.3.99.1.1010">
             <rim:Name>
3305           <rim:LocalizedString
                   charset="UTF-8"
                   value="XDSDocumentEntry.uniqueId"
                   xml:lang="en-us"/>
             </rim:Name>
3310         <rim:Description/>
           </rim:ExternalIdentifier>
         </rim:ExtrinsicObject>
         <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
       xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:41a5887f-8865-4c09-adf7-
3315   e362475b143a"/>
```

```
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:f4f85eac-e6cb-4883-b524-
f2705394840f"/>
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:a09d5840-386c-46f2-b5ad-
9c3699a4309d"/>
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:f33fb8ac-18af-42cc-ae0e-
ed0b0bdb91e1"/>
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:cccf5598-8b07-4b77-a05e-
ae952c785ead"/>
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:f0306f51-975f-434e-a61c-
c59651d33983"/>
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:58a6f841-87b3-4a3e-92fd-
a8ffeff98427"/>
        <rim:ObjectRef xmlns:q="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0" id="urn:uuid:2e82c1f6-a085-4c72-9da3-
8640a32e42ab"/>
    </rim:RegistryObjectList>
</AdhocQueryResponse>
```

The following query response is the same as above (repeated sections replaced with …) with the homeCommunityId attribute specified, in bold for readability. Subsequent requests specifying entryUUID of `urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf` or uniqueID of `1.3.6.1.4.1.21367.2005.3.99.1.1010` shall include the homeCommunityId value of urn:oid:1.2.3 in the query.

```
<?xml version="1.0" encoding="UTF-8"?>
<AdhocQueryResponse ... status="Success">
    <rim:RegistryObjectList>
        <rim:ExtrinsicObject … id="urn:uuid:08a15a6f-5b4a-42de-8f95-
89474f83abdf" isOpaque="false"  mimeType="text/xml"
objectType="urn:uuid:7edca82f-054d-47f2-a032-9b2a5b5186c1"
status="urn:oasis:names:tc:ebxml-regrep:StatusType:Approved"
home="urn:oid:1.2.3">

…

        <rim:ExternalIdentifier id="urn:uuid:c3fcbf0e-9765-4f5b-abaa-
b37ac8ff05a5" registryObject="urn:uuid:08a15a6f-5b4a-42de-8f95-89474f83abdf"
identificationScheme="urn:uuid:2e82c1f6-a085-4c72-9da3-8640a32e42ab"
objectType="ExternalIdentifier" value="1.3.6.1.4.1.21367.2005.3.99.1.1010">
            <rim:Name>
                <rim:LocalizedString charset="UTF-8"
value="XDSDocumentEntry.uniqueId" xml:lang="en-us"/>
            </rim:Name>
            <rim:Description/>
        </rim:ExternalIdentifier>
        </rim:ExtrinsicObject>
    </rim:RegistryObjectList>
</AdhocQueryResponse>
```

3370 **3.18.4.1.3.4 Intentionally Left Blank**

3.18.4.1.3.5 Basic Patient Privacy Enforcement Option

If the Basic Patient Privacy Enforcement Option is implemented:

1. All Document Consumer Actors may provide a list of confidentialityCode in XDS Registry Stored Query Transaction and the XDS Registry will return only document
3375 that have at least one matching confidentialityCode. In this way documents without at least one of the requested codes will not be returned.

2. The Document Consumer actor shall be able to be configured with the Patient Privacy Policies, Patient Privacy Policy Identifiers (OIDs) and associated information necessary to understand and enforce the XDS Affinity Domain Policy. The details of this are
3380 product specific and not specified by IHE.

3. The Document Consumer shall not allow access to documents for which the Document Consumer does not understand at least one of the confidentialityCode returned. This assures that a Document Consumer will not improperly handle documents with confidentialityCode that may be more restrictive than the Document Consumer is
3385 configured to support.

4. The Document Consumer actor shall abide by the XDS Affinity Domain Policies represented by the confidentialityCode in the metadata associated with the document. The Document Consumer actor likely will have user access controls or business rule capabilities to determine the details of how confidentiality codes apply to query results.
3390 The details of this are product specific and not specified by IHE. These rules shall reduce the query results to only those that are appropriate to the current situation for that actor and user.

5. Note: The Registry is already required to return only documents that match the requested confidentialityCode (filter) indicated in the Registry Stored Query.

3395 6. Note: Products implementing the Registry Actor may be able to further filter Registry Stored Query results through looking at all the Patient Privacy Acknowledgement Documents registered for the patient that have the availabilityStatus of Approved and for which have not expired.

3.18.4.1.3.6 Basic Patient Privacy Proof Option

3400 If the Basic Patient Privacy Consents Proof Option is implemented:

1. The Document Consumer actor shall be capable of querying for 'Approved' Patient Privacy Acknowledgement Documents in the XDS Affinity Domain. This query should be done by document class so as to catch both formats of document (Consent). The Document Consumer actor shall be capable of recognizing the eventCodeList from the
3405 resulting XDS Metadata. There is no required handling of Patient Privacy Consent Acknowledgement Document XDS Metadata. There is no requirement for the

_____

Document Consumer to retrieve the Patient Privacy Acknowledgement Document content.

3.18.5 Security Considerations

3410 Relevant XDS Affinity Domain Security background is discussed in the XDS Security Considerations Section (see ITI TF-1: 10.7).

3.18.5.1 Audit Record Considerations

The Registry Stored Query Transaction is a Query Information event as defined in Table 3.20.6-1. The Actors involved shall record audit events according to the following:

3415 #### 3.18.5.1.1 Document Consumer audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110112, DCM, "Query")
	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-18", "IHE Transactions", "Registry Stored Query")
Source (Document Consumer) (1)			
Human Requestor (0..n)			
Destination (Document Registry) (1)			
Audit Source (Document Consumer) (1)			
Patient (0..1)			
Query Parameters(1)			

Where:

Source **AuditMessage/** **ActiveParticipant**	UserID	M	The content of the <wsa:ReplyTo/> element.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) **AuditMessage/** **ActiveParticipant**	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination	UserID	M	SOAP endpoint URI.

_____

	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/ AuditSourceIdentification**	*AuditSourceID*	U	*Not specialized.*
	AuditEnterpriseSiteID	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

Patient **(AudittMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*
Query Parameters **(AudittMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"2" (system object)
	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-18", "IHE Transactions", "Registry Stored Query")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	Stored Query ID (UUID)
	ParticipantObjectName	C	If known the value of <ihe:HomeCommunityId/>
	ParticipantObjectQuery	M	the AdhocQueryRequest, base64 encoded.
	ParticipantObjectDetail	C	The ParticipantObjectDetail element may occur more than once. In one element, set "QueryEncoding"as the value of the attribute *type*, Set the attribute *value* to the character encoding, such as "UTF-8", used to encode the ParticipantObjectQuery before base64 encoding. In another element, set "urn:ihe:iti:xca:2010:homeCommunityId" as the value of the attribute type and the value of the homeCommunityID as the value of the attribute value, if known.

3420 ### 3.18.5.1.2 Document Registry audit message:

	Field Name	Opt	Value Constraints
Event	EventID	M	EV(110112, DCM, "Query")

	EventActionCode	M	"E" (Execute)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-18", "IHE Transactions", "Registry Stored Query")

Source (Document Consumer) (1)
Destination (Document Registry) (1)
Audit Source (Document Registry) (1)
Patient (0..1)
Query Parameters(1)

Where:

Source	UserID	M	The content of the <wsa:ReplyTo/> element.
AuditMessage/ ActiveParticipant	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Destination	UserID	M	SOAP endpoint URI.
AuditMessage/ ActiveParticipant	*AlternativeUserID*	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source	*AuditSourceID*	*U*	*Not specialized.*
AuditMessage/ AuditSourceIdentification	*AuditEnterpriseSiteID*	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient	ParticipantObjectTypeCode	M	"1" (Person)
(AudittMessage/ ParticipantObjectIdenti fication)	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Query	ParticipantObjectTypeCode	M	"2" (system object)

	ParticipantObjectTypeCodeRole	M	"24" (query)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("ITI-18", "IHE Transactions", "Registry Stored Query")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	Stored Query ID (UUID)
	ParticipantObjectName	C	If known the value of <ihe:HomeCommunityId/>
	ParticipantObjectQuery	M	the AdhocQueryRequest, base64 encoded.
	ParticipantObjectDetail	C	The ParticipantObjectDetail element may occur more than once. In one element, set "QueryEncoding"as the value of the attribute *type*, Set the attribute *value* to the character encoding, such as "UTF-8", used to encode the ParticipantObjectQuery before base64 encoding. In another element, set "urn:ihe:iti:xca:2010:homeCommunityId" as the value of the attribute type and the value of the homeCommunityID as the value of the attribute value, if known.

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3.41 Provide and Register Document Set-b

This section corresponds to Transaction [ITI-41] of the IHE Technical Framework. Provide and Register Document Set-b is used by the Document Source to provide a set of documents to the Document Repository, and to request that the Document Repository store these documents and then register them with the Document Registry. The Document Source may also provide a set of documents to a Document Recipient.

Integration Profiles using this Transaction
Cross-Enterprise Document Sharing-b (XDS.b)
Cross-Enterprise Document Reliable Interchange (XDR)

The Provide and Register Document Set-b transaction describes the interaction between the Document Source and the Document Recipient actors, and the Document Source and Document Repository actors. The interaction between the Document Repository and the XDS Document Registry is described separately in the Register Document Set-b Transaction [ITI-42].

This transaction aligns with the Registry Services standard (ebRS) for the format of the document metadata as defined in ITI TF-3: 4.1. The ebRS standard covers the interaction with a service that includes a registry with integrated repository. From the point of view of the Document Source, the separate nature of the XDS Document Registry and Document Repository actors is not relevant.

By specifying separate Document Registry and Document Repository actors, XDS offers additional flexibility of having a single Document Registry index content for multiple Document Repositories. The ebRIM portion of the registry standard supports this possibility though the ExternalLink object type.

In XDS, the documents and metadata go to the Document Repository actor and then the metadata is forwarded on to the Document Registry actor. They move in this direction for several reasons:

- Allows best reuse of ebXML Registry specified metadata and web services protocols
- Document Source only needs to know the identity of the Document Repository. Document Repository knows the identity of the Document Registry. If Provide and Register Document Set-b transaction were sent to the Document Registry then routing decisions for documents would be more complex.
- Resulting protocols are simpler

- Simplifies the common case where the Document Source and the Document Repository are grouped.

Actors that support the Asynchronous Web Services Exchange option and implement the Provide and Register Document Set-b [ITI-41] transaction shall support Asynchronous Web Services

2765 Exchange on all XDS.b transactions they implement. Refer to section ITI TF-2x: V.5 Synchronous and Asynchronous Web Services Exchange for an explanation of Asynchronous Web Services Exchange.

3.41.1 Scope

The Provide and Register Document Set-b transaction passes a Repository Submission Request

2770 (see ITI TF-3: 4.1.3.1) from a Document Source to a Document Repository or Document Recipient.

A Provide and Register Document Set-b transaction shall carry:

- Metadata describing zero or more documents
- Within metadata, one XDSDocumentEntry object per document

2775 - XDS Submission Set definition along with the linkage to new documents and references to existing documents
- Zero or more XDS Folder definitions along with linkage to new or existing documents
- Zero or more documents

3.41.2 Use Case Roles
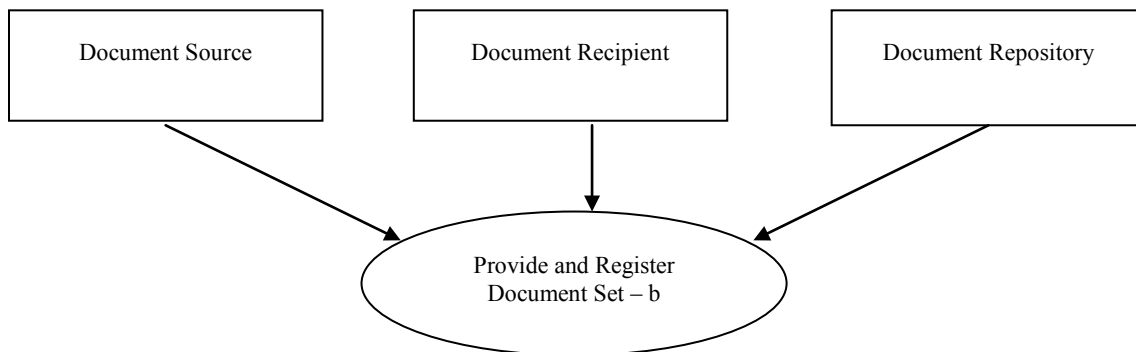
2780

Actor: Document Source

Role: A system that submits documents and associated metadata to a Document Repository. Detailed requirements for this actor are discussed in ITI TF-2b: 3.41.6.1.**Actor:** Document Recipient

2785 **Actor:** Document Recipient

Role: A system that receives a set of documents. Typically this document set will be made available to the intended recipient who will chose to either view it or integrate it into the Electronic Healthcare Record (EHR).

Detailed requirements for this actor are discussed in ITI TF-2b: 3.41.6.2.

2790   **Actor:** Document Repository

Role: A document storage system that receives documents and associated metadata and:

- Stores the documents
- Enhances submitted metadata with repository information to enable later retrieval of documents

2795   - Forwards the enhanced metadata to the Document Registry.

Detailed requirements for this actor are discussed in ITI TF-2b: 3.41.6.2.

3.41.3 Referenced Standards

Implementors of this transaction shall comply with all requirements described in: ITI TF-2x: Appendix V: Web Services for IHE Transactions.

2800

ebRIM	OASIS/ebXML Registry Information Model v3.0
ebRS	OASIS/ebXML Registry Services Specifications v3.0
Appendix V	ITI TF-2x:Appendix V Web Services for IHE Transactions Contains references to all Web Services standards and requirements of use
MTOM	SOAP Message Transmission Optimization Mechanism http://www.w3.org/TR/soap12-mtom/
XOP	XML-binary Optimized Packaging http://www.w3.org/TR/2005/REC-xop10-20050125/

3.41.4 Interaction Diagrams
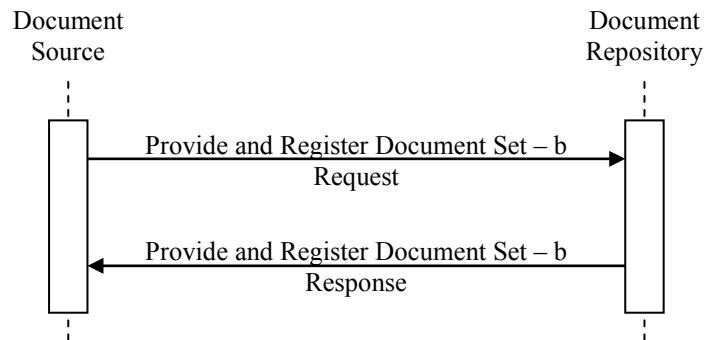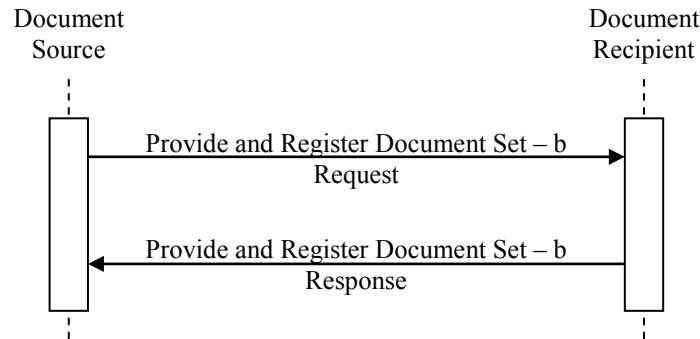
2805

3.41.4.1 Provide and Register Document Set-b Request

A Document Source sends documents and associated metadata to a Document Recipient, or a Document Repository that has an associated Document Registry.

The Document Repository shall, upon receipt of a Provide and Register Document Set-b [ITI-41] transaction send a corresponding Register Document Set-b [ITI-42] transaction to the Document Registry actor.

- The Document Repository actor shall create and insert the XDSDocumentEntry.repositoryUniqueId, XDSDocumentEntry.size, and XDSDocumentEntry.hash attributes for each document received from the Provide and Register Document Set-b [ITI-41] transaction into the resulting Register Document Set-b [ITI-42] transaction metadata. The combination of XDSDocumentEntry.uniqueId and XDSDocumentEntry.repositoryUniqueId attributes value shall later be accepted in a Retrieve Document Set transaction [ITI-43] for that document and the document shall be returned.

3.41.4.1.1 Trigger Events

The Document Source, based on a human decision or the application of a certain rule of automatic operation, wants to submit

- A set of zero or more documents to the Document Repository and the associated metadata to the Document Registry.

    or

2825

- A set of one or more documents to a Document Recipient.

3.41.4.1.2 Message Semantics

The sections in ITI TF-3: 4.1 specify the mapping of XDS concepts to ebRS and ebRIM semantics and document metadata. A full example of document metadata submission can be found in ITI TF-2x: Appendix W.

3.41.4.1.3 Expected Actions

The Provide and Register Document Set-b message shall include the metadata attributes (as defined in ITI TF-3: 4.1.7 Document Definition Metadata)

A Document Recipient receives the metadata and the associated document(s). It shall be able to interpret the submission without any context (e.g., a prior submission).

The Document Source may include Folders in metadata. If the Document Recipient is not able to process the Folder specific content it shall return a PartialFolderContentNotProcessed warning which includes a textual description identifying that Folder Content was not processed. In this case the Document Recipient is expected to have processed the rest of the submission successfully.

In the case where the Document Source submits a replacement of documents, if the Document Recipient is not able to process the replacement semantics in the submission it shall return a PartialReplaceContentNotProcessed warning which includes a textual description identifying that the replacement semantics were not processed. In this case the Document Recipient is expected to have processed the rest of the submission successfully.

A Document Repository shall forward the metadata to the Document Registry using the Register Document Set-b transaction [ITI-42].

The Document Repository receives this message. Each document within the message shall be stored into the Document Repository as an octet stream with an associated MIME type.

The Document Source shall supply all necessary document metadata attributes with the exception of the ones below. The Document Repository shall modify the received document metadata before initiating the Register Document Set-b transaction to the Document Registry by adding/replacing:

- The repositoryUniqueId for this Document Repository to allow for the Document Consumer to correctly identify the proper Document Repository for each document (XDSDocumentEntry.repositoryUniqueId).
- A hash value (XDSDocumentEntry.hash)
- A size (XDSDocumentEntry.size).

A Register Document Set-b transaction with this modified metadata shall be issued to the Document Registry.

The Document Repository shall ensure that when any Retrieve Document Set transaction is received requesting a specific document(s), it shall be provided to the Document Consumer unchanged from the octet stream that was submitted (full fidelity repository) and shall match the size and hash attributes of the XDSDocumentEntry object.

If the Document Repository or Document Recipient detects a failure it shall return an error message to the Document Source thus terminating this transaction. The conditions of failure and possible error messages are given in the ebRS standard and detailed in ITI TF-3: 4.1.13 Error Reporting.

3.41.4.1.3.1 Basic Patient Privacy Enforcement Option

2870   If the Basic Patient Privacy Enforcement Option is implemented:

1. The Document Source actor shall populate the confidentialityCode in the document metadata with the list of values that identify the sensitivity classifications that apply to the associated document. The confidentiality codes for different documents in the same submission may be different.

2875   2. The Document Source actor shall be able to be configured with the Patient Privacy Policies, Patient Privacy Policy Identifiers (OIDs) and associated information necessary to understand and enforce the XDS Affinity Domain Policy. The details of this are product specific and not specified by IHE.

3. The Document Source actor may have user interface or business rule capabilities to
2880   determine the appropriate confidentiality codes for each document. The details of this are product specific and not specified by IHE. However, the information about how confidentiality codes are assigned must be part of the published policy for the XDS Affinity Domain. Note: For example, when publishing a document, the Document Source, might show a list of checkboxes where a user can select which of the available
2885   consents a document is to be published.

4. The Document Recipient actor shall be able to be configured with the Patient Privacy Policies, Patient Privacy Policy Identifiers (OIDs) and associated information necessary to understand and enforce the policies. The meanings of the codes on the media must be provided out of band, e.g., by telephone, fax, or email. The detail of how this is done is
2890   product specific and not specified by IHE. If the documents are transferred internally within the organization or to other members of the recipient's affinity domain, appropriate internal confidentiality codes shall be applied.

5. The Document Recipient actor shall have the ability to coerce the confidentiality code in the metadata associated with the document from the codes used by the Document Source
2895   to the codes used by the Document Recipient.

6. The Document Recipient actor shall abide by the XDS Affinity Domain Policies represented by the confidentialityCode in the metadata associated with the document. The Document Recipient actor likely will have user access controls or business rule capabilities to determine the details of how confidentiality codes apply to query results.
2900   The details of this are product specific and not specified by IHE. These rules shall reduce the query results to only those that are appropriate to the current situation for that actor and user.

3.41.4.2 Provide and Register Document Set-b Response

The Document Repository or Document Recipient shall send a Provide and Register Document
2905   Set-b Response when the processing of a Provide and Register Document Set-b Request is complete.

The Provide and Register Document Set-b Response message shall carry the status of the requested operation and an error message if the requested operation failed. The conditions of

failure and possible error messages are given in the ebRS standard and detailed in ITI TF-3:
2910   4.1.13 Error Reporting.

3.41.4.2.1 Trigger Events

The following events can trigger this message:

- Documents successfully received and processed by the Document Recipient
- Documents were not successfully received by the Document Recipients
2915
- Documents stored to the Document Repository successfully and metadata stored to the Document Registry successfully (The registry part is carried out as part of a Register Document Set-b transaction)
- Documents stored to the Document Repository successfully but an error occurred in storing the metadata to the Document Registry
2920
- Documents were not successfully stored to the Document Repository

3.41.4.2.2 Message Semantics

The Provide and Register Document Set-b Response message shall carry the status of the requested operation and an error message if the requested operation failed. The conditions of failure and possible error messages are given in the ebRS standard and detailed in ITI TF-3:
2925   4.1.13 Error Reporting.

3.41.4.2.3 Expected Actions

The Document Source now knows that the transaction succeeded/failed and can continue.

The document(s) received by the Document Recipient shall be available for further processing according to the capabilities of the system. These capabilities are not specified by IHE, but may
2930   include viewing the document or storing them to an Electronic Healthcare Record (EHR).

The document(s) added to the Document Repository are now available for retrieval. The metadata added to the registry shall be available for discovery via Registry Stored Query transactions.

3.41.5 Protocol Requirements

2935   Implementors of this transaction shall comply with all requirements described in ITI TF-2x :Appendix V: Web Services for IHE Transactions.

The Provide and Register Document Set-b transaction shall use SOAP12 and MTOM with XOP encoding (labeled MTOM/XOP in this specification). See ITI TF-2x: Appendix V for details.

WSDL Namespace Definitions

ihe	urn:ihe:iti:xds-b:2007
rs	urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0
lcm	urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0
query	urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0

2940 Document Repository: These are the requirements for the Provide and Register Document Set-b transaction presented in the order in which they would appear in the Document Repository WSDL definition:

- The following types shall be imported (xsd:import) in the /definitions/types section:

    - namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schema="rs.xsd"

2945
    - namespace="urn:ihe:iti:xds-b:2007", schemaLocation="IHEXDS.xsd"

- The /definitions/message/part/@element attribute of the Provide and Register Document Set-b Request message shall be defined as "ihe:ProvideAndRegisterDocumentSetRequest"

- The /definitions/message/part/@element attribute of the Provide and Register Document Set-b Response message shall be defined as "rs:RegistryResponse"

2950
- Refer to Table 3.41.5.b below for additional attribute requirements

- To support the Asynchronous Web Services Exchange option on the Document Source, the Document Repository shall support the use of a non-anonymous response EPR in the WS-Addressing replyTo header.

2955 These are the requirements that affect the wire format of the SOAP message. The other WSDL properties are only used within the WSDL definition and do not affect interoperability. Full sample request and response messages are in ITI TF-2b: 3.41.5.1 Sample SOAP Messages.

For informative WSDL for the Document Repository actor see ITI TF-2x: Appendix W.

The <ihe:ProvideAndRegisterDocumentSetRequest/> element is defined as:

- One <lcm:SubmitObjectsRequest/> element that contains the submission set metadata

2960
- Zero or more <ihe:Document/> elements that contain the base64encoded data for the documents being submitted to the Document Repository or Document Recipient. The <ihe:Document/> element also includes the document id attribute (ihe:Document/@id) of type xsd:anyURI to match the document ExtrinsicObject id in the metadata and providing the necessary linkage

2965 The use of MTOM/XOP is governed by the following rules:

- The Document Repository or Document Recipient shall accept documents in a Provide and Register Document Set-b transaction in MTOM/XOP format. The response message shall use MTOM/XOP format.

- The Document Source shall generate Provide and Registry Document Set-b transactions in
2970 MTOM/XOP format. It shall accept the response message in MTOM/XOP format.

Table 3.41.5. b Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation @name	DocumentRepository_ ProvideAndRegisterDocumentSet-b
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2007: ProvideAndRegisterDocumentSet-b
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2007: ProvideAndRegisterDocumentSet-bResponse

Attribute	Value
/definitions/binding/operation/soap12:operation/@soapAction	urn:ihe:iti:2007:CrossGatewayQuery

A full XML Schema Document for the XDS.b types is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.41.5.1 Sample SOAP Messages

2975 The samples in the following two sections show a typical SOAP request and its relative SOAP response. The sample messages also show the WS-Addressing headers <Action/>, <MessageID/>, <ReplyTo/>…; these WS-Addressing headers are populated according to the ITI TF-2x: Appendix V: Web Services for IHE Transactions. The body of the SOAP message is omitted for brevity; in a real scenario the empty element will be populated with the appropriate
2980 metadata.

Samples presented in this section are also available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.41.5.1.1 Sample Provide and Register Document Set-b SOAP Request

3.41.5.1.1.1 Synchronous Web Services Exchange

2985
```
POST /axis2/services/repository HTTP/1.1
Content-Type: multipart/related; boundary=MIMEBoundaryurn_uuid_76A2C3D9BCD3AECFF31217932910180;
type="application/xop+xml"; start="<0.urn:uuid76A2C3D9BCD3AECFF31217932910181@apache.org>";
start-info="application/soap+xml"; action="urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-b"
User-Agent: Axis2
Host: localhost:4040
Content-Length: 4567

--MIMEBoundaryurn_uuid_76A2C3D9BCD3AECFF31217932910180
Content-Type: application/xop+xml; charset=UTF-8; type="application/soap+xml"
Content-Transfer-Encoding: binary
Content-ID: <0.urn:uuid:76A2C3D9BCD3AECFF31217932910181@apache.org>

<?xml version='1.0' encoding='UTF-8'?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope"
xmlns:wsa="http://www.w3.org/2005/08/addressing">
    <soapenv:Header>
        <wsa:To>http://localhost:4040/axis2/services/test11966a</wsa:To>
        <wsa:MessageID>urn:uuid:76A2C3D9BCD3AECFF31217932910053</wsa:MessageID>
        <wsa:Action soapenv:mustUnderstand="1">urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-
b</wsa:Action>
    </soapenv:Header>
    <soapenv:Body>
        <xdsb:ProvideAndRegisterDocumentSetRequest xmlns:xdsb="urn:ihe:iti:xds-b:2007">
            <lcm:SubmitObjectsRequest xmlns:lcm="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0">
                <rim:RegistryObjectList xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0">

                    <!-- Registry Metadata goes here -->

                </rim:RegistryObjectList>
            </lcm:SubmitObjectsRequest>
            <xdsb:Document id="Document01">
                <xop:Include href="cid:1.urn:uuid:76A2C3D9BCD3AECFF3121793290229@apache.org"
                    xmlns:xop="http://www.w3.org/2004/08/xop/include"/>
            </xdsb:Document>
        </xdsb:ProvideAndRegisterDocumentSetRequest>
```

```
    </soapenv:Body>
</soapenv:Envelope>
```

3025
```
--MIMEBoundaryurn_uuid_76A2C3D9BCD3AECFF31217932910180
Content-Type: text/plain
Content-Transfer-Encoding: binary
Content-ID: <1.urn:uuid:76A2C3D9BCD3AECFF31217932910229@apache.org>
```

3030
```
This is my document.

It is great!
```

3035
```
--MIMEBoundaryurn_uuid_76A2C3D9BCD3AECFF31217932910180--
```

3.41.5.1.1.2 Asynchronous Web Services Exchange

```
3040   <s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
       xmlns:a="http://www.w3.org/2005/08/addressing">
               <s:Header>
                       <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-
       b</a:Action>
                       <a:MessageID>urn:uuid:6d296e90-e5dc-43d0-b455-7c1f3eb35d83</a:MessageID>
3045                   <a:ReplyTo>
                               <a:Address>―http://192.168.2.4:9080/XdsService
       /DocumentSourceReceiver.svc</a:Address>
                       </a:ReplyTo>
                       <a:To
3050   s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentRepositoryReceiver.svc</a:To>
               </s:Header>
               <s:Body>
                       <ProvideAndRegisterDocumentSetRequest
                                       xmlns="urn:ihe:iti:xds-b:2007"
3055                                   xmlns:lcm="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0"
                                       xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
                                       xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">

                               <lcm:SubmitObjectsRequest>
3060
                                       <!―Rest of SubmitObjectsRequest message goes here -->
                               </lcm:SubmitObjectsRequest>
                               <Document
       id="Document01">UjBsR09EbGhjZ0dTQUxNQUFBUUNBRU1tQ1p0dU1G-GUXhEUzhi</Document>
3065                           </ProvideAndRegisterDocumentSetRequest>
               </s:Body>
       </s:Envelope>
```

3.41.5.1.2 Sample Provide and Register Document Set-b SOAP Response

3070

3.41.5.1.2.1 Synchronous Web Services Exchange

```
       <s:Envelope
          xmlns:s="http://www.w3.org/2003/05/soap-envelope"
3075      xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
         <a:Action s:mustUnderstand="1">
          urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-bResponse
         </a:Action>
3080     <a:RelatesTo>urn:uuid:6d296e90-e5dc-43d0-b455-7c1f3eb35d83</a:RelatesTo>
        </s:Header>
        <s:Body>
         <rs:RegistryResponse
           status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
3085       xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0" />
        </s:Body>
       </s:Envelope>
```

3.41.5.1.2.2 Asynchronous Web Services Exchange

```
       <s:Envelope
3090           xmlns:s="http://www.w3.org/2003/05/soap-envelope"
               xmlns:a="http://www.w3.org/2005/08/addressing">
           <s:Header>
               <a:Action s:mustUnderstand="1">
                       urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-bResponse
3095           </a:Action>
               <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-821622C099DB</a:MessageID>
```

```
                <a:RelatesTo>urn:uuid:6d296e90-e5dc-43d0-b455-7c1f3eb35d83</a:RelatesTo>
                <a:To
s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentSourceReceiver.svc</a:To>
        </s:Header>
        <s:Body>
            <rs:RegistryResponse
                    status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
                    xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0" />
        </s:Body>
</s:Envelope>
```

3.41.6 Actor Requirements

This section summarizes the responsibilities of the actors relevant to this transaction.

3.41.6.1 Document Source

An implementation of the Document Source actor shall be capable of the following operations:

- Submit one or more documents. Whether a submission contains a single or multiple documents depends on workflows, policies, and other external factors which are outside of the scope of this transaction.

An implementation of the XDS Document Source actor may support one or more of the following XDS.b options:

- **Document Replace Option:** In this option the Document Source offers the ability to submit a document as a replacement for another document already in the registry/repository.

- **Document Addendum Option** In this option the Document Source shall offer the ability to submit a document as an addendum to another document already in the registry/repository.

- **Document Transformation Option** In this option the Document Source shall offer the ability to submit a document as a transformation of another document already in the registry/repository.

> Note: In order to support document replacement/addendum/transformation grouping with the Document Consumer may be necessary in order to Query the registry (e.g., for UUIDs of existing document entries)

- **Folder Management Option.** In this option the Document Source offers the ability to perform the following operation:
  - Create a folder
  - Add one or more documents to a folder

> Note: In order to support document addition to an existing folder, grouping with the Document Consumer may be necessary in order to Query the registry (e.g., for UUIDs of existing folder).

These operations are discussed in ITI TF-3: 4.1.3.4 Other Properties of Submission Requests.

3.41.6.2 Document Repository or Document Recipient

A Document Repository or Document Recipient shall be capable of accepting submissions containing multiple documents.

> Note: The Document Source may submit single documents or multiple documents depending on its needs.

A Document Repository shall validate the following metadata element received as part of a Provide and Register transaction:

3140 • **XDSDocumentEntry.uniqueId** – a submission shall be rejected if not unique within the repository and the hashes of the two documents do not match. If the hashes of the documents match, the Document Repository shall accept the duplicate document.

A Document Repository or Document Recipient shall validate the following metadata element received as part of a Provide and Register transaction:

3145 • **XDSSubmissionSet.sourceId** – a Document Repository or Document Recipient may choose to accept submissions only from certain sources and use this field to perform the filtering.

• **XDSDocumentEntry.hash** – a submission shall be rejected if the hash is included in the submission and its value does not match the hash for the received document (ignoring case), as calculated by the Document Repository or Document Recipient; an

3150 XDSRepositoryMetadataError shall be returned on mismatch.

• **XDSDocumentEntry.size** – a submission shall be rejected if the size is included in the submission and its value does not match the size of the received document, as computed by the Document Repository or Document Recipient; an XDSRepositoryMetadataError shall be returned on mismatch.

3155 ## 3.41.7 Security Considerations

Relevant XDS Affinity Domain security considerations are discussed in the XDS Security Considerations Section (see ITI TF-1: 10.7).

3.41.7.1 Audit Record Considerations

The Provide and Register Document Set-b Transaction is PHI-Export event, as defined in ITI
3160 TF-2a: Table 3.20.6-1. The Actors involved in the transaction shall create audit data in conformance with DICOM (Supp 95) "Data Export"/"Data Import", with the following exceptions.

3.41.7.1.1 Document Source audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110106, DCM, "Export")
	EventActionCode	M	"R" (Read)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-41", "IHE Transactions", "Provide and Register Document Set-b")
Source (Document Source) (1)			
Human Requestor (0..n)			
Destination (Document Repository) (1)			
Audit Source (Document Source) (1)			
Patient (1)			
SubmissionSet (1)			

3165   Where:

	UserID	M	The content of the <wsa:ReplyTo/> element.
Source **AuditMessage/** **ActiveParticipant**	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human **Requestor** **(if known)** **AuditMessage/** **ActiveParticipant**	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Destination **AuditMessage/** **ActiveParticipant**	UserID	M	SOAP endpoint URI.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient **(AudittMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Submission Set **(AuditMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"2" (System)
	ParticipantObjectTypeCodeRole	M	"20" (job)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("urn:uuid:a54d6aa5-d40d-43f9-88c5-b4633d873bdd", "IHE XDS Metadata", "submission set classificationNode")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The submissionSet unique ID
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*

3.41.7.1.2 Document Repository or Document Recipient audit message:

	Field Name	**Opt**	**Value Constraints**
Event **AuditMessage/ EventIdentification**	EventID	M	EV(110107, DCM, "Import")
	EventActionCode	M	"C" (Create)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-41", "IHE Transactions", "Provide and Register Document Set-b")
Source (Document Source) (1)			
Destination (Document Repository or Document Recipient) (1)			
Audit Source (Document Repository or Document Recipient) (1)			
Patient (1)			
SubmissionSet (1)			

3170   Where:

Source **AuditMessage/ ActiveParticipant**	UserID	M	The content of the <wsa:ReplyTo/> element.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

_____

Destination	UserID	M	SOAP endpoint URI
AuditMessage/ ActiveParticipant	*AlternativeUserID*	M	the process ID as used within the local operating system in the local system logs.
	UserName	U	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source	*AuditSourceID*	U	*Not specialized.*
AuditMessage/ AuditSourceIdentification	*AuditEnterpriseSiteID*	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

Patient	ParticipantObjectTypeCode	M	"1" (Person)
(AudittMessage/ ParticipantObjectIdenti fication)	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*
Submission Set **(AudittMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"2" (System)
	ParticipantObjectTypeCodeRole	M	"20" (job)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("urn:uuid:a54d6aa5-d40d-43f9-88c5-b4633d873bdd", "IHE XDS Metadata", "submission set classificationNode")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The submissionSet unique ID
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*

3175 ## 3.42 Register Document Set-b

This section corresponds to transaction [ITI-42] of the IHE IT Infrastructure Technical Framework. Transaction [ITI-42] is used by the Document Repository Actor to register a set of documents with the Document Registry in XDS.b.

Integration Profiles using this Transaction
Cross-Enterprise Document Sharing-b (XDS.b)

_____

3180   Actors that support the Asynchronous Web Services Exchange option and implement the
       Register Document Set-b transaction shall support the following:

- Document Repository Actor shall support Asynchronous Web Services Exchange for the
  Provide & Register Document Set – b [ITI-41] and Register Document Set – b [ITI-42], and
  Retrieve Document Set [ITI-43] transactions

3185   - Document Registry Actor shall support Asynchronous Web Services Exchange for the
  Registry Stored Query [ITI-18] and Register Document Set – b [ITI-42] transactions

Refer to section ITI TF-2x: V.5 Synchronous and Asynchronous Web Services Exchange for an
explanation of Asynchronous Web Services Exchange.

3.42.1 Scope

3190   The Register Document Set-b transaction passes a Submission Request from a Document
       Repository actor to a Document Registry actor.

A Register Document Set-b transaction shall carry:

- Metadata describing zero or more documents
- XDS Submission Set definition along with the linkage to new documents and references to
3195   existing documents
- An optional XDS Folder definitions along with linkage to new or existing documents

3.42.2 Use Case Roles
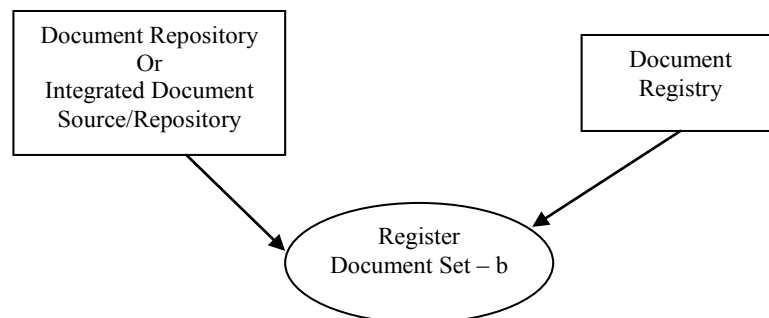
3200

Actor: Document Repository or Integrated Document Source/Repository

Role: A document storage system that submits document metadata to a Document Registry.

Actor: Document Registry

3205   **Role:** A document indexing system that receives and stores document metadata.

> Note: Within this transaction, the Document Repository and Integrated Document Source/Repository actors can be used
> interchangeably

3.42.3 Referenced Standards

Implementors of this transaction shall comply with all requirements described in ITI TF-2x:
Appendix V: Web Services for IHE Transactions.

ebRIM	OASIS/ebXML Registry Information Model v3.0
ebRS	OASIS/ebXML Registry Services Specifications v3.0
HL7V2	HL7 Version 2.5
Appendix V	ITI TF-2x:Appendix V Web Services for IHE Transactions Contains references to all Web Services standards and requirements of use

3.42.4 Interaction Diagram
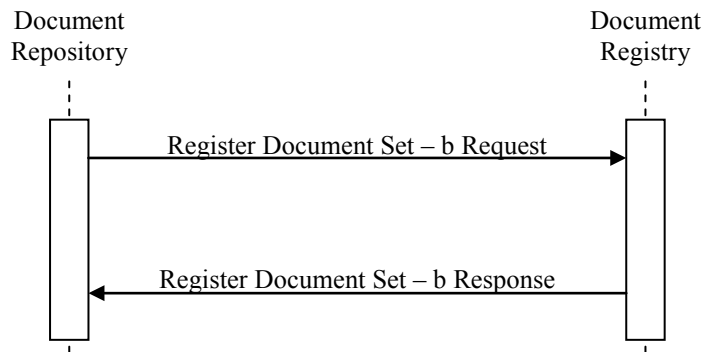
3215

3.42.4.1 Register Document Set-b Request

The Document Repository sends metadata for a set of documents to the Document Registry.

3.42.4.1.1 Trigger Events

The Register Document Set-b Request message is triggered when:

- A Document Repository wants to register metadata for a set of documents it holds. These documents may have been stored in the Document Repository by a Document Consumer (using the Provide and Register Document Set-b transaction [ITI-41]) or generated internally by an Integrated Document Source/Repository.

3.42.4.1.2 Message Semantics

The sections in ITI TF-3: 4.1 specify the mapping of XDS concepts to ebRS and ebRIM semantics and document metadata. A full example of document metadata submission can be found in ITI TF-2x: Appendix W.

The Registry actor shall store and later include in metadata returned in a query response the XDSDocumentEntry.repositoryUniqueId attribute along with other metadata attributes received in the Register Document Set-b [ITI-42] transaction as determined by profile and transaction requirements.

3.42.4.1.4 Expected Actions

Upon receipt of a Register Document Set-b Request message, the Document Registry with the aid of the Registry Adaptor shall do the following:

- Accept all valid SubmitObjectsRequests.
- Perform metadata validations
- Update the registry with the contained metadata
- Return a RegistryResponse message given the status of the operation.

If the registry rejects the metadata, then, the following shall occur:

- An error is returned
- The error status includes an error message
- The request is rolled back

3.42.4.1.4.1 Basic Patient Privacy Enforcement Option

If the Basic Patient Privacy Enforcement Option is implemented:

1. The Integrated Document Source / Repository actor shall populate the confidentialityCode in the document metadata with the list of values that identify the sensitivity classifications that apply to the associated document. The confidentiality codes for different documents in the same submission may be different.

2. The Integrated Document Source / Repository actor shall be able to be configured with the Patient Privacy Policies, Patient Privacy Policy Identifiers (OIDs) and associated information necessary to understand and enforce the XDS Affinity Domain Policy. The details of this are product specific and not specified by IHE.

3. The Integrated Document Source / Repository actor may have a user interface or business rule capabilities to determine the appropriate confidentiality codes for each document. The details of this are product specific and not specified by IHE. However, the information about how confidentiality codes are assigned must be part of the published policy for the XDS Affinity Domain. For example, when publishing a document, the Integrated Document Source / Repository might show a list of checkboxes where a user can select which of the available consents a document is to be published.

3.42.4.1.5 Protocol Requirements

The Register Document Set-b transaction shall use SOAP12. Furthermore:

- The Document Registry actor shall accept the Register Document Set-b Request formatted as a SIMPLE SOAP message and respond with the Register Document Set-b Response formatted as a SIMPLE SOAP message.

3265
- The Document Repository actor shall generate the Register Document Set-b Request formatted as a SIMPLE SOAP message and accept the Register Document Set-b Response formatted as a SIMPLE SOAP message.

See ITI TF-2x: Appendix V for details.

3.42.4.2 Register Document Set-b Response

3270 **3.42.4.2.1 Trigger Events**

The Document Registry finishes processing a Register Document Set-b Request Message and shall respond with:

- Register Document Set-b Response

3.42.4.2.2 Message Semantics

3275 The Register Document Set-b Response message shall carry the status of the requested operation and an error message if the requested operation failed. The conditions of failure and possible error messages are given in the ebRS standard and detailed in ITI TF-3: 4.1.13 Error Reporting.

3.42.4.2.3 Expected Actions

The Document Repository now knows that the transaction succeeded/failed and can continue.
3280 The metadata added to the registry as a result of this transaction is now available for discovery.

3.42.5 Protocol Requirements

Implementors of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V: Web Services for IHE Transactions.

3285

WSDL Namespace Definitions

ihe	urn:ihe:iti:xds-b:2007
rs	urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0
lcm	urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0
query	urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0

Document Registry: These are the requirements for the Register Document Set-b transaction presented in the order in which they would appear in the Document Registry WSDL definition:

- The following types shall be imported (xsd:import) in the /definitions/types section:

3290
  - namespace="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0", schema=" rs.xsd"
  - namespace="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0", schema=" lcm.xsd"

- The /definitions/message/part/@element attribute of the Register Document Set-b Request message shall be defined as "lcm:SubmitObjectsRequest"

- The /definitions/message/part/@element attribute of the Register Document Set-b Response
3295 message shall be defined as "rs:RegistryResponse"

- Refer to Table 3.42.5.b below for additional attribute requirements

- To support the Asynchronous Web Services Exchange option on the Document Repository, the Document Registry shall support the use of a non-anonymous response EPR in the WS-Addressing replyTo header.

3300 These are the requirements that affect the wire format of the SOAP message. The other WSDL properties are only used within the WSDL definition and do not affect interoperability. Full sample request and response messages are in ITI TF-2b: 3.42.5.1 Sample SOAP Messages.

For informative WSDL for the Document Registry actor see ITI TF-2x: Appendix W.

Table 3.42.5.b Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	DocumentRepository _RegisterDocumentSet-b
/definitions/portType/operation/input/@wsaw:Action	urn:ihe:iti:2007:RegisterDocumentSet-b
/definitions/portType/operation/output/@wsaw:Action	urn:ihe:iti:2007: ProvideAndRegisterDocumentSet-bResponse
/definitions/binding/operation/soap12:operation/@soapAction	urn:ihe:iti:2007: RegisterDocumentSet-b

3305 **3.42.5.1 Sample SOAP Messages**

The samples in the following two sections show a typical SOAP request and its relative SOAP response. The sample messages also show the WS-Addressing headers <Action/>, <MessageID/>, <ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V: Web Services for IHE Transactions. The body of the SOAP message is

3310   omitted for brevity; in a real scenario the empty element will be populated with the appropriate metadata.

Samples presented in this section are also available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3.42.5.1.1 Sample Register Document Set-b SOAP Request

3315   ### 3.42.5.1.1.1 Synchronous Web Services Exchange

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
 <s:Header>
   <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegisterDocumentSet-b</a:Action>
   <a:MessageID>urn:uuid:1ec52e14-4aad-4ba1-b7d3-fc9812a21340</a:MessageID>
   <a:ReplyTo>
    <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
   </a:ReplyTo s:mustUnderstand="1">
   <a:To >http://localhost:2647/XdsService/IHEXDSRegistry.svc</a:To>
 </s:Header>
 <s:Body>
   <lcm:SubmitObjectsRequest
      xmlns:lcm="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0"
      xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
      xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">

     <!—Rest of SubmitObjectsRequest message goes here -->

   </lcm:SubmitObjectsRequest>
 </s:Body>
</s:Envelope>
```

3.42.5.1.1.2 Asynchronous Web Services Exchange

3340
```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
                <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegisterDocumentSet-b</a:Action>
                <a:MessageID>urn:uuid:1ec52e14-4aad-4ba1-b7d3-fc9812a21340</a:MessageID>
                <a:ReplyTo>
                        <a:Address>
http://192.168.2.4:9080/XdsService/DocumentRepositoryReceiver.svc</a:Address>
                </a:ReplyTo>
                <a:To
s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentRegistryReceiver.svc</a:To>
        </s:Header>
        <s:Body>
                <lcm:SubmitObjectsRequest
                             xmlns:lcm="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0"
                             xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
                             xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">

                        <!—Rest of SubmitObjectsRequest message goes here -->

                </lcm:SubmitObjectsRequest>
        </s:Body>
</s:Envelope>
```

3.42.5.1.2 Sample Register Document Set-b SOAP Response

3365

3.42.5.1.2.1 Synchronous Web Services Exchange

```
<s:Envelope
   xmlns:s="http://www.w3.org/2003/05/soap-envelope"
   xmlns:a="http://www.w3.org/2005/08/addressing">
 <s:Header>
   <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegisterDocumentSet-bResponse</a:Action>
   <a:RelatesTo>urn:uuid:1ec52e14-4aad-4ba1-b7d3-fc9812a21340</a:RelatesTo>
 </s:Header>
 <s:Body>
   <rs:RegistryResponse
   status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
   xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"/>
 </s:Body>
</s:Envelope>
```

3380

3.42.5.1.2.2 Asynchronous Web Services Exchange

```
<s:Envelope
             xmlns:s="http://www.w3.org/2003/05/soap-envelope"
             xmlns:a="http://www.w3.org/2005/08/addressing">
     <s:Header>
             <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RegisterDocumentSet-
bResponse</a:Action>
             <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-821622C099DB</a:MessageID>
             <a:RelatesTo>urn:uuid:1ec52e14-4aad-4ba1-b7d3-fc9812a21340</a:RelatesTo>
             <a:To
s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentRepositoryReceiver.svc</a:To>
     </s:Header>
     <s:Body>
             <rs:RegistryResponse
             status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"
             xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"/>
     </s:Body>
</s:Envelope>
```

3400

3.42.6 Actor Requirements

The Document Repository actor shall:

- Make (all) the new document(s) included in the XDS Submission Set available for retrieval via the Retrieve Document Set transaction before it initiates the Register Document Set-b Request message with the Registry actor.

3405   This is necessary because:

- The Document Registry actor may choose to validate the successful storage of the document(s) before acknowledging the Register Document Set-b Request transaction.
- The Document Consumer actor may retrieve the document(s) before the Register Document Set-b Response is received by the Document Repository actor.

3410

3.42.7 Security Considerations

Relevant XDS Affinity Domain Security background is discussed in the XDS Security Considerations Section (see ITI TF-1: 10.7).

3.42.7.1 Audit Record Considerations

The Register Document Set-b Transaction is PHI-Export event, as defined in ITI TF-2a: Table
3415   3.20.6-1.   The Actors involved in the transaction shall create audit data in conformance with
DICOM (Supp 95) "Data Export", with the following exceptions.

3.42.7.1.1 Document Repository or Integrated Document Source/Repository audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110106, DCM, "Export")
	EventActionCode	M	"R" (Read)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-42", "IHE Transactions", "Register Document Set-b")
Source (Document Repository or Integrated Document Source/Repository) (1)			
Human Requestor (0..n)			
Destination (Document Registry) (1)			
Audit Source (Document Repository or Integrated Document Source/Repository) (1)			
Patient (1)			
SubmissionSet (1)			

Where:

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	U	*When WS-Addressing is used: <ReplyTo/>*
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human **Requestor** **(if known)** **AuditMessage/** **ActiveParticipant**	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

3420

	Field Name	Opt	Value Constraints
Destination	UserID	M	SOAP endpoint URI.

	AlternativeUserID	U	*not specialized*
	UserName	U	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	U	*Not specialized.*
	AuditEnterpriseSiteID	U	*not specialized*
	AuditSourceTypeCode	U	*not specialized*

Patient **(AudittMessage/** **ParticipantObjectIdenti** **fication)**	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*
Submission **Set** **(AudittMessage/** **ParticipantObjectIdenti** **fication)**	ParticipantObjectTypeCode	M	"2" (System)
	ParticipantObjectTypeCodeRole	M	"20" (job)
	ParticipantObjectDataLifeCycle	U	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("urn:uuid:a54d6aa5-d40d-43f9-88c5-b4633d873bdd", "IHE XDS Metadata", "submission set classificationNode")
	ParticipantObjectSensitivity	U	*not specialized*
	ParticipantObjectID	M	The submissionSet unique ID
	ParticipantObjectName	U	*not specialized*
	ParticipantObjectQuery	U	*not specialized*
	ParticipantObjectDetail	U	*not specialized*

3.42.7.1.2 Document Registry audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110107, DCM, "Import")
	EventActionCode	M	"C" (Create)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-42", "IHE Transactions", "Register Document Set-b")
Source (Document Repository or Integrated Document Source/Repository) (1)			
Destination (Document Registry) (1)			
Audit Source (Document Registry) (1)			
Patient (1)			
SubmissionSet (1)			

Where:

Source **AuditMessage/** **ActiveParticipant**	UserID	*U*	*When WS-Addressing is used this should be the value of the* *<ReplyTo/> element.*
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

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Destination **AuditMessage/** **ActiveParticipant**	UserID	M	SOAP endpoint URI
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient **(AudittMessage/** **ParticipantObjectIdenti** **fication)**	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	the patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Submission Set **(AudittMessage/** **ParticipantObjectIdenti** **fication)**	ParticipantObjectTypeCode	M	"2" (System)
	ParticipantObjectTypeCodeRole	M	"20" (job)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV("urn:uuid:a54d6aa5-d40d-43f9-88c5-b4633d873bdd", "IHE XDS Metadata", "submission set classificationNode")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The submissionSet unique ID
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*

ParticipantObjectDetail		*U*	*not specialized*

3.43 Retrieve Document Set

This section corresponds to Transaction ITI-43 of the IHE Technical Framework. The Document
3430   Consumer, Document Repository and Initiating Gateway actors use transaction ITI-43.

Integration Profiles using this Transaction
Cross-Enterprise Document Sharing-b (XDS.b)
Cross-Community Access (XCA)

Actors that support the Asynchronous Web Services Exchange option shall support
Asynchronous Web Services Exchange on all XDS.b transactions they implement. Refer to
section ITI TF-2x: V.5 Synchronous and Asynchronous Web Services Exchange for an
3435   explanation of Asynchronous Web Services Exchange.

3.43.1 Scope

This transaction is used by the Document Consumer to retrieve a set of documents from the
Document Repository or Initiating Gateway. The Document Consumer has already obtained the
XDSDocumentEntry uniqueId and the Document Repository repositoryUniqueId from the
3440   Document Registry/Initiating Gateway by means of the Registry Stored Query transaction.

3.43.2 Use Case Roles
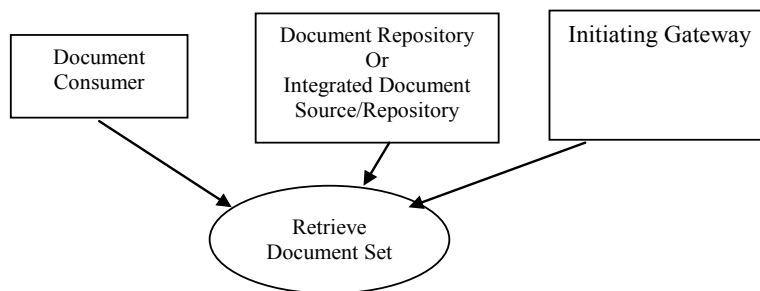
3445

XDS Actors:

    Actor: Document Consumer

    Role: Obtains document.

    Actor: Document Repository or Integrated Document Source/Repository

3450   **Role:** Provides documents.

XCA Actors:

Actor: Initiating Gateway

Role: An Initiating Gateway which implements the XDS Affinity Domain option retrieves a set of documents by using the Cross Gateway Retrieve transaction and/or a Retrieve Document Set transaction.

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Note: Within this transaction, the Document Repository and Integrated Document Source/Repository actors can be used interchangeably.

3.43.3 Referenced Standard

Implementors of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V: Web Services for IHE Transactions.

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ebRIM	OASIS/ebXML Registry Information Model v3.0
ebRS	OASIS/ebXML Registry Services Specifications v3.0
Appendix V	ITI TF-2x:Appendix V Web Services for IHE Transactions Contains references to all Web Services standards and requirements of use
MTOM	SOAP Message Transmission Optimization Mechanism http://www.w3.org/TR/soap12-mtom/
XOP	XML-binary Optimized Packaging http://www.w3.org/TR/2005/REC-xop10-20050125/

3.43.4 Interaction Diagram
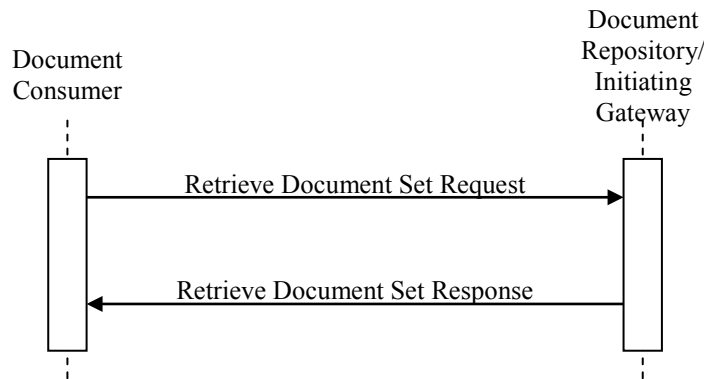
3465

3.43.4.1 Retrieve Document Set Request

3.43.4.1.1Trigger Events

The Document Consumer obtains document(s) uniqueId via the Registry Stored Query transaction. If the Registry Stored Query was sent to the Initiating Gateway the Document Consumer shall address the Retrieve Document Set to the Initiating Gateway. In this case no

3470

resolution of repositoryUniqueId is needed by the Document Consumer. The Document Consumer shall specify the homeCommunityId element in the Retrieve Document Set transaction if it was found in the entry containing the uniqueId of the document being retrieved.

3475 For more information regarding the homeCommunityId see XCA supplement section 3.38.4.1.2.

Once the document(s) uniqueId have been obtained, the Document Consumer will start the Retrieve Document Set Request with the Document Repository.

3.43.4.1.2 Message Semantics

The Retrieve Document Set Request shall carry the following information:

3480
- A required repositoryUniqueId that identifies the repository from which the document is to be retrieved. This value corresponds to XDSDocumentEntry.repositoryUniqueId.

- A required documentUniqueId that identifies the document within the repository. This value corresponds to the XDSDocumentEntry.uniqueId.

- If available, the homeCommunityId element that identifies the community holding the
3485 document. The homeCommunityId element shall be specified if the XDSDocumentEntry containing the uniqueId of the document contains the homeCommunityId attribute. See ITI TF-2a: 3.18.4.1.2 for details.

The repositoryUniqueId associated to each document requested can be different therefore allowing a single request to identify multiple repositories.

3490 ### 3.43.4.1.3 Expected Actions

When receiving a Retrieve Document Set Request, a Document Repository or an Initiating Gateway shall generate a Retrieve Document Set Response containing the requested documents or error codes if the documents could not be retrieved.

An XCA Initiating Gateway receiving the Retrieve Document Set Request shall use the
3495 homeCommunityId to obtain the Web Services endpoint of the Responding Gateways or, in the case where homeCommunityId identifies the local community, use the repositoryUniqueId to obtain the Web Services endpoint of the Document Repositories. The process of obtaining the Web Services endpoint is not further specified in this profile. The Initiating Gateway shall send Cross Gateway Retrieves/Retrieve Document Set transactions to each appropriate Responding
3500 Gateway/Document Repository, consolidate the results, and return them to the Document Consumer.

3.43.4.1.3.1 Basic Patient Privacy Enforcement Option

If the Basic Patient Privacy Enforcement Option is implemented:

1. The Document Consumer actor shall abide by the XDS Affinity Domain Policies
3505 represented by the confidentialityCode in the metadata associated with the document. The Document Consumer actor likely will have user access controls or business rule capabilities to determine the details of how confidentiality codes apply to query results. The details of this are product specific and not specified by IHE. These rules shall reduce

3510 the query results to only those that are appropriate to the current situation for that actor and user.

2. The Document Consumer actor shall be able to be configured with Patient Privacy Policies, Patient Privacy Policy Identifiers (OIDs) and associated information necessary to understand and enforce the XDS Affinity Domain Policy. The details of this are product specific and not specified by IHE.

3515 3.43.4.2 Retrieve Document Set Response

3.43.4.2.1 Trigger Events

This message will be triggered by a Retrieve Document Set Request Message

3.43.4.2.2 Message Semantics

The Retrieve Document Set Response Message shall carry the following information, for each of
3520 the returned documents:

- A homeCommunityId. This value shall be the same as the homeCommunityId value in the Retrieve Document Set Request Message. If the homeCommunityId value is not present in the Retrieve Document Set Request Message, this shall not be present.

- A required repositoryUniqueId that identifies the repository from which the document is to
3525 be retrieved. This value shall be the same as the value of the repositoryUniqueId in the original Retrieve Document Set Request Message. This value corresponds to XDSDocumentEntry.repositoryUniqueId.

- A required documentUniqueId that identifies the document within the repository. This value shall be the same as the documentUniqueId in the original Retrieve Document Set Request
3530 Message. This value corresponds to the XDSDocumentEntry.uniqueId.

- The retrieved document as a XOP Infoset

- The MIME type of the retrieved document

- Errors or warnings in case the document(s) could not be retrieved successfully

3.43.4.2.3 Expected Actions

3535 A Document Repository shall retrieve the document(s) indicated in the request.

The Document Repository shall return the document or an error code in case the document could not be retrieved. The conditions of failure and possible error messages are given in the ebRS standard and detailed in ITI TF-3: 4.1.13 Error Reporting.

3.43.5 Protocol Requirements

3540 Implementors of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V: Web Services for IHE Transactions.

The Retrieve Document Set transaction shall use SOAP12 and MTOM with XOP encoding (labeled MTOM/XOP in this specification). See ITI TF-2x: Appendix V for details. The Document Repository shall:

3545
- Accept the Retrieve Document Set Request message in MTOM/XOP format.
- Generate the Retrieve Document Set Response message in MTOM/XOP format

The Document Consumer shall:

- Generate the Retrieve Document Set Request message in MTOM/XOP format.
- Accept the Retrieve Document Set Response message in MTOM/XOP format.

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WSDL Namespace Definitions

ihe	urn:ihe:iti:xds-b:2007
rs	urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0
lcm	urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0
query	urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0

Document Repository: These are the requirements for the Retrieve Document Set transaction presented in the order in which they would appear in the Document Repository WSDL definition:

3555
- The following types shall be imported (xsd:import) in the /definitions/types section:
  - namespace="urn:ihe:iti:xds-b:2007", schema="IHEXDS.xsd"
- The /definitions/message/part/@element attribute of the Retrieve Document Set Request message shall be defined as "ihe:RetrieveDocumentSetRequest"
- The /definitions/message/part/@element attribute of the Retrieve Document Set Response
3560 message shall be defined as "ihe:RetrieveDocumentSetResponse"
- Refer to Table 3.43.5.b below for additional attribute requirements

To support the Asynchronous Web Services Exchange option on the Document Consumer, the Document Repository shall support the use of a non-anonymous response EPR in the WS-Addressing replyTo header.

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Table 3.43.5.b Additional Attribute Requirements

Attribute	Value
/definitions/portType/operation@name	DocumentConsumer_ RetrieveDocumentSet
/definitions/portType/operation/input/@wsaw :Action	urn:ihe:iti:2007: RetrieveDocumentSet
/definitions/portType/operation/output/@wsa w:Action	urn:ihe:iti:2007: RetrieveDocumentSetResp onse
/definitions/binding/operation/soap12:operati on/@soapAction	urn:ihe:iti:2007: RetrieveDocumentSet

These are the requirements that affect the wire format of the SOAP message. The other WSDL properties are only used within the WSDL definition and do not affect interoperability. Full sample request and response messages are in ITI TF-2b: 3.43.5.1 Sample SOAP Messages.

For informative WSDL for the Document Repository actor see in Appendix W.

The <ihe:RetrieveDocumentSetRequest/> element is defined as:

- One or more <ihe:DocumentRequest/> elements, each one representing an individual document that the Document Consumer wants to retrieve from the Document Repository. Each <ihe:DocumentRequest/> element contains:

  - A required <ihe:RepositoryUniqueId/> element that identifies the repository from which the document is to be retrieved. This value corresponds to XDSDocumentEntry.repositoryUniqueId.

  - A required <ihe:DocumentUniqueId/> that identifies the document within the repository. This value corresponds to the XDSDocumentEntry.uniqueId.

  - An optional <ihe:HomeCommunityId/> element that corresponds to the home attribute of the Identifiable class in ebRIM.

This allows the Document Consumer to specify one or more documents to retrieve from the Document Repository.

The <ihe:RetrieveDocumentResponse/> element is defined as:

- A required /ihe:RetrieveDocumentSetResponse/rs:RegistryResponse element

- An optional sequence of <ihe:DocumentResponse/> elements containing

  - A <ihe:HomeCommunityId/> element. The value of this element shall be the same as the value of the /RetrieveDocumentSetRequest/DocumentRequest/HomeCommunityId element in the Retrieve Document Set Request Message. If the <ihe:HomeCommunityId/> element is not present in the Retrieve Document Set Request Message, this value shall not be present.

  - A required <ihe:RepositoryUniqueId/> that identifies the repository from which the document is to be retrieved. The value of this element shall be the same as the value of the /RetrieveDocumentSetRequest/DocumentRequest/RepositoryUniqueId element in the original Retrieve Document Set Request Message. This value corresponds to XDSDocumentEntry.repositoryUniqueId.

  - A required <ihe:DocumentUniqueId/> that identifies the document within the repository. The value of this element shall be the same as the value of the /RetrieveDocumentSetRequest/DocumentRequest/DocumentUniqueId element in the original Retrieve Document Set Request Message. This value corresponds to XDSDocumentEntry.uniqueId.

  - A required <ihe:Document/> element that contains the retrieved document in base64binary encoded format

  - A required <ihe:mimeType/> element that indicates the MIME type of the retrieved document

The /RetrieveDocumentSetResponse/rs:RegistryResponse/@status attributes provides the overall status of the request: It shall contain one of the following values:

3610   `urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success`

            `urn:ihe:iti:2007:ResponseStatusType:PartialSuccess`

            `urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Failure`

See ITI TF-3: 4.1.13 Error Reporting for the interpretation of these values.

For each document requested in a /RetrieveDocumentSetRequest/DocumentRequest element:

3615   •   If a warning is reported when retrieving the document, then a /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:RegistryErrorList/ rs:RegistryError element shall be returned with:

        •   @severity is urn:oasis:names:tc:ebxml-regrep:ErrorSeverityType:Warning

        •   @errorCode is specified

3620   •   @codeContext contains the warning message

        •   @location contains the DocumentUniqueId of the document requested

    •   The document shall be returned in an instance of /RetrieveDocumentSetResponse/DocumentResponse/Document as a XOP Infoset. The returned document and warning are correlated via the DocumentUniqueId.

3625   •   If an error is reported when retrieving a document, then a /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:RegistryErrorList/ rs:RegistryError element shall be returned with:

        •   @severity is urn:oasis:names:tc:ebxml-regrep:ErrorSeverityType:Error

        •   @errorCode is specified

3630   •   @codeContext contains the error message

        •   @location contains the DocumentUniqueId of the document requested

    •   No corresponding RetrieveDocumentSetResponse/DocumentResponse element shall be returned

    •   If the document is successfully retrieved (without warning) then no
3635   /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:RegistryErrorList/ rs:RegistryError element shall be present and a /RetrieveDocumentSetResponse/DocumentResponse/Document element shall be returned containing the document as a XOP Infoset.

The /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:ResponseSlotList element is not
3640   used in this transaction.

The /RetrieveDocumentSetResponse/rs:RegistryResponse/@requestId attribute is not used in this transaction.

A full XML Schema Document for the XDS.b types is available online on the IHE FTP site, see ITI TF-2x: Appendix W.

3645 **3.43.5.1 Sample SOAP Messages**

The samples in the following two sections show a typical request and its relative response. The sample messages also show the WS-Addressing headers <Action/>, <MessageID/>, <ReplyTo/>…; these WS-Addressing headers are populated according to ITI TF-2x: Appendix V: Web Services for IHE Transactions.

3650 **3.43.5.1.1 Sample Retrieve Document Set SOAP Request**

3.43.5.1.1.1 Synchronous Web Services Exchange

```
POST /tf6/services/xdsrepositoryb HTTP/1.1
Content-Type: multipart/related;
    boundary=MIMEBoundaryurn_uuid_3448B7F8EA6E8B9DFC1289514997517;
    type="application/xop+xml";
    start="<0.urn:uuid:3448B7F8EA6E8B9DFC1289514997518@apache.org>";
    start-info="application/soap+xml"
User-Agent: Axis2
Host: ihexds.nist.gov:5000

--MIMEBoundaryurn_uuid_3448B7F8EA6E8B9DFC1289514997517
Content-Type: application/xop+xml; charset=UTF-8;
    type="application/soap+xml"
Content-Transfer-Encoding: binary
Content-ID: <0.urn:uuid:3448B7F8EA6E8B9DFC1289514997518@apache.org>

<?xml version='1.0' encoding='UTF-8'?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
    <soapenv:Header xmlns:wsa="http://www.w3.org/2005/08/addressing">
        <wsa:To soapenv:mustUnderstand="1"
            >http://localhost:5000/tf6/services/xdsrepositoryb</wsa:To>
        <wsa:MessageID soapenv:mustUnderstand="1"
            >urn:uuid:3448B7F8EA6E8B9DFC1289514997508</wsa:MessageID>
        <wsa:Action soapenv:mustUnderstand="1"
            >urn:ihe:iti:2007:RetrieveDocumentSet</wsa:Action>
    </soapenv:Header>
    <soapenv:Body>
        <RetrieveDocumentSetRequest xmlns="urn:ihe:iti:xds-b:2007">
            <DocumentRequest>
                <RepositoryUniqueId>1.19.6.24.109.42.1.5</RepositoryUniqueId>
                <DocumentUniqueId>1.42.20101110141555.15</DocumentUniqueId>
            </DocumentRequest>
        </RetrieveDocumentSetRequest>
    </soapenv:Body>
</soapenv:Envelope>
--MIMEBoundaryurn_uuid_3448B7F8EA6E8B9DFC1289514997517--
```

This request message is in MTOM/XOP format because request/response message pairs must 3690 always be in the same format (MTOM/XOP vs. SIMPLE SOAP) and the response requires MTOM/XOP: one part for descriptive metadata and a second part for document contents.

3.43.5.1.1.2 Asynchronous Web Services Exchange

```
<s:Envelope
            xmlns:s="http://www.w3.org/2003/05/soap-envelope"
            xmlns:a="http://www.w3.org/2005/08/addressing">
    <s:Header>
            <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RetrieveDocumentSet</a:Action>
            <a:MessageID>urn:uuid:0fbfdced-6c01-4d09-a110-2201afedaa02</a:MessageID>
            <a:ReplyTo>
```

```
                        <a:Address>
http://192.168.2.4:9080/XdsService/DocumentConsumerReceiver.svc</a:Address>
                    </a:ReplyTo>
                    <a:To
3705  s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentRepositoryReceiver.svc</a:To>
        </s:Header>
        <s:Body>
            <RetrieveDocumentSetRequest xmlns="urn:ihe:iti:xds-b:2007">
                <DocumentRequest>
3710               <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
                    <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
                </DocumentRequest>
                <DocumentRequest>
                    <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
3715               <DocumentUniqueId>1.3.6.1.4...2301</DocumentUniqueId>
                </DocumentRequest>
            </RetrieveDocumentSetRequest>
        </s:Body>
</s:Envelope>
3720
```

3.43.5.1.2 Sample Retrieve Document Set SOAP Response

3.43.5.1.2.1 Synchronous Web Services Exchange

In the following example, the HTTP header `Transfer-Encoding: chunked` and the
3725 corresponding chunk annotations were removed for readability.

```
     HTTP/1.1 200 OK
     Server: Apache-Coyote/1.1
     Content-Type: multipart/related;
3730     boundary=MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310;
         type="application/xop+xml";
         start="0.urn:uuid:E910375860336E2B8F1289514978311@apache.org";
         start-info="application/soap+xml";
     Date: Thu, 11 Nov 2010 22:36:15 GMT
3735
     --MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310
     Content-Type: application/xop+xml; charset=UTF-8;
         type="application/soap+xml"
     Content-Transfer-Encoding: binary
3740 Content-ID: <0.urn:uuid:E910375860336E2B8F1289514978311@apache.org>

     <?xml version='1.0' encoding='UTF-8'?>
     <soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope"
         xmlns:wsa="http://www.w3.org/2005/08/addressing">
3745     <soapenv:Header>
            <wsa:Action soapenv:mustUnderstand="1"
                    >urn:ihe:iti:2007:RetrieveDocumentSetResponse</wsa:Action>
            <wsa:RelatesTo>urn:uuid:3448B7F8EA6E8B9DFC1289514997508</wsa:RelatesTo>
         </soapenv:Header>
3750     <soapenv:Body>
            <xdsb:RetrieveDocumentSetResponse xmlns:xdsb="urn:ihe:iti:xds-b:2007">
              <rs:RegistryResponse xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
                  status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"/>
              <xdsb:DocumentResponse>
3755               <xdsb:RepositoryUniqueId
                     >1.19.6.24.109.42.1.5</xdsb:RepositoryUniqueId>
                   <xdsb:DocumentUniqueId
                     >1.42.20101110141555.15</xdsb:DocumentUniqueId>
                   <xdsb:mimeType>text/plain</xdsb:mimeType>
3760               <xdsb:Document>
                       <xop:Include
```

```
                   href="cid:1.urn:uuid:E910375860336E2B8F1289514978312@apache.org"
                       xmlns:xop="http://www.w3.org/2004/08/xop/include"/>
                   </xdsb:Document>
               </xdsb:DocumentResponse>
           </xdsb:RetrieveDocumentSetResponse>
       </soapenv:Body>
</soapenv:Envelope>
```

3765

```
--MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310
Content-Type: text/plain
Content-Transfer-Encoding: binary
Content-ID: <1.urn:uuid:E910375860336E2B8F1289514978312@apache.org>
```

3770

```
Four score and seven years ago our fathers brought forth on this continent a new nation,
conceived in Liberty, and dedicated to the proposition that all men are created equal.
--MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310--
```

3775

This example shows the 'wire format' for MTOM/XOP. The Document element contains a
<xop:Include> element that points to the document contents as a separate attachment.

3780

> Note: In some systems, the 'in memory' format replaces the <xop:Include> with the Base64 encoded contents of the document. This is done so the entire message contents fits into an XML parse tree.

A second form of the response is possible, an un-optimized MTOM/XOP message. In this form
the message is still formatted as a multipart but the document contents is not split out into a
separate part of the multipart. Some popular Web Service toolkits generate this form for very
small documents. The same response in this form looks like:

3785

```
HTTP/1.1 200 OK
Server: Apache-Coyote/1.1
Content-Type: multipart/related;
    boundary=MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310;
    type="application/xop+xml";
    start="0.urn:uuid:E910375860336E2B8F1289514978311@apache.org";
    start-info="application/soap+xml";
Date: Thu, 11 Nov 2010 22:36:15 GMT
```

3790

3795

```
--MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310
Content-Type: application/xop+xml; charset=UTF-8;
    type="application/soap+xml"
Content-Transfer-Encoding: binary
Content-ID: <0.urn:uuid:E910375860336E2B8F1289514978311@apache.org>
```

3800

```
<?xml version='1.0' encoding='UTF-8'?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope"
    xmlns:wsa="http://www.w3.org/2005/08/addressing">
    <soapenv:Header>
        <wsa:Action soapenv:mustUnderstand="1"
            >urn:ihe:iti:2007:RetrieveDocumentSetResponse</wsa:Action>
        <wsa:RelatesTo>urn:uuid:3448B7F8EA6E8B9DFC1289514997508</wsa:RelatesTo>
    </soapenv:Header>
    <soapenv:Body>
        <xdsb:RetrieveDocumentSetResponse xmlns:xdsb="urn:ihe:iti:xds-b:2007">
          <rs:RegistryResponse
            xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0"
            status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"/>
          <xdsb:DocumentResponse>
                <xdsb:RepositoryUniqueId
                  >1.19.6.24.109.42.1.5</xdsb:RepositoryUniqueId>
                <xdsb:DocumentUniqueId
                  >1.42.20101110141555.15</xdsb:DocumentUniqueId>
                <xdsb:mimeType>text/plain</xdsb:mimeType>
                <xdsb:Document>
```

3805

3810

3815

3820

```
                        Base64 encoded contents of document go here
                    </xdsb:Document>
3825            </xdsb:DocumentResponse>
            </xdsb:RetrieveDocumentSetResponse>
        </soapenv:Body>
</soapenv:Envelope>
--MIMEBoundaryurn_uuid_E910375860336E2B8F1289514978310--
```

3830 **3.43.5.1.2.2 Asynchronous Web Services Exchange**

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
        <s:Header>
                <a:Action
3835  s:mustUnderstand="1">urn:ihe:iti:2007:RetrieveDocumentSetResponse</a:Action>
                <a:MessageID>urn:uuid:D6C21225-8E7B-454E-9750-821622C099DB</a:MessageID>
                <a:RelatesTo>urn:uuid:0fbfdced-6c01-4d09-a110-2201afedaa02</a:RelatesTo>
                <a:To
s:mustUnderstand="1">http://localhost:2647/XdsService/DocumentConsumerReceiver.svc</a:To>
3840    </s:Header>
        <s:Body>
                <RetrieveDocumentSetResponse
                        xmlns="urn:ihe:iti:xds-b:2007"
                        xmlns:lcm="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0"
3845                    xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
                        xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
                        xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
                <rs:RegistryResponse status="urn:oasis:names:tc:ebxml-
regrep:ResponseStatusType:Success"/>
3850            <DocumentResponse>
                        <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
                        <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
                        <mimeType>text/xml</mimeType>

3855    <Document>UjBsR09EbGhjZ0dTQUxNQUFBBUUNBRU1tQ1p0dU1GGUXhEUzhi</Document>
                </DocumentResponse>
                <DocumentResponse>
                        <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
                        <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
3860                    <mimeType>text/xml</mimeType>

        <Document>UjBsR09EbGhjZ0dTQUxNQUFBBUUNBRU1tQ1p0dU1FGUXhEUzhi</Document>
                </DocumentResponse>
            </RetrieveDocumentSetResponse>
3865    </s:Body>
</s:Envelope>
```

3.43.6 Security Considerations

Relevant XDS Affinity Domain Security background is discussed in the XDS Security
Considerations Section (see ITI TF-1: 10.7).

3870 **3.43.6.1 Audit Record Considerations**

The Retrieve Document Set Transaction is PHI-Export event, as defined in ITI TF-2a: Table
3.20.6-1.   The Actors involved in the transaction shall create audit data in conformance with
DICOM (Supp 95) "Data Export"/"Data Import", with the following exceptions.

The Repository Actor shall generate an "Export" event. This may be an event for each Retrieve
3875 Document Transaction, or multiple transactions for the same patient may be heuristically
combined. The heuristics for this combination are not specified by IHE. It is intended to reduce

the volume of audit records. Combination is permitted when the active participants and patient are the same, and the time difference is considered insignificant.

3880 The Document Consumer Actor shall generate an "Import" event. This may be one event per transaction, or multiple transactions may be reported as a single event using a heuristic for combining transactions. Combination is permitted when the active participants and patient are the same, and the time difference is considered insignificant.

3.43.6.1.1 Document Consumer audit message:

	Field Name	Opt	Value Constraints
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110107, DCM, "Import")
	EventActionCode	M	"C" (Create)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-43", "IHE Transactions", "Retrieve Document Set")
Source (Document Repository) (1)			
Destination (Document Consumer) (1)			
Human Requestor (0..n)			
Audit Source (Document Consumer) (1)			
Patient (0..1)			
Document (1..n) *(see combining rules above)*			

Where:

3885

	Field Name	Opt	Value Constraints
Source **AuditMessage/** **ActiveParticipant**	UserID	M	SOAP endpoint URI
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

Destination **AuditMessage/ ActiveParticipant**	UserID	M	The content of the <wsa:ReplyTo/> element.
	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.
Human Requestor (if known) **AuditMessage/ ActiveParticipant**	UserID	M	Identity of the human that initiated the transaction.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*NA*	
	NetworkAccessPointID	*NA*	

Audit Source **AuditMessage/ AuditSourceIdentification**	*AuditSourceID*	*U*	*Not specialized.*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Patient (if-known) **(AudittMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"1" (Person)
	ParticipantObjectTypeCodeRole	M	"1" (Patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(2, RFC-3881, "Patient Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The patient ID in HL7 CX format.
	ParticipantObjectName	*U*	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*U*	*not specialized*
Document **(AudittMessage/ ParticipantObjectIdenti fication)**	ParticipantObjectTypeCode	M	"2" (System)
	ParticipantObjectTypeCodeRole	M	"3" (report)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(9, RFC-3881, "Report Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The value of <ihe:DocumentUniqueId/>
	ParticipantObjectName	C	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*

	ParticipantObjectDetail	*M*	The ParticipantObjectDetail element may occur more than once. In one element, the value of <ihe:RepositoryUniqueId/> in value attribute, "Repository Unique Id" in type attribute In another element, the value of "ihe:homeCommunityID" as the value of the attribute *type* and the value of the homeCommunityID as the value of the attribute *value*

3.43.6.1.2 Document Repository audit message:

	Field Name	**Opt**	**Value Constraints**
Event **AuditMessage/** **EventIdentification**	EventID	M	EV(110106, DCM, "Export")
	EventActionCode	M	"R" (Read)
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-43", "IHE Transactions", "Retrieve Document Set")
Source (Document Repository) (1)			
Destination (Document Consumer) (1)			
Audit Source (Document Repository) (1)			
Document (1..n) *(see combining rules above)*			

3890   Where:

	UserID	M	SOAP endpoint URI
Source **AuditMessage/** **ActiveParticipant**	AlternativeUserID	M	the process ID as used within the local operating system in the local system logs.
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"false"
	RoleIDCode	M	EV(110153, DCM, "Source")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

	UserID	M	The content of the <wsa:ReplyTo/> element.
Destination **AuditMessage/** **ActiveParticipant**	*AlternativeUserID*	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	M	"true"
	RoleIDCode	M	EV(110152, DCM, "Destination")
	NetworkAccessPointTypeCode	M	"1" for machine (DNS) name, "2" for IP address
	NetworkAccessPointID	M	The machine name or IP address, as specified in RFC 3881.

	AuditSourceID	*U*	*Not specialized.*
Audit Source **AuditMessage/** **AuditSourceIdentification**	*AuditEnterpriseSiteID*	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

Document	ParticipantObjectTypeCode	M	"2" (System)

	ParticipantObjectTypeCodeRole	M	"3" (report)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	M	EV(9, RFC-3881, "Report Number")
	ParticipantObjectSensitivity	*U*	*not specialized*
	ParticipantObjectID	M	The value of <ihe:DocumentUniqueId/>
	ParticipantObjectName	C	*not specialized*
	ParticipantObjectQuery	*U*	*not specialized*
	ParticipantObjectDetail	*M*	The ParticipantObjectDetail element may occur more than once. In one element, the value of <ihe:RepositoryUniqueId/> in value attribute, "Repository Unique Id" in type attribute In another element, the value of "ihe:homeCommunityID" as the value of the attribute *type* and the value of the homeCommunityID as the value of the attribute *value*

18 Cross-Enterprise Document Sharing for Imaging (XDS-I.b) Integration Profile

IMPORTANT NOTE: *The Cross-Enterprise Document Sharing for Imaging (XDS-I) Integration Profile (originally found here) has been deprecated and is replaced by a functionally equivalent profile called Cross-Enterprise Document Sharing for Imaging (XDS-I.b), which is described in the remainder of this section.*

The Cross-Enterprise Document Sharing (XDS.b) Profile in the IHE IT Infrastructure Domain provides a solution for sharing (publishing, finding and retrieving) documents across a group of affiliated enterprises. The XDS for Imaging (XDS-I.b) Profile, defined here, extends and specializes the mechanisms defined by XDS.b to support imaging "documents", specifically including the following:

- Imaging studies that include images acquired on a broad range of different modalities, as well as evidence documents (e.g., post-processing measurements/analysis outcome), and presentation states.
- Diagnostic reports resulting from the interpretation of one or more related imaging studies provided in a ready-for-display form
- A selection of diagnostically significant images associated with the report content.

These document types along with the actor capabilities required to share them are defined by this profile.

Since the XDS for Imaging (XDS-I.b) Profile depends on and extends the IT Infrastructure XDS.b Profile including the use of terms defined in XDS.b (e.g., XDS Affinity Domain, submission set, etc.) the reader of XDS-I.b is expected to have read and understood the XDS Profiles (See ITI TF-1: 10). The XDS-I.b specification does not repeat requirements and text for the XDS-defined Actors Document Repository, Document Registry, and Document Consumer, and does not place any new requirements on these actors.

Both the XDS.b and XDS for Imaging (XDS-I.b) Integration Profiles are not intended to address all cross-enterprise EHR communication needs. Many scenarios may require the use of other IHE Integration profiles, such as Patient Identifier Cross-Referencing (PIX), Audit Trail and Node Authentication (ATNA), Enterprise User Authentication (EUA), Cross-Enterprise User Authentication (XUA) and Retrieve Information for Display (RID). Other scenarios may be only partially supported, while still others may require future IHE Integration profiles, which will be defined by IHE as soon as the necessary base standards are available. Specifically:

1. The operation of any XDS Affinity Domain will require that a proper security model be put in place. It is expected that a range of security models should be possible. Although the XDS-I.b Integration Profile is not intended to include nor require any specific security model, it is required that XDS-I.b implementers shall group XDS-I.b Actors with actors from the IHE Audit Trail and Node Authentication and will need an Access Control capability that operates in such a cross-enterprise environment. New IHE Integration Profiles have been identified as candidates (e.g., Public Key Infrastructure, Access Control, etc.). There is a discussion of XDS-I.b security considerations in RAD TF-1: Appendix H.

2. XDS and XDS-I.b do not address transactions for the management or configuration of an XDS Affinity Domain. For example, the configuration of network addresses or the definition of what type of clinical information is to be shared is specifically left up to the policies established by the XDS Affinity Domain.

3. XDS and XDS-I.b do not specifically address the patient information reconciliation process necessary between the XDS Affinity Domain and any other local patient identity domains that Document Sources and Document Consumers may be members of. For a discussion of some of these issues see RAD TF-1: Appendix G.

4. XDS and XDS-I.b do not directly address the rendering and display of the documents retrieved by the Document and Imaging Document Consumers. Users wishing to achieve a well-defined level of display/ rendering capability simply need to request systems that combine the XDS-I.b Imaging Document Consumer Actor with an Image Display Actor from the appropriate Profile (e.g., Mammography Image, NM Image, Basic Image Review, etc.).

5. XDS and XDS-I.b do not directly address the rendering and display of the documents retrieved by the Document and Imaging Document Consumers. Users wishing to achieve a well-defined level of display/ rendering capability simply need to request systems that combine the XDS-I.b Imaging Document Consumer Actor with an Image Display Actor from the appropriate Profile (e.g., Mammography Image, NM Image, Basic Image Review, etc.).

18.1 Actors/ Transactions

Figure 18.1-1 shows the actors directly involved in this profile and the transactions between actors. The shaded XDS actors are NOT actually included in this profile but are included to show the other endpoint of transactions that ARE part of the profile (e.g., the Document Repository Actor that is the endpoint for the Provide and Register Imaging Document Set – MTOM/XOP Transaction). As a result, the shaded actors are not listed in Table 18.1-1. The XDS-I.b Profile does not place any additional requirements on any of these actors above and beyond what it required of them by the ITI XDS.b Profile.
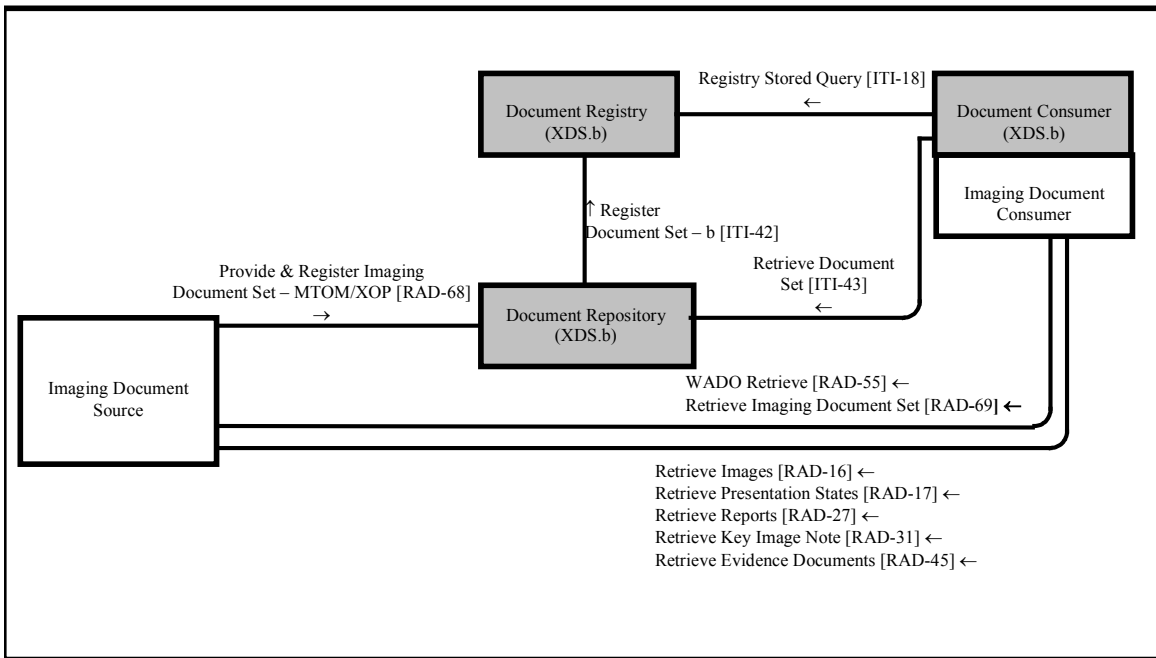
Figure 18.1-1: Cross-Enterprise Document Sharing for Imaging Diagram

Table 18.1-1 lists the transactions for each actor directly involved in the Cross-Enterprise Document Sharing for Imaging (XDS-I.b) Profile. In order to claim support of this Integration Profile, an implementation shall perform the required transactions (labeled "R"). Transactions labeled "O" are optional. A complete list of options defined by this Integration Profile is listed in RAD TF-1: 18.2. Note the grouping of actors described in RAD TF-1: 2.4.

Table 18.1-1: Cross-enterprise Document Sharing for Imaging Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section in Vol. 2
Imaging Document Consumer	Retrieve Images [RAD-16]	O (note 1)	4.16
	Retrieve Presentation States [RAD-17]	O	4.17
	Retrieve Reports [RAD-27]	O (note 1)	4.27
	Retrieve Key Image Note [RAD-31]	O	4.31
	Retrieve Evidence Documents [RAD-45]	O (note 1)	4.45
	WADO Retrieve [RAD-55]	O (note 1)	4.55
	Retrieve Imaging Document Set [RAD-69]	O (note 1)	4.69
Imaging Document Source	Provide and Register Imaging Document Set – MTOM/XOP [RAD-68]	R (note 2)	4.68
	Retrieve Images [RAD-16]	R (note 3)	4.16
	Retrieve Presentation States [RAD-17]	R (note 3)	4.17
	Retrieve Reports [RAD-27]	R (note 3)	4.27
	Retrieve Key Image Note [RAD-31],	R (note 3)	4.31
	Retrieve Evidence Documents [RAD-45]	R (note 3)	4.45
	WADO Retrieve [RAD-55]	R (note 3)	4.55
	Retrieve Imaging Document Set [RAD-69]	R (note 3)	4.69

Note 1: At least one of the optional retrieve transactions is required to be supported. Refer to section 18.4 for additional requirements on the Imaging Document Consumer.

Note 2: Support of at least one of the three document types described by the options in section 18.2 is required.

Note 3: These transactions are only required if the Imaging Document Source supports the 'Set of DICOM Instances' option as described in Table 18.2-1.

18.2 Integration Profile Options

Options that may be selected for this Integration Profile are listed in table 18.2-1 along with the Actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 18.2-1: Cross-enterprise Document Sharing for Imaging - Actors and Options

Actor	Options	Vol & Section
Imaging Document Source	Set of DICOM Instances (Note 1)	RAD TF-1: 18.2.1

Table 18.1-1: Cross-enterprise Document Sharing for Imaging Integration Profile - Actors and Transactions

Actors	Transactions	Optionality	Section in Vol. 2
Imaging Document Consumer	Retrieve Images [RAD-16]	O (note 1)	4.16
	Retrieve Presentation States [RAD-17]	O	4.17
	Retrieve Reports [RAD-27]	O (note 1)	4.27
	Retrieve Key Image Note [RAD-31]	O	4.31
	Retrieve Evidence Documents [RAD-45]	O (note 1)	4.45
	WADO Retrieve [RAD-55]	O (note 1)	4.55
	Retrieve Imaging Document Set [RAD-69]	O (note 1)	4.69
Imaging Document Source	Provide and Register Imaging Document Set – MTOM/XOP [RAD-68]	R (note 2)	4.68
	Retrieve Images [RAD-16]	R (note 3)	4.16
	Retrieve Presentation States [RAD-17]	R (note 3)	4.17
	Retrieve Reports [RAD-27]	R (note 3)	4.27
	Retrieve Key Image Note [RAD-31],	R (note 3)	4.31
	Retrieve Evidence Documents [RAD-45]	R (note 3)	4.45
	WADO Retrieve [RAD-55]	R (note 3)	4.55
	Retrieve Imaging Document Set [RAD-69]	R (note 3)	4.69

Note 1: At least one of the optional retrieve transactions is required to be supported. Refer to section 18.4 for additional requirements on the Imaging Document Consumer.

Note 2: Support of at least one of the three document types described by the options in section 18.2 is required.

Note 3: These transactions are only required if the Imaging Document Source supports the 'Set of DICOM Instances' option as described in Table 18.2-1.

18.2 Integration Profile Options

Options that may be selected for this Integration Profile are listed in table 18.2-1 along with the Actors to which they apply. Dependencies between options when applicable are specified in notes.

Table 18.2-1: Cross-enterprise Document Sharing for Imaging - Actors and Options

Actor	Options	Vol & Section
Imaging Document Source	Set of DICOM Instances (Note 1)	RAD TF-1: 18.2.1

Actor	Options	Vol & Section
	PDF Report (Note 1)	RAD TF-1: 18.2.2
	Text Report [CDA] (Note 1)	RAD TF-1: 18.2.3
Imaging Document Consumer	*No options defined*	-

Note 1: At least one of these three options is required

18.2.1 Set of DICOM Instances Option

This option requires the Imaging Document Source to create a DICOM manifest that references DICOM instances, and to provide and register this document to the Document Repository. The Imaging Document Source is required to ensure that the referenced images from within a published manifest are available to be retrieved. For details of the transaction affected by this option, refer to RAD TF-2: 4.68.4.1.2.1.

18.2.2 PDF Report Option

This option requires the Imaging Document Source to provide and register an Imaging Report in a PDF format to the Document Repository. The published report may contain embedded images or pre-computed links that reference images in a non-DICOM format. The Imaging Document Source is required to ensure that image references are valid links. For details of the transaction affected by this option, refer to RAD TF-2: 4.68.4.1.2.2.

18.2.3 CDA Wrapped Text Report Option

This option requires the Imaging Document Source to provide and register an Imaging Report in a Text wrapped into a CDA Document to the Document Repository. For details of the transaction affected by this option, refer to RAD TF-2: 4.68.4.1.2.2.

18.3 Image Information Sharing Process Flow

The sharing of imaging related information among different health professionals and facilities, even across administrative and geographic boundaries can lead to a large variety of information flows. Typical imaging information sets used in healthcare settings are well known, but the challenge is to distill the "exchange" scenarios to drive the sharing of imaging information across enterprises distributed over a community, region or nation.

18.3.1 Overview of Imaging Information Sharing Use Cases

The following use case scenarios express the core imaging information sharing common to most clinical settings. They cover:

1. **Routine imaging referral**. The referring physician in his office requests that a patient have an examination done at an imaging facility. The physician expects to have

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electronic access to the imaging report and to the images if needed after the examination has been performed on his patient. This use case is further analyzed in this profile.

2. **Course of Treatment Consult**. An emergency physician orders an imaging examination for a patient at his hospital. After reviewing the preliminary report the ER physician decides to consult a surgical specialist at the regional hospital for advice on a course of action. For this, the surgical specialist accesses the images and preliminary report and reviews them in order to propose, on the phone, a course of action for the patient. This use case is further analyzed in this profile.

3. **Clinical Consult**. A general practitioner performs a routine imaging referral, reviews the shared imaging report and chooses to send the patient for evaluation by a specialist (e.g., an oncologist). The specialist needs access to the imaging report and full image set produced at the imaging facility where the patient had been sent by his general practitioner to perform the examination. This use case is further analyzed in this profile.

4. **General imaging record access**.   A patient relocates or decides to change her physician. The new physician needs to retrieve relevant information from the patient record, review its content, including recent labs and imaging studies. A similar situation occurs when a patient is admitted for an emergency and timely access to the patient's past information is required, including prior imaging studies. This use case is further analyzed in this profile.

This profile describes the information sharing transactions for care-delivering systems to publish patient's imaging diagnostic documents (EHR-CR) for sharing across enterprises as longitudinal patient care records (HER-LR). The policies or administrative details regarding the sharing of imaging information are for the most part not explicitly discussed so as not to obscure clinical needs. Administrative variations between countries and regions are expected, and can be added or modified without losing the clinical information-sharing context.

Since the focus is on the sharing and access to patients imaging records rather than the entire workflow in which such information sharing takes place, other activities are described as though they are being done by telephone, paper mail, fax, etc. In an integrated electronic environment these other activities may be more automated, but those details are separate from the records access/sharing and are to be addressed by separate Integration Profiles.

18.3.2 Assumptions

The imaging information needs to be shared between multiple care delivery organizations (information sources and consumers), each (typically) with its own RIS and PACS. The point of service ("POS") for physicians may be supported by a variety of systems: hospital EMR, physician practice system, PACS viewers, EHR web application, etc.

The concept of sharing information across enterprises that have agreed to join in such a health information network is based on basic design principles that can be summarized in the following points:

1. A group of healthcare enterprises have agreed to work together using a common set of policies and to share a common infrastructure of repositories and a registry for an affinity domain.

2. Information sources (e.g., EHR, lab system, PACS) select the "documents" they wish to share.

3. Documents may include any information in an agreed format (e.g., a PDF document, a DICOM manifest, etc.). Documents are stored in multiple document repositories.

4. Shared documents are registered with a central service called a document registry that tracks only indexing information and the location from which documents may be retrieved.

5. Information consumers may query this well-defined unique/singular indexing service (document registry) to find the document index information for any patient and the location from which documents may be retrieved (document repositories).

6. Information sources remain the owner of the documents shared in repositories and, thereby, remain responsible for replacing or deprecating its documents if necessary.

In each one of the use cases, it is assumed that the people and the information systems that participate in a single "Affinity Domain" have agreed upon mechanisms to address:

- Governance: operational structure, data stewardship, etc.
- Privacy: consent management and data masking controls
- Security: Authorization and authentication, network security, audit trails, etc.
- Normalized patient ID schemes: MPI (Master Patient Index), unique information IDs, etc.
- Coded Vocabularies used for registry information

18.3.3 Use cases

18.3.3.1 Routine Imaging Referral Use Case

This scenario describes imaging information sharing in a typical patient referral and reporting use case where:

- An examination is performed upon the request of a referring physician:
- The referring physician accesses the regional health information network and reviews the report along with the key images and may optionally access the full image set that made the study.

This scenario is characterized by all the information being provided for sharing at one time, as a single logical unit, when the imaging study is completed by the radiology enterprise (i.e., a single "document submission set").

18.3.3.1.1 Process Flow

Figure 18.3.3-1 highlights the people and systems participating in this regional health information network, including:

- *Physician Office*: A referring physician working out of a private office with a physician practice system for access to information
- *RIS/PACS Enterprise A*: A radiology enterprise with modality equipment and a RIS/PACS to manage report and imaging information: Radiology Enterprise A
- *RIS/PACS Enterprise B*: Another radiology enterprise with a RIS/PACS to manage report and imaging information: Radiology Enterprise B
- *Document Registry*: A document registry that serves as the information index for the regional health information network

In the process flow description, steps that pertain to information sharing are shown in bold (and numbered). In contrast, the steps that do not pertain to the focus of information sharing are shown in italic (and not numbered). These steps are expressed to ensure a more complete context.

Figure 18.3.3-2 shows the transaction diagram for this process flow.

Exam is ordered

The Referring Physician orders the examination and the patient goes to the Imaging Department: Radiology Enterprise A.

This is well-understood workflow that may be executed using any combination of paper, faxes, telephone, and electronic communications. It may or may not be addressed using the IHE Scheduled Workflow Integration Profile.

Although this step is part of the use case, it is peripheral to the specific steps for sharing of imaging of information.

Step 1: Obtain Relevant Prior Imaging Information

- The PACS at Radiology Enterprise A, where the acquisition and reporting is performed, does a query of the Document Registry to identify relevant prior images and reports. It should be noted that the determination of what is relevant is the responsibility of the consumer and not the registry.
- The PACS at Radiology Enterprise A retrieves prior imaging information from a repository in another radiology enterprise within the regional health network: Radiology Enterprise B, in preparation for study acquisition and subsequent reporting
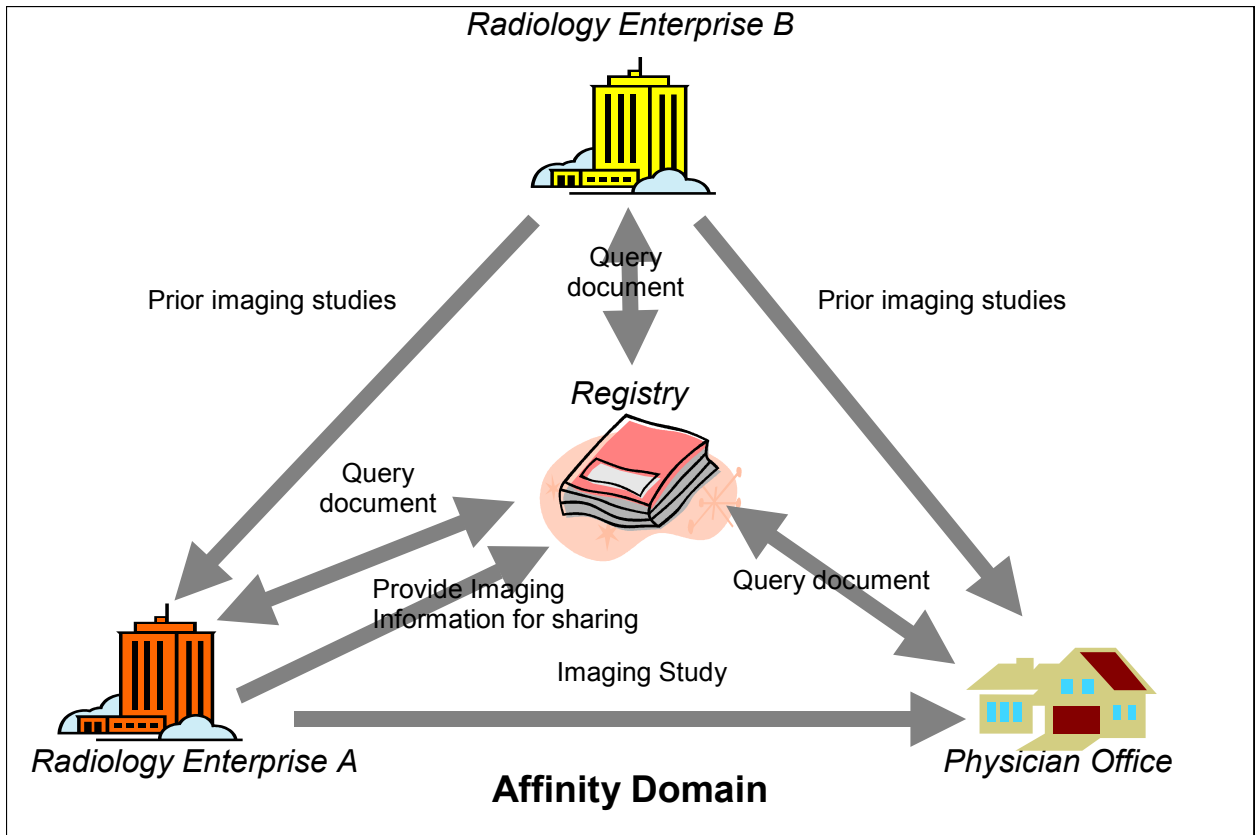
Figure 18.3.3-1: Data Flow within the Regional Health Network for a Routine Imaging Referral

Exam is Acquired and Reported

Images are sent from the modality to the PACS. This is well-understood workflow described in IHE SWF.

The study is reported. This is well understood workflow that is managed by systems within Radiology Enterprise A

Step 2: Share Imaging Information within the Regional Health Network (Affinity Domain)

- The PACS at Radiology Enterprise A, serving as a "Imaging Document Source", provides imaging information to the document repository, which register the document in the registry, for sharing, including:

  - Acquired DICOM study
  - Final report
  - Key images along with annotations

Step 3: Obtain and Display Study Results

- A physician practice system in the Physician's office, serving as a document consumer, queries the Document Registry in the regional health network. This query may be triggered by the patient's next appointment, a call from the patient to the physician's secretary, an electronic notification that the examination's result is available (using the IHE ITI Notification for Document Availability profile), etc.
- The physician practice system presents a list of imaging information available for the patient
- The referring physician selects the study results and relevant prior studies and reports
- The physician practice system in the Physician's office, serving as an Imaging Document Consumer, retrieves the selected documents from the RIS/PACS Document Repositories in the regional health network and displays them to the referring physician.

Referring Physician reviews the results

The Referring Physician reviews the results of the examination: the report and images from the RIS/PACS in Radiology Enterprise A, and the results of prior examinations: reports and images from the RIS/PACS in Radiology Enterprise B
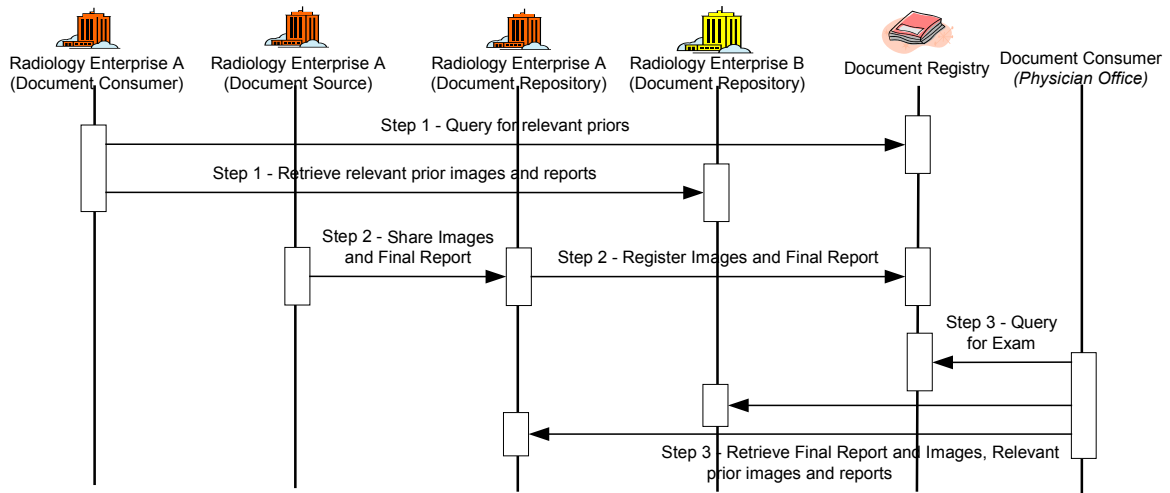
Figure 18.3.3-2: Process Flow – Routine Imaging Referral Use Case

18.3.3.2 Course of Treatment Consult Use Case

This scenario is a variation on the routine imaging referral use case in that an addendum is generated after completion of the final report. As such, this scenario is characterized by information being provided for sharing at two separate times while ensuring that the initial information is supplemented by the addendum report.

The use of addendum reports is commonly encountered in a course of treatment consultation where:

- An ER physician orders an exam, and the study is acquired in the affiliated radiology department.
- A department radiologist creates and shares a report as well as identifies key images and annotations.
- A remotely located surgical specialist, at the request of the ER physician, reviews the report along with key images and the full study, and provides a consult to the ER physician (this use case does not constrain the method for communicating the results of the consult, e.g., phone, fax, etc.).
- The radiologist identifies additional information and completes an addendum to the initial report.

Note that the scenario where the radiologist seeks an opinion from a more senior radiologist is similar to this use case.

18.3.3.2.1   Process Flow

The process flow description and steps are as for the routine imaging referral, but with the following variations (shown in bold):

Exam is ordered

Step 1: Obtain Relevant Prior Imaging Information

Exam Acquisition and Reporting

Step 2: Share Imaging Information within the Regional Health Network (Affinity Domain)

- The PACS at Enterprise A, serving as a "Imaging Document Source", provides imaging information to the document repository, which register the document in the registry, for sharing, including:

  - Acquired DICOM study
  - Report
  - Key images along with annotations

Step 3: Obtain and Display Study Results

ER Physician reviews the results

Step 4: Share Addendum to Report within the Regional Health Network (Affinity Domain)

- Sometime later on, the radiologist creates an addendum to the initial report. This addendum is transcribed into the RIS at Enterprise A and signed off by the radiologist. This addendum must now supplement the initial report.
- The RIS at Enterprise A performs a document query of the document registry for the first submission set
- The RIS at Enterprise A, serving as a "Imaging Document Source", provides the addendum for sharing to the document registry including the content of the first submission set and declaring the new document as an addendum to the initial report

Figure 18.3.3-3 shows the transaction diagram for this process flow.
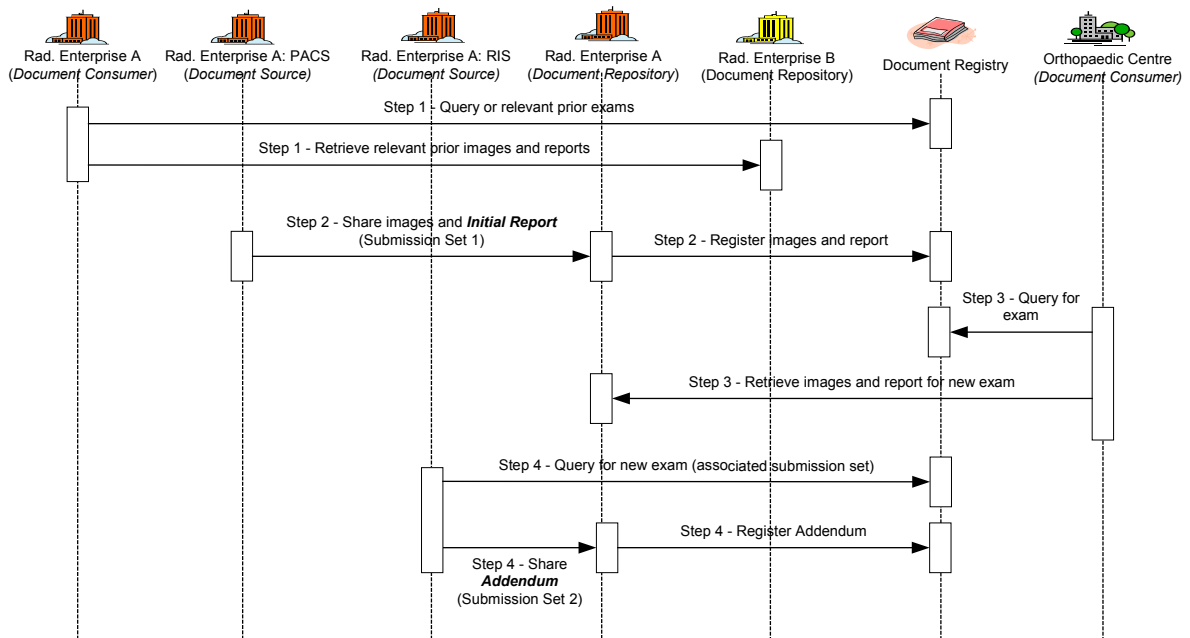
Figure 18.3.3-3: Process Flow – Course of Treatment Consult Use Case

18.3.3.3 Clinical Consult Use Case

This scenario is an extension of the routine imaging referral use case in that a consult report is generated based from the original imaging exam and radiologist report. As such, this scenario is characterized by information being provided for sharing at <u>two separate times by two separate source systems</u>.

The reports shared in this use case are based on the same initial imaging exam. However the reports are generated by different people and registered by different systems.

The generation of consult reports is commonly encountered in cancer treatment. As such, the following clinical consult use case is used to describe the scenario:

- A general practitioner performs a routine imaging referral (as per Use Case 1).
- In reviewing the imaging exam report from the radiologist, the practitioner chooses to send the patient to an oncologist for a consultation.
- The oncologist, located at a Cancer Center, reviews the report along with key images, the full study, and past imaging information records for the patient
- The oncologist generates an additional report that is made available to the general practitioner
- The general practitioner reviews the oncologists report and takes appropriate treatment action

18.3.3.3.1   Process Flow

Figure 18.3.3-4 highlights the people and systems participating in this regional health information network. These are the same as for the routine imaging referral but with one additional participant:

- *Physician Office*
- *RIS/PACS Enterprise A*
- *RIS/PACS Enterprise B*
- *Document Registry*
- *Oncologist*: An oncologist working out of a cancer center: Cancer Center. This center has an Electronic Health Record (EHR) application that serves as the POS application for reviewing imaging information within the regional health network. The EHR application has DICOM Viewing capabilities
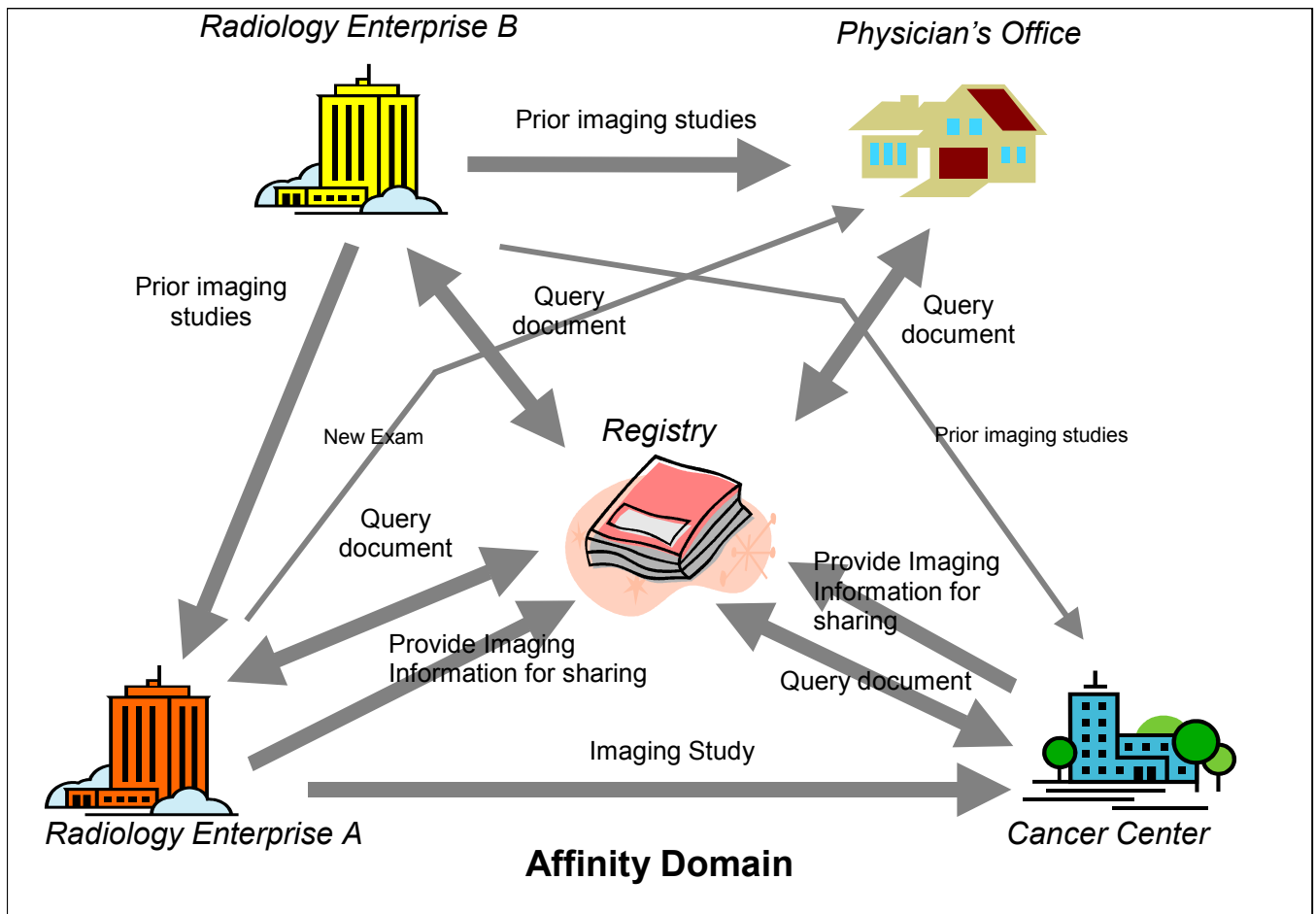
Figure 18.3.3-4: Data Flow within the Regional Health Network for a Clinical Consult

The process flow description and steps are as for the routine imaging referral, but with certain variations. The variations that pertain to information sharing are shown in bold (and numbered).

In contrast, the variations that do not pertain to the focus of information sharing are shown in italic (and not numbered).

Exam is ordered

Step 1: Obtain Relevant Prior Imaging Information

Exam Acquisition and Reporting

Step 2: Share Imaging Information within the Regional Health Network (Affinity Domain)

Step 3: Obtain and Display Study Results (General Practitioner)

- This is identical to Step 3 in the routine imaging referral use case
- Based on the radiology report, the general practitioner determines that a consult with an oncologist is required

Step 4: Obtain and Display Study Results (Oncologist)

- The EHR application in the oncologist's office, serving as a document consumer, queries the document registry in the regional health network. This query is triggered by a consult request from the general practitioner via paper, fax, phone, and/or electronic notification. The EHR application presents a list of imaging information available for the patient, including the most recent exam completed at Radiology Enterprise A
- The oncologist selects the exam reported by the radiologist as well as a number of relevant prior exams
- The EHR application in the oncologist's office, serving as an Imaging Document Consumer, retrieves the documents selected from the RIS/PACS document repositories in the regional health network and displays them to the oncologist
- The oncologist reviews the images using image manipulation tools such as window level, zoom, pan, invert, measurement, etc. The oncologist may also apply 3D rendering such as multi-planar reformatting

Oncologist Generates Consult Report

- The oncologist reviews the results of the examination along with prior exams
- The oncologist generates a consult report

Step 5: Share Consult Report within the Regional Health Network (Affinity Domain)

- The EHR application in the oncologist's office, serving as an "Imaging Document Source", provides the consult report to the document registry for sharing. This has reference to the original imaging exam, which was used during the consult.

Figure 18.3.3-5 shows the transaction diagram for this process flow.
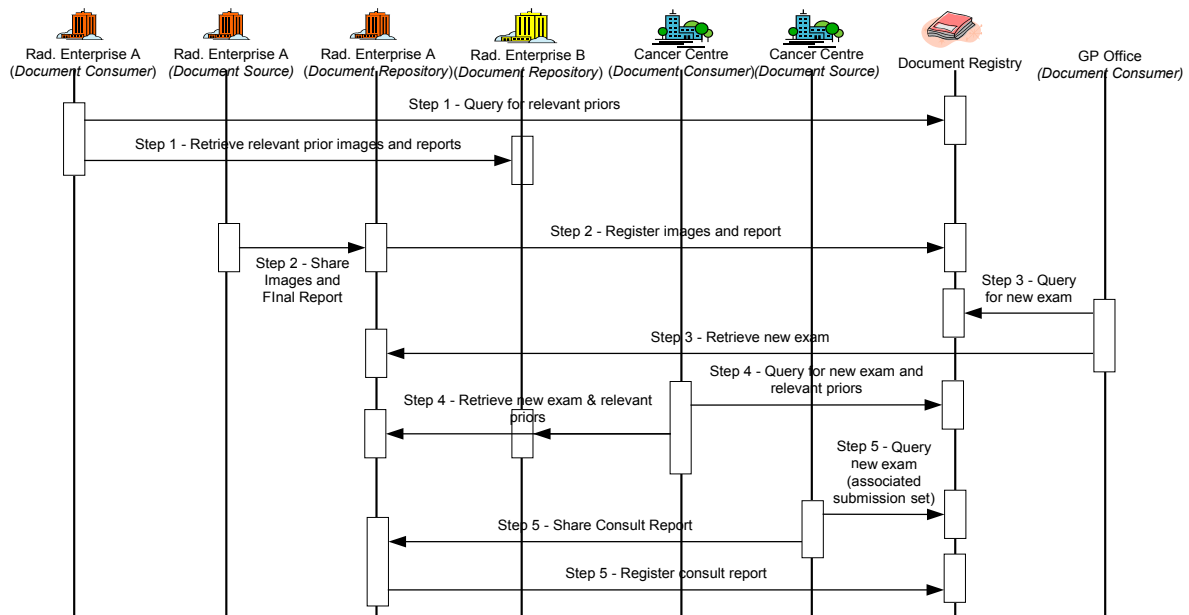
Figure 18.3.3-5: Process Flow – Clinical Consult Use Case

18.3.4 Queries

As presented in the use cases, human or machine users may query the Registry in order to retrieve documents in a subsequent step, based on the query result. The type of query attributes may vary between users or query scenarios, depending on the intent of the query. For instance, human users often wish to query specifically, restricting the search by several query attributes and values.

The following query attributes are relevant (but not exhaustive):

- Patient Identity – The patient is expected to be identified by Patient ID
- Exam Identity – The physician is looking for a specific exam. The attributes used to identify the exam may include one or more of the following:

  - Date
  - Modality
  - Body part/anatomical region
  - Document type – images, diagnosis, progress report, preliminary report, etc.
  - Author – in the case of reports, the physician may well identify the report by its author i.e., the radiologist and / or specialist

The metadata in the query response needs to be sufficient to allow the system consumer to parse the response and identify relevant priors. Relevant metadata includes (but is not limited to):

- Exam date
- Modality
- Body part/anatomical region
- Procedure code

18.4 Consumer Processing

18.4.1 Consumer Processing – Set of DICOM Instances

When the Imaging Document Consumer retrieves a manifest from the Document Repository, it is expected to decode the Key Object Selection Document Instance in order to find the references to DICOM objects. The Imaging Document Consumer is also expected to retrieve the referenced DICOM objects using DICOM retrieve or WADO. It should not make any assumptions about whether one or more studies are referenced within the Key Object Selection Document.

18.5 Patient Information Reconciliation

These considerations can be found in appendix G.

18.6 Security considerations

All XDS-I.b actors shall be grouped with either a Secure Node or Secure Application actor from the ATNA Profile. These actors shall also support the Radiology Audit Trail Option.

This grouping is required to provide the capability for security auditing, for establishing a trust relationship between systems exchanging information, and to enable secure data exchange. Some care sites may use alternate mechanisms for providing equivalent security.

Other security considerations can be found in Appendix H.

4.16 Retrieve Images

4110   This section corresponds to Transaction RAD-16 of the IHE Technical Framework. Transaction
RAD-16 is used by an Image Display actor to request and retrieve images from an Image
Archive and the Imaging Document Consumer to request and retrieve documents from an
Imaging Document Source actor.

4.16.1 Scope

4115   After the Image Display or Imaging Document Consumer request for image retrieval, the
requested DICOM Images are transferred from the Image Archive to the Image Display or from
the Imaging Document Source to the Imaging Document Consumer for viewing.

4.16.2 Use Case Roles
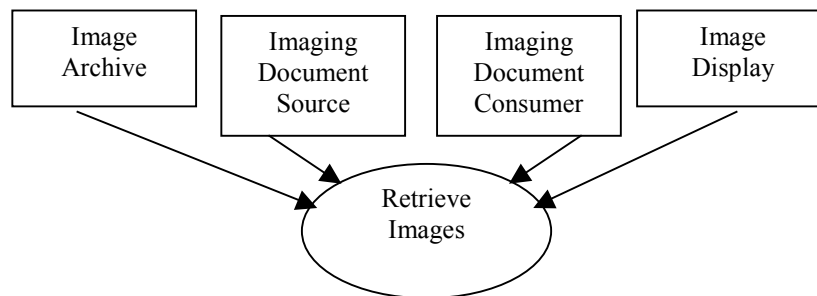
4120   **Actor:** Image Archive:

Role: Sends requested images to the Image Display Actor.

Actor: Imaging Document Source:

Role: Sends requested images to the Imaging Document Consumer Actor.

Actor: Image Display

4125   **Role:** Receives requested images from the Image Archive Actor.

Actor: Imaging Document Consumer

Role: Receives requested images from the Imaging Document Source Actor.

4.16.3 Referenced Standards

4130   DICOM 2011 PS 3.4: Storage Service Class

DICOM 2011 PS 3.4: Query/Retrieve Service Class

4.16.4 Interaction Diagram

Image Archive   Image Display

Retrieve Images (C-MOVE)

Store Images (C-STORE)

View Images

Imagig Document Source   Imaging Document Consumer

Retrieve Images (C-MOVE)

Store Images (C-STORE)

View Images
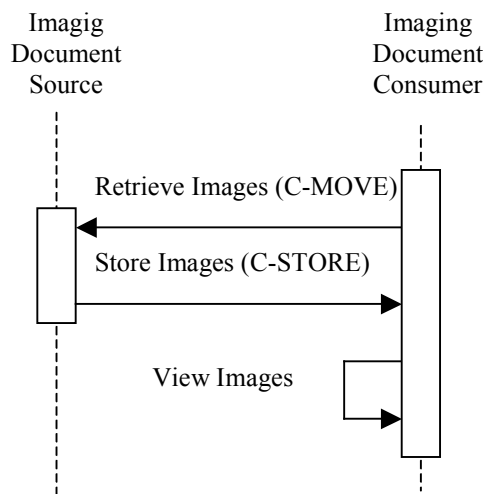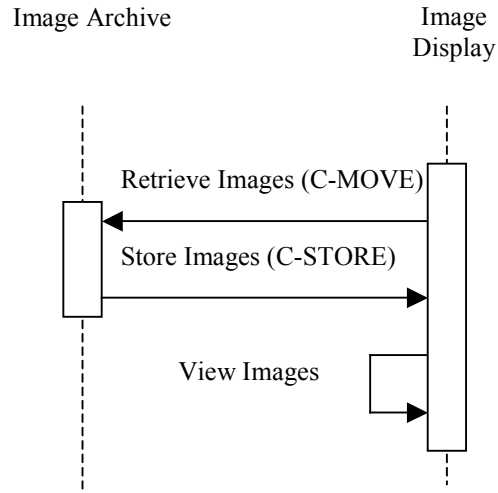
4135

4.16.4.1 Retrieve Images

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 or Imaging Document Source as an SCU. Refer to DICOM 2011 PS 3.4, Annex C, for detailed

4140   descriptive semantics.

In the case of retrieving images in a Cross-Enterprise, imaging document sharing (XDS-I) network environment, a configuration of mapping the AE Titles to DICOM AE Network Addresses (IP Address and Port number) are needed to be exchanged between the Imaging Document Source and the Imaging Document Consumer. RAD TF-3: Appendix G describes in

4145   details the AE Title mapping to the DICOM AE Network Addresses.

4.16.4.1.1   Trigger Events

Images are selected for viewing at the Image Display or Imaging Document Consumer.

4.16.4.1.2   Message Semantics

The message semantics are defined by the DICOM Query/Retrieve SOP Classes and the DICOM Image 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 or from the Imaging Document Consumer to the Imaging Document Source.

4.16.4.1.3   Expected Actions

The Image Archive or Imaging Document Source receives the C-MOVE request, establishes a DICOM association with the Image Display or Imaging Document Consumer, respectively, and uses the appropriate DICOM Image Storage SOP Classes to transfer the requested images. The Image Display or Imaging Document Consumer is expected to support at least one of the SOP Classes specified in table 4.8-1. It is assumed that support of retrieval for a SOP Class also means support for display.

4.16.4.1.3.1   NM Image Profile

Image Manager/Image Archive, Imaging Document Source, Image Displays and Imaging Document Consumer actors that claim the NM Image Profile shall support all the SOP Classes specified in Table 4.8-3 in section 4.8.

4.16.4.1.3.2   Mammography Image Profile

Image Manager/Image Archive actors supporting the Mammography Image Profile shall support all the SOP Classes specified in Table 4.16.4.1.3.2-1.

Image Display actor supporting the Mammography Image Profile shall support all the SOP Classes specified in Table 4.16.4.1.3.2-1.

Table 4.16.4.1.3.2-1: Mammography SOP Classes for Display

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.1.2	Digital Mammography Image Storage – For Presentation

Note that Image Displays are not required to support "For Processing" images.

4.16.4.2 View Images

This transaction relates to the "View Images" event of the above interaction diagram.

4.16.4.2.1　Trigger Events

The Image Display or Imaging Document Consumer is requested to be capable to display the images.

4180 **4.16.4.2.2　Invocation Semantics**

This is a local invocation of functions at the Image Display or Imaging Document Consumer.

4.16.4.2.2.1　Display of Digital X-Ray, Mammo and Intra-Oral Images

For the "For Presentation" variant of the Digital X-Ray Image, the Digital Mammography Image, and the Digital Intra-oral X-Ray Image, the Image Display or Imaging Document
4185　Consumer actor shall have both the capability to apply all the transformations specified by the VOI LUT Sequence (0028,3010) and the capability to apply all the transformations specified by the Window Width (0028,1051)/Window Center (0028,1050)/VOI LUT Function (0028,1056) attributes in the DX Image Module as selected by the user from the choices available (e.g., guided by Window Center/Width Explanation (0028,1055) or LUT Explanation(0028,3003).

4190　If VOI LUT Function (0028,1056) is absent, then Window Width (0028,1051)/Window Center (0028,1050) shall be assumed to be the parameters of a linear window operation. VOI LUT Function (0028,1056) values of "SIGMOID" and "LINEAR" shall be supported.

The Image Display or Imaging Document Consumer shall support the application of LUT Data (0028,3006) in items of the VOI LUT Sequence (0028,3010) regardless of the Value
4195　Representation (i.e., the DICOM standard allows either OW or US Value Representation).

The Image Display or Imaging Document Consumer actor must also support pixel rendering according to the Grayscale Standard Display Function (GSDF) defined in DICOM 2011 PS 3.14, because the output values of these images are always P-Values.

If the DICOM image is referenced by other DICOM composite objects, such as Grayscale
4200　Softcopy Presentation States, it is optional for the Image Display or Imaging Document Consumer to actually retrieve and display/apply these objects.

4.16.4.2.2.1.1 Display of Digital Mammography Images

The contents of this section are required for Image Display claiming the Mammography Image Profile.

4205　The following requirements are intended to establish a baseline level of capabilities. Providing more intelligent and advanced capabilities is both allowed and encouraged and the profile is not intended to be limiting in any way with respect to capabilities. The intention is not to dictate implementation details.

All mammography Image Display actors shall support the Retrieve Images transaction for "For
4210　Presentation" images.

189

The Image Display shall be capable of displaying simultaneously a set of current and prior conventional four view screening mammogram images (left and right CC and MLO views), regardless of whether these images are in one or multiple DICOM Series.

An Image Display that supports the Mammography Image Profile shall support calibration as described in the DICOM Grayscale Standard Display Function (GSDF). The minimum and maximum luminance of the display shall be configurable by the site, within the gamut of the device, for the purpose of conforming to local, regional or national regulatory and other requirements for luminance settings throughout the organization. For example, a site may require that all Image Displays used for primary interpretation be calibrated to the same minimum and maximum luminance.

4.16.4.2.2.1.1.1 Background Air Suppression

Image Display actors shall be capable of recognizing pixels that have the value specified in Pixel Padding Value (0028,0120) when present alone, and between Pixel Padding Value (0028,0120) and Pixel Padding Range Limit (0028,0121) inclusive when both elements are present, and setting them to a minimum display value that is not affected by image contrast adjustments, including inversion of the image contrast.

4.16.4.2.2.1.1.2 Image Orientation and Justification

Image Display actors shall not assume that the pixel data is encoded with an orientation that is suitable for direct display to the user without flipping or rotating into the correct orientation.

The Image Display actor shall use the values of Image Laterality (0020,0062), View Code Sequence (0054,0220), View Modifier Code Sequence (0054,0222) and Patient Orientation (0020,0020) to display images according to the preferred hanging protocol of the current user, rather than depend on descriptive attributes such as Series Description (0008,103E).

The Image Display shall allow the user to select or configure hanging protocols such that given a set of images containing these attributes, the placement of images relative to one another, the required orientation of the images, the display of current and prior images, and the sequence of layouts displayed can be defined.

Note that images are normally displayed such that the axilla is towards the top of the viewport, except for cleavage views (which contain two axillas). The location of the axilla can be determined from the direction of the head encoded in Patient Orientation (0020,0020) in the case of lateral and oblique views, and the Image Laterality (0020,0062) in the case of cranio-caudal or caudo-cranial views. For cleavage views, indicated by the presence of a View Modifier Code Sequence (0054,0222) Item containing (R-102D2, SNM3, "Cleavage"), either axilla may be at the top of the view port.

The Image Display shall be able to distinguish and display separately images with one or more Items in a View Modifier Code Sequence (0054,0222) from each other and those without a View Modifier Code Sequence (0054,0222) Item.

190

The Image Display shall be capable of horizontally justifying the image to the left or right side of the viewport rather than centering it, when the aspect ratio (ratio of the number of rows and columns) of the viewport does not match aspect ratio of the image, in order to avoid displaying any unnecessary padding between the adjacent chest walls of back to back images; excessive window decoration (such as scroll bars) shall not be displayed between back to back viewports.

4250

4.16.4.2.2.1.1.3 Image Size

The physical size of the pixels in an image for the purposes of the display modes defined in this section shall be approximated by using the values of Imager Pixel Spacing (0018,1164).

4255

The physical size of the pixels in an image for the purposes of distance measurements and the display of a distance caliper shall be approximated by using the values of Imager Pixel Spacing (0018,1164) divided by Estimated Radiographic Magnification Factor (0018,1114).

For contact (unmagnified) views, the value of Estimated Radiographic Magnification Factor (0018,1114) is typically 1, or close to 1, depending on the distance between the detector side of the compressed breast and the front of the detector housing (the latter being the plane in which Imager Pixel Spacing (0018,1164) is defined), and what depth the nominal location of the object plane is within the compressed breast.

4260

For magnification views, the spacing between the detector side of the compressed breast and the detector is increased substantially relative to the distance to the x-ray source to obtain geometric magnification, and Estimated Radiographic Magnification Factor (0018,1114) will have a value substantially greater than 1.

4265

Pixel Spacing (0028,0030) shall not be used to determine size for the purpose of sizing for display or distance measurements. DICOM CP 586, which clarifies the meaning of Pixel Spacing (0028,0030) values that differ from Imager Pixel Spacing (0018,1164) values when an image has been calibrated by use of a fiducial of known size within the image, is not relevant to mammography applications.

4270

Note that the use of Imager Pixel Spacing (0018,1164) is sufficient regardless of the physical size of the detector used.

4275 **4.16.4.2.2.1.1.3.1 Same Size**

The Image Display shall be capable of displaying multiple images such that all images are at the same relative physical size, regardless of whether they have the same values of Imager Pixel Spacing (0018,1164) or not.

For example, a user reviewing a four-view screening mammogram together with a four-view prior mammogram might want to display eight viewports, each showing one view, such that the each view is at the same relative physical size, even if the images were obtained on detectors with different sized pixels. This allows the user to compare features in the prior and current images to visually assess whether or not they have changed in size.

4280

Note that it is not expected that the Image Display attempt to compensate for the location of the object within the compressed breast of finite thickness along the x-ray beam, since the

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convention for measurement from film-screen practice assumes that all objects are located at the cassette (detector) side of the breast.

This mode of display is not intended for comparison of geometrically magnified views at the same time as non-magnified views, since the geometrically magnified view would then be
4290   displayed too small.

4.16.4.2.2.1.1.3.2 True Size

The Image Display shall be capable of displaying multiple images such that all images are true size, regardless of whether they have the same values of Imager Pixel Spacing (0018,1164) or not.

4295   True size is defined as the display of an image such that an object in the image when measured with a hand-held ruler on the surface of the display measures as closely as possible to the true physical size of the object if located on the front face of the detector housing.

This mode of display is not intended for geometrically magnified views, since the geometrically magnified view would then be displayed too small.

4300   ### 4.16.4.2.2.1.1.3.3 View Actual Pixels

The Image Display shall be capable of displaying multiple images such that each encoded pixel occupies one display pixel in the viewport.

If the size of the pixel data exceeds the size of the viewport, it may not be possible to display all of the encoded pixels at once, in which case some form of pan or quadrant navigation
4305   functionality shall be provided.

Since there is no minification or magnification, images with different pixel physical size will be displayed in this mode such that the physical size in the patient will appear different.

4.16.4.2.2.1.1.4 Image Contrast Adjustment

As described in 4.16.4.2.2.1 Display of Digital X-Ray, Mammography and Intra-Oral Images,
4310   the Image Display shall provide the user with the ability to select amongst the available window and VOI LUT choices available in the image object.

Subsequent to the initial application of the chosen contrast transformation, the Image Display actor shall allow the user to adjust the contrast without reverting to a purely linear transformation:

4315   - If the chosen contrast transformation is a lookup table, then the Image Display shall allow the input value of the lookup table to be stretched and translated so as to give the affect of adjusting contrast and brightness whilst applying the same general shape as the curve encoded in the lookup table. To provide feedback to the user, the "window width" can be reported as the adjusted range of input values to the LUT, and the "window center" can
4320   be reported as the center value of that range.

- If the chosen contrast transformation is a sigmoid shaped VOI LUT Function parameterized by the window center and width, then the Image Display shall allow the window center and width values to be adjusted and a sigmoid function reapplied.

4325 If a Pixel Padding Value (0028,0120) only is present in the image then image contrast manipulations shall be not be applied to those pixels with the value specified in Pixel Padding Value (0028,0120).

If both Pixel Padding Value (0028,0120) and Pixel Padding Range Limit (0028,0121) are present in the image then image contrast manipulations shall not be applied to those pixels with values in the range between the values of Pixel Padding Value (0028,0120) and Pixel Padding Range 4330 Limit (0028,0121), inclusive.

4.16.4.2.2.1.1.5 Annotation of Image Information

Quite apart from good practice, there are nationally-specific requirements for information to be displayed (or displayable) to the user in order to ensure correct identification of the patient and study during reporting and review as well as the resolution of quality issues.

4335 This profile defines the union of currently known and anticipated nationally-specific requirements with respect to annotation.

It is desirable that the subset of attributes displayed be configurable by the user or the site.

If annotations are overlayed on the displayed image, the Image Display shall not annotate the edge that contains the chest wall, as determined from (0020,0020) Patient Orientation, so as to 4340 avoid covering breast tissue.

4.16.4.2.2.1.1.5.1 Annotation of Identification Information

The Image Display shall be capable of displaying the information contained in the attributes listed in Table 4.16.4.2.2.1.1.5.1-1. The required information is defined in two categories:

- Clinical - Those attributes that are useful during interpretation and review of the images
4345 for clinical purposes, and which under normal circumstances should be displayed
- Investigative - Those attributes that are useful for investigative purposes, such as to trace a quality problem, and which under normal circumstances are a distraction and should not be displayed until requested by the user

4350 **Table 4.16.4.2.2.1.1.5.1-1: Identification Attributes for Display**

Attribute	Tag	Requirement
Patient's Name	(0010,0010)	Clinical
Patient ID	(0010,0020)	Clinical
Patient's Birth Date	(0010,0030)	Clinical
Patient's Age	(0010,1010)	Clinical
Acquisition Date	(0008,0022)	Clinical
Acquisition Time	(0008,0032)	Clinical

Attribute	Tag	Requirement
Operator's Name	(0008,1070)	Clinical
Manufacturer	(0008,0070)	Investigative
Institution Name	(0008,0080)	Clinical
Institution Address	(0008,0081)	Investigative
Manufacturer's Model Name	(0008,1090)	Investigative
Device Serial Number	(0018,1000)	Investigative
Detector ID	(0018,700A)	Investigative
Software Versions	(0018,1020)	Investigative
Station Name	(0008,1010)	Clinical
Gantry ID	(0018,1008)	Clinical (for CR overrides Station Name, which is plate reader)
Date of Last Detector Calibration	(0018,700C)	Investigative

Note that it is common practice to use the Operator's Name (0008,1070) to encode the initials rather than the full name of the operator, and this is sufficient to meet known regulatory requirements.

4355   Note also that Station Name (0008,1010) (or Gantry ID (0018,1008) for CR) are typically short, human-recognizable strings meaningful to the users, and are preferred for satisfying any regulatory requirement for "mammography unit identification" over the more cryptic but precise attributes like Device Serial Number (0018,1000).

The Image Display shall make the investigative set of values available to the ordinary user, but
4360   these need not necessarily be annotated directly on the image, e.g., they might be displayed in a separate pop-up window.

It shall be possible to turn on or off either set of annotations at the user's discretion.

4.16.4.2.2.1.1.5.2 Annotation of Technical Factor Information

Good practice dictates that certain technical factors be displayed (or displayable) to the user in
4365   order to detect and resolve quality issues.

In addition, there are technical factors that are unique to the digital realm. One such factor is related to the adjustment of the sensitivity and/or dynamic range of the sensor or processing, corresponding to the amount of radiation reaching the detector. These are variously referred to by manufacturers as ADU, exposure index, or sensitivity. Note that interpretation of this value is
4370   vendor-specific, though may be standardized in the future by AAPM.

The Image Display shall be capable of displaying the information contained in the attributes listed in Table 4.16.4.2.2.1.1.5.2-1.

Table 4.16.4.2.2.1.1.5.2-1: Technique Attributes for Display

Attribute	Tag
KVP	(0018,0060)
Exposure	(0018,1152)
Exposure Time	(0018,1150)
Filter Material	(0018,7050)
Anode Target Material	(0018,1191)
Compression Force	(0018,11A2)
Body Part Thickness	(0018,11A0)
Positioner Primary Angle	(0018,1510)
Relative X-ray Exposure	(0018,1405)
Entrance Dose in mGy	(0040,8302)
Organ Dose	(0040,0316)

4375 It shall be possible to turn on or off the annotations at the user's discretion.

4.16.4.2.2.1.1.5.3 Annotation of View Information

Traditional film-screen practice requires the use of lead markers consisting of letters encoding the type of view, located in the corner of the film that is opposite the chest wall and towards the axilla.

4380 Image Displays shall mimic this practice by annotating the viewport with abbreviations derived from the value of Image Laterality (0020,0062), View Code Sequence (0054,0220) and any values of View Modifier Code Sequence (0054,0222) Items that are present.

Unless otherwise overridden by nationally specific extensions, the specific abbreviations to be displayed are as defined in the View Modifier Abbreviations Column of CID 4014 and CID 4015
4385 of DICOM PS 3.16, which is derived from ACR MQCM 1999, with the following clarifications:

- The Image Laterality shall be prepended to the abbreviation, e.g., a right CC view shall be displayed as "RCC"
- A CC view with a cleavage modifier shall be annotated as only "CV" if Image Laterality has a value of "B", i.e., the "CC" shall not be displayed, and the laterality shall be
4390 omitted (in which case the left and right breast can be determined from the value of Patient Orientation (0020,0020)); otherwise "LCV" or "RCV" shall be used
- A right MLO view with the axillary tail modifier shall be annotated only as "RAT", i.e., the "MLO" shall not be displayed
- The implant displaced modifier shall be appended as a suffix to the view, as if it were
4395 defined as "…ID", e.g., a right implant displaced CC view would be annotated as "RCCID"
- A spot compression modifier shall be prepended as a prefix to the view, as if it were defined as "S…", e.g., a left spot compression CC view would be annotated as "LSCC"

- A tangential modifier shall be annotated as only "TAN", i.e., the "CC" or whatever else is encoded as the view, shall not be displayed
- When multiple prefix or suffix modifiers are present, they shall be sorted alphabetically, e.g., a right magnified, spot compression, implant displaced, rolled lateral CC view would be annotated as "RMSCCIDRL"

Spaces and other delimiters are permitted between components of the abbreviations.

Prior to any flip or rotation for display, the location of the corner opposite the chest wall and towards the axilla can be determined from the direction of the chest wall encoding in Patient Orientation (0020,0020), regardless of view, and the direction of the head encoded in Patient Orientation (0020,0020) in the case of lateral and oblique views, and the Image Laterality (0020,0062) in the case of cranio-caudal or caudo-cranial views. For cleavage views, the axilla at the top of the viewport shall be annotated. See also 4.16.4.2.2.1.1.2 Image Orientation and Justification.

It shall be possible to turn on or off the annotations at the user's discretion.

4.16.4.2.2.1.1.6 Annotation of Size Information

For the purpose of this section, physical pixel size is as defined in Section 4.16.4.2.2.1.1.3 Image Size.

The user needs to be aware when the displayed image does not reflect a 1:1 rendition of an encoded image pixel to a displayed pixel, i.e., that some magnification or minification has taken place. Anything other than 1:1 rendition may result in loss or distortion of information.

Further, the user needs to be aware of whether or not the image is displayed at true size, and whether or not different images are at the same relative physical size.

Therefore, the Image Display shall be capable of annotating the displayed images with the following:

- Pixel Size Magnification - Number of displayed pixels relative to the number of encoded image pixels, such that a factor of 1.0 (or 100%) means 1:1 rendition, a factor of less than 1.0 means that one pixel on the display represents more than one pixel in the encoded image (minification), and a factor of greater than 1.0 means that pixels in the encoded image have been replicated or interpolated to span multiple displayed pixels (magnification)
- True Size Magnification - Size of the displayed pixels relative to true size, such that a factor of 1.0 (or 100%) means true size, a factor of less than 1.0 means smaller than true size, and a factor of greater than 1.0 means larger than true size

The exact form of these two relative pixel size indications is left to the discretion of the implementer.

The Image Display shall be capable of displaying a ruler or caliper indicating the physical size of the displayed image, for the purpose of providing a visual cue to the user of the general size of the features in the image. It shall be possible to turn on or off the ruler at the user's discretion.

The Image Display shall provide a means of accurately measuring distance between two points based on the physical size of the image pixels.

4.16.4.2.2.1.1.7 Partial View Option

4440 If the Image Display supports the Partial View Option, it shall additionally annotate the displayed image in the view port to indicate:

- when the image is a partial view, as defined by the presence of Attribute Partial View (0028,1350) with a value of YES
- which region of the mosaic the image represents, as encoded in Partial View Code Sequence (0028,1352), if present

4445

Whether or not this annotation is textual or in the form of some iconic graphic representation, and whether or not any navigational or layout assistance is provided for the entire mosaic is at the discretion of the implementer.

4.16.4.2.2.1.1.8 Display of CAD Marks

4450 Image Displays shall be able to apply marks on the displayed image corresponding to all findings encoded in Mammography CAD SR objects with a (111056, DCM, "Rendering Intent") value of (111150, DCM, "Presentation Required"). They may be able to display additional findings that have a (111056, DCM, "Rendering Intent") value of (111151, DCM, "Presentation Optional").

The Image Display shall make the user aware that CAD marks are available for display, and
4455 indicate whether or not CAD marks are currently activated. More than one set of CAD objects could be available that are applicable to the same image (e.g., CAD was run more than once on the same images). If this is the case then all CAD SRs shall be made available for display on the review workstation with the most recent CAD SR (by Content Date/Time) being displayed by default. The user shall be able to choose which CAD SR object is to be displayed.

4460 Only a single CAD SR object at a time shall be applied to a displayed image.

The Image Display shall be able to apply the marks to "For Presentation" images that are referenced by the Mammography CAD SR SOP Instance.

The Image Display shall also be able to apply the marks to "For Presentation" images whose Source Image Sequence references the SOP Instance UID of the "For Processing" images that
4465 are referenced by the Mammography CAD SR SOP Instance, unless the Spatial Locations Preserved (0028,135A) is present in the Source Image Sequence Item and has a value of NO.

The Patient Orientation of the images referenced in the Source Image Sequence encoded in (111044, DCM, "Patient Orientation Row") and (111043, DCM, "Patient Orientation Column") of the Mammography CAD SR SOP Instance shall be used to transform (flip or rotate) the
4470 coordinates of the CAD marks if it differs from the Patient Orientation (0020,0020) of the corresponding "For Presentation" image.

The form in which the CAD marks are displayed may influence observer performance, and hence it may be necessary to display them in a manner prescribed by the CAD device vendor,

which is not encoded in the DICOM object. The form of the CAD mark rendering is out of the scope of this profile to define.

The Image Display shall make available for display the following information about each CAD finding, if encoded in the CAD object:

- Manufacturer (0008,0070)
- Algorithm as defined in (111001, DCM, "Algorithm Name") and (111003, DCM, "Algorithm Version")
- Operating point as defined in (111071, DCM, "CAD Operating Point")
- Content Date (0008,0023) and Content Time (0008,0033) of the CAD SR instance, if more than one exists and applies to the displayed image

The Image Display shall indicate when CAD was not attempted or has failed, either entirely, or if some algorithms have succeeded and others failed, as distinct from when CAD has succeeded but there are no findings. This information shall be obtained from the status values of (111064, DCM, "Summary of Detections") and (111065, DCM, "Summary of Analyses").

4.16.4.2.2.1.1.9 Post-Processing of For Presentation Images

This profile does not constrain the ability of the Image Display to further post-process "For Presentation" images, for example with edge enhancement or noise reduction.

However, there shall be a mode in which actual pixels of "For Presentation" images are displayed not only with 1:1 display to encoded pixel size, but with no further processing or interpolation other than application of point grayscale transformations.

4.16.4.2.2.1.1.10 Accidental reading of prior studies

There is a significant risk that during primary interpretation the most recently available prior study on the Image Display will be interpreted by the user as the current study, if for some reason the current study is not available.

Accordingly, it is required that an Image Display explicitly warn the user if none of the studies being displayed are within a user configurable period from the current real time, as determined by Acquisition Date (0008,0022).

4.16.4.2.2.2 Display of Localizer Lines

Image Display or Imaging Document Consumer actors that want to show the localizer lines, if visible, will be able to calculate the position of these lines of intersection based on the information recorded in the images by the Acquisition Modality actor (See 4.8.4.1.2.1).

4.16.4.2.2.3 Display of NM Images

The contents of this section are required for Image Displays claiming the NM Image Profile.

The following requirements are intended to establish a baseline level of capabilities. Providing more intelligent and advanced capabilities is both allowed and encouraged. The intention is to focus on display capabilities, not to dictate implementation details.

4510   Note that the NM Image profile is undergoing revision, and vendors considering implementation are advised to include the modifications contained in the trial implementation version "NM Image Profile with Cardiac Option". For additional information please contact the IHE Radiology Technical Committee at IHE-Rad-Tech@googlegroups.com.

Some examples of display behaviors typical to NM are described in RAD TF-1, Appendix E.5.3.

4515   The NM Image IOD is a multi-frame image indexed by vectors as described in Section 4.8.4.1.2.2.1. "Image" will be used here to strictly refer to the IOD, while frame will be used to refer to the usual two-dimensional array of pixels.

The Image Display shall be able to display the frames in the order they are stored in the image.

The Image Display shall be able to perform the frame selections shown for each Image Type in
4520   the Table 4.16-1 and as described below in 4.16.4.2.2.3.1 Frame Selection Support. The result of a frame selection will be referred to as a "frameset" in this document. Note that a frameset only references frames from a single Image.

The Image Display shall be able to display simultaneously multiple framesets. These may be from the same Image, different Images, different Series, or different Studies.

4525   The Image Display is not required to display simultaneously multiple framesets with different Image Types. (Note that two exceptions to this are identified in 4.16.4.2.2.3.5 Review Option).

The Image Display shall be able to display simultaneously at least the number of framesets indicated in table 4.16-1.

All frames in the displayed frameset(s) are not required to be on the screen at once; if there are
4530   more frames than fit on the screen based on the current frame display size (see Section 4.16.4.2.2.3.4 Image Zoom), the ability to scroll through the frames is required.

The Image Display shall be able to display, if present, the View Code Sequence (0054,0220), Acquisition Context Sequence (0040,0555), Series Description (0008,103E) and Acquisition Time (0008,0032) values for a given frameset.

4535   The Image Display is required to support the display capabilities for each Image Type shown in table 4.16-1.

Table 4.16-1: Selection, Sorting and Viewing Requirements for NM Images

Image Type (0008,0008) Value 3	Frame Increment Pointer (0028,0009) [i.e., vectors]	Required Frame Selection[1] E = single **E** = all	Display Capabilities (See 4.16.4.2.2.3.2)	# of Simultaneous Framesets	
				Basic	Review Option
STATIC	Energy Window (0054,0010) Detector (0054,0020)	**E D**	Grid Display	1	1
		E **D**	Fit Display	12	12
		E D *	Cine	-	1 (optional))
WHOLE BODY	Energy Window(0054,0010)	**E D**	Whole body Display	2	4 [2]

199

Image Type (0008,0008) Value 3	Frame Increment Pointer (0028,0009) [i.e., vectors]	Required Frame Selection[1] E = single **E** = all	Display Capabilities (See 4.16.4.2.2.3.2)	# of Simultaneous Framesets	
				Basic	Review Option
	Detector(0054,0020)	E **D** **E** D *			
DYNAMIC	Energy Window (0054,0010) Detector (0054,0020) Phase (0054,0100) Time Slice (0054,0030)	**E D P T** E D P **T** E D **P T**	Grid Display	1	1
			Comparison Display	1	2
			Cine	1	2
GATED	Energy Window (0054,0010) Detector (0054,0020) R-R Interval (0054,0060) Time Slot(0054,0070)	**E D I T**	Grid Display	1	1
			Comparison Display	3	6
			Cine	3	6
TOMO	Energy Window (0054,0010) Detector (0054,0020) Rotation (0054,0050) Angular View (0054,0090)	**E D R A**	Grid Display	1	1
			Comparison Display	3	3
			Cine	3	3
GATED TOMO	Energy Window(0054,0010) Detector (0054,0020) Rotation (0054,0050) R-R Interval (0054,0060) Time Slot (0054,0070) Angular View (0054,0090)	**E D R I T A** **E D R I T** A **E D R I** T **A** - any one of above three	Grid Display	1	1
			Cine	1	1
RECON TOMO	Slice(0054,0080)	**S**	Grid Display	1	1
			Comparison Display	3	6
			Cine	3	3
			MPR Display	-	1
GATED RECON TOMO	R-R Interval (0054,0060) Time Slot(0054,0070) Slice (0054,0080)	**I T S** **I T** S **I** T **S** *	Grid Display	1	1
			Comparison Display	1	2
			Cine	-	2
			MPR Display	-	1

4540

Note 1: The Frame Selection column refers to the Frame Increment Pointer vectors by their first letter (except for R-R Interval which uses "I" for Interval). A letter shown underlined and bold (e.g., **E**) indicates that all values for that vector are selected. A letter shown in plain text (e.g., E) indicates that a single value for that vector has been selected. So in the case of the TOMO Image Type, **E** R D A means that all frames of the image are selected; while E R D A means that the selected frames represent all Angular Views for a specific Energy Window, a specific Detector and a specific Rotation. An asterisk (*) indicates that it is required under the review option only, and not required

4545 under the basic NM Image profile.

Note 2: The requirement for 4 framesets is to handle the case where the 4 frames are in separate framesets due to the anterior and posterior views being in separate images. It is not required to support 4 framesets with 2 frames each.

4.16.4.2.2.3.1 Frame Selection Support

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A Frame Selection consists of either a single value, or "all values" being identified for each vector in the Image. In fact (except for the case of selecting "all frames" and the case of selecting all phases and time slices in a Dynamic Image) a single value will be identified for all but one of the available vectors.

4555

It is not necessary to require the user to specify a value for single valued vectors, such as when, for example, only a single detector value is present. It is desirable for the application to provide a way to make a selection when a vector that is *typically* single valued unexpectedly has additional values.

4560

When selecting values for certain vectors, the user shall be presented with meaningful terms, if available, rather than the underlying integer values from the DICOM vector. For example, in the case of the detector vector, if the View Code Sequence it present, the terms contained there (e.g., "Anterior", "Posterior") shall be used instead of the Detector Number from the vector.

The sources of selection terms in priority order (i.e., the first, if present shall be used, otherwise consider the next) are shown in the following table:

Table 4.16-2: Sources of Value Selection Terms for Vectors

Vector	Source of Selection Terms
Energy Window	1. Energy Window Name (0054,0018) 2. Energy Window Lower Limit (0054,0014) & Energy Window Upper Limit (0054,0015) 3. Energy Window Number
Detector	1. View Code Sequence (0054,0220) 2. Detector Number
Phase	1. Phase Description (0054,0039) 2. Phase Number
Rotation	1. Rotation Number
R-R Interval	1. R-R Interval Number
Time Slot	1. Time Slot Number
Angular View	1. Angular View Number
Slice	1. Slice Number

4565

One method of allowing the user to select a frameset by vectors might be to display a multi-vectored image to the user as if it were broken down into its components by vector. For example, a 2-phase dual-detector GI bleed study might be shown to the user as

GI-bleed Phase-1 Anterior

GI-bleed Phase-1 Posterior

4570

GI-bleed Phase-2 Anterior

GI-bleed Phase-2 Posterior

This is acceptable as a means of frame selection support, provided the user has the option of selecting all the parts of the image for display as at the same time, should the user desire to do so, and provided that the multi-vectored image remains as a single image if it is sent via DICOM to
4575 another system.

4.16.4.2.2.3.2 Display Capabilities

Image Displays are required to support the following display formats as indicated above in Table 4.16-1

Practical examples of the usage and appearance of these display capabilities can be found in
4580 RAD TF-1 Appendix E.5 NM Display and in particular in RAD TF-1, Appendix E.5.3 NM Display Examples.

4.16.4.2.2.1.1.1 Grid Display

For Grid Display, the Image Display shall display a single frameset arranged in a 2D grid of frames.

4585 ### 4.16.4.2.2.1.1.2 Fit Display

For Fit Display, the Image Display shall display several framesets simultaneously. Efficient use of screen space is encouraged. The Image Display is free to organize the frames any way that seems sensible. In the absence of other useful information, it is common to display them in order of acquisition time.

4590 ### 4.16.4.2.2.1.1.3 Comparison Display

For Comparison Display, the Image Display shall display several framesets simultaneously in a fashion such that frames in the two framesets can be compared. For example, each frameset could be placed on an adjacent row.

Display of each frameset in a single row (i.e., the number of rows equals the number of
4595 framesets) is required. Support for more than one row per frameset is optional.

Comparison requires that the relationship between frames in the two framesets be maintained when navigating, and to be adjusted separately/established.

4.16.4.2.2.1.1.4 Whole Body Display

For Whole body Display, the Image Display shall simultaneously display of both the anterior and
4600 posterior frames of an NM whole body image.

These images will typically be rectangular in shape (taller than wide) and are typically 256 x 1024 or 512 x 1024 in size. The display system should display them as rectangular frames (and not pad them to make them square).

4.16.4.2.2.1.1.5 MPR (Multi-Planar Reconstruction) Display

4605 For MPR Display, the Image Display shall provide MPR capabilities for slice stack data. Typically, MPR involves displaying three orthogonal plane views at the same time along with a method of navigating the volume (i.e., controlling the specific sagittal, coronal and transaxial images shown).

4610 The Image Display is not required to generate oblique slices from slice data, but is required to generate orthogonal slices even if the slice data is obliquely oriented.

In the NM Image Profile, MPR Display shall be supported when claiming the Review Option (See section 4.16.4.2.2.3.5). When displaying NM Data, the Image Display shall be specifically capable of taking a frameset of slice data from a RECON TOMO or GATED RECON TOMO image and displaying all three orthogonal plane views (transaxial, saggital and coronal). PET

4615 transaxial data in the MPR display is strongly encouraged, but not required under the NM Profile.

Refer to DICOM documentation for details on how orientation and spatial information is encoded in the NM Image IOD.

4.16.4.2.2.1.1.6 Cine Display

4620 The Image Display shall be able to display a cine of the selected frames as indicated by the order they are stored in the Image.

The Image Display shall be capable of displaying cines of multiple framesets simultaneously as indicated above in Table 4.16-1.

When the framesets have the same number of frames, the Image Display shall be capable of

4625 displaying the cines in synchronization (i.e., the first frame of each frameset should display simultaneously, the second frame of each frameset should display simultaneously, etc.).

The Image Display shall provide the ability to adjust intensity (as described below in Section 4.16.4.2.2.3.3) for each frameset independently. The ability to adjust intensity while a cine is running is useful but not required.

4630 ### 4.16.4.2.2.3.3 Intensity and Color

NM clinical practice requires the ability to adjust the Upper and Lower Window Levels rather than the Window Center and Window Width. Refer to RAD TF-1, Appendix E.5.1 for details on NM usage of intensity and color attributes.

For all images with a modality type of NM, the Image Display shall provide direct control over

4635 the Upper Window Level and the Lower Window Level display parameters independently from each other for both grayscale and pseudocolor display.

This control shall be available for all frames as a group and for each frameset individually. Optionally is it also useful to support adjustment of individual frames.

Window Level values shall be translated into equivalent Window Width and Center values when

4640 stored in the image attributes.

The Image Display shall be capable of effectively "inverting" the image (in the sense of switching between a MONOCHROME1 and MONOCHROME2 interpretation).   The method is undefined.   This requirement applies to grayscale image display only; it is not required for pseudo-color lookup tables.

4645   If the Image Display supports a color screen, the following shall be supported:

The Image Display shall support display of frames of grayscale Images using a pseudo-color lookup table.

The Image Display shall allow the user to select from a configured set of pseudo-color lookup tables. Simultaneous display of both grayscale and pseudo-color presentations is not required.
4650   Thus, selecting a color lookup table may change all displayed frames on the screen.

The Image Display shall provide a method of adding new pseudo-color lookup tables. It is acceptable if this is only available to service engineers.

4.16.4.2.2.3.4   Image Zoom

The Image Display shall be capable of "zooming" the frames where zooming consists of
4655   resampling and displaying the frame at a larger or smaller matrix size. For example re-sampling a 128x128 frame to create a 256x256 frame is referred to as a 2X zoom in this document.

All zooming of NM images shall preserve the aspect ratio (that is, the same zoom factor shall be applied in both the x and y dimensions). The Image Display is free to use pixel replication or interpolation to perform image zooming.

4660   Some guidelines on appropriate default display sizes and desirable zoom behaviors are provided in RAD TF-1, Appendix E.5.2 NM Image Resizing.

4.16.4.2.2.3.5   Review Option

Image Displays claiming the Review Option shall support the following display capabilities and those indicated in Table 4.16-1.

4665   The Image Display shall be capable of displaying both a Dynamic Image frameset and Static Image frameset(s) at the same time.

The Image Display shall be capable of displaying both a Whole body Image frameset and a Static Image frameset at the same time (i.e., anterior & posterior whole body and several static spot images).

4670   The Image Display shall be capable of displaying the pixel value of a selected pixel.

4.16.4.2.2.4 Display of Result Screens

The contents of this section are required for Image Displays claiming the NM Image Profile. Refer to Table 4.18-2 for the specific SOP Class UIDs of the IODs referenced here for use as Result Screens.

4675   The Image Display shall be able to display DICOM Secondary Capture images (including specifically 8 and 16 bit monochrome and 24 bit RGB).

The Image Display shall be able to display DICOM Multi-Frame Secondary Capture images (including specifically 8-bit monochrome and 24-bit True Color)

4680   The Image Display shall be able to display result screens at their original pixel resolution. If the display size is equal to or greater than the size of the result screen, this should be done as the default. If the display size is less than the size of the result screen, this will require some sort of panning capability.

The Image Display shall be able to scale result screens using a fixed aspect ratio. If the display size is smaller than the size of the result screen, this should be done to fit the result screen onto 4685   the display as the default.

For Multi-Frame Secondary Capture images which contain a Cine module, the Image Display shall be able to cine the frames. The default cine rate shall be the value in the Cine module, or the maximum rate of the Image Display, whichever is slower.

4.16.4.2.3   Expected Actions

4690   The Image Display or Imaging Document Consumer presents to the user a DICOM Image.

The Image Display or Imaging Document Consumer may receive patient data inconsistent with those received from a previously issued query or retrieve operation. For example, in the event that a patient has been renamed, the Image Display or Imaging Document Consumer will receive images with the same Study Instance UID, Series Instance UID and SOP Instance UIDs, but with 4695   a different patient name. The Image Display or Imaging Document Consumer shall use the just queried information or the most recently received instances to ensure that the most recent patient data from the Image Manger/Archive or Imaging Document Source is displayed.

The Image Display or Imaging Document Consumer shall be able to display the Series Description for each series displayed.

4700   #### 4.16.4.2.3.1   NM Image Specifics

Actors claiming the NM Image Profile which have applications that accept re-sliced (reconstructed tomographic) cardiac data for viewing or further processing shall make use of the View Code Sequence (0054,0220), Slice Progression Direction (0054,0500) and Acquisition Context Sequence (0040,0555) attributes to aid in the selection of input data. However, the 4705   means by which these attributes are used to identify and/or process the data is unspecified.

Note: a means for identifying and processing cardiac input data that does not include the above mentioned attributes will likely be useful due to the existence of Images without those attributes. Series Description may be useful in such cases.

Matching related studies or series (such as stress and rest images) is an important part of NM 4710   processing and display. When Image Displays are trying to do this they shall look for the Patient State (0038,0500) to identify such things as stress and rest images and in the NM Acquisition Context Module, the Image Orientation in the Detector Sequence, and the View Code Sequence

(0054,0220) to identify images with desired orientations. Since images may exist without those fields present, the Series Description may also be examined for relevant details by the software.

4715

4.17 Retrieve Presentation States

This section corresponds to Transaction RAD-17 of the IHE Technical Framework. Transaction RAD-17 is used by the Image Display or Imaging Document Consumer to request and retrieve
4720 Presentation State from the Image Archive or Imaging Document Source actor.

4.17.1 Scope

This section describes the sequence of messages required for the Image Display or Imaging Document Consumer to retrieve Grayscale Softcopy Presentation State Instances from the Image Archive or Imaging Document Source. The Image Display or Imaging Document Consumer will
4725 query and then retrieve Presentation State objects. The transformations will be applied by the Image Display or Imaging Document Consumer to the image data to assure the image display is consistent with the device that originally created and stored the Presentation State. The Image Display or Imaging Document Consumer will be required to support all transformations defined in DICOM 2011 PS 3.4: Grayscale Softcopy Presentation State Storage. In addition, multiple
4730 Presentation States may exist that reference the same image data.

4.17.2 Use Case Roles
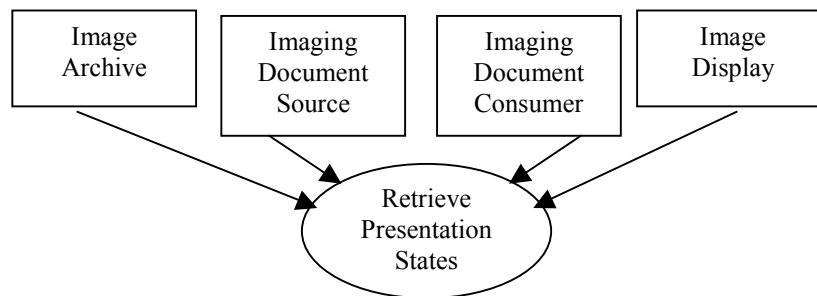
Actor: Image Display

Role: Retrieve Grayscale Softcopy Presentation State objects together with the referenced image
4735 data and apply the transformations specified by the Presentation State. This device will implement the Query/Retrieve SOP Classes in the role of an SCU.

Actor: Imaging Document Consumer

Role: Retrieve Grayscale Softcopy Presentation State objects together with the referenced image data and apply the transformations specified by the Presentation State. This actor must support
4740 pixel rendering according to the Grayscale Standard Display Function (GSDF) defined in DICOM 2011 PS 3.14. This device will implement the Query/Retrieve SOP Classes in the role of an SCU.

Actor: Image Archive

Role: Respond to retrieve requests from the Image Display for Grayscale Softcopy Presentation
4745 States objects. Transmit requested Grayscale Softcopy Presentation State object(s) to the Image Display. This device will implement the Query/Retrieve SOP Classes in the role of an SCP.

Actor: Imaging Document Source

Role: Respond to retrieve requests from the Imaging Document Consumer for Grayscale Softcopy Presentation States objects. Transmit requested Grayscale Softcopy Presentation State object(s) to the Imaging Document Consumer. This device will implement the Query/Retrieve SOP Classes in the role of an SCP.

4.17.3 Referenced Standards

DICOM 2011 PS 3.4: Query/Retrieve Service Class

DICOM 2011 PS 3.14: Grayscale Standard Display Function

DICOM 2011 PS 3.4: Grayscale Softcopy Presentation State Storage

4.17.4 Interaction Diagram

Imaging
Document
Consumer

Imaging
Document
Source

Select Presentation States (C-MOVE)

Store Presentation States (C-STORE)

View Presentation States
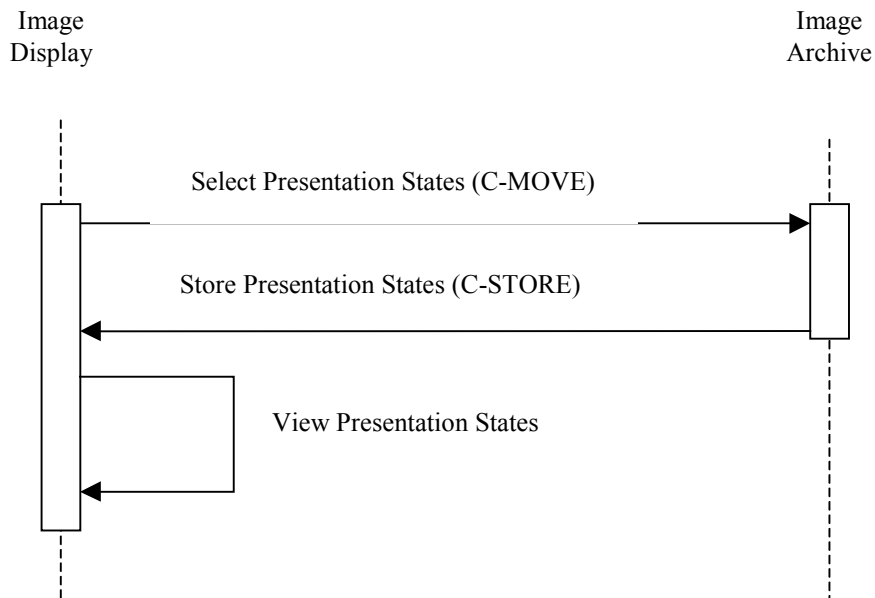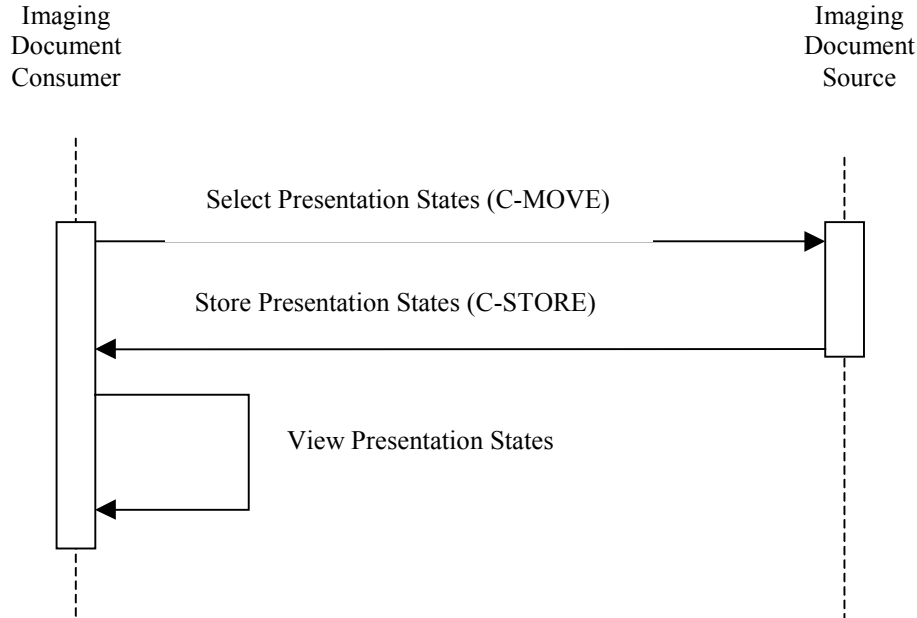
4760 **4.17.4.1 Retrieve Grayscale Softcopy Presentation State**

This transaction refers to the "C-MOVE" and "C-STORE" messages between the Image Display and Image Archive or Imaging Document Consumer and Imaging Document Source actor in the above interaction diagram. The Retrieve (Study Root – MOVE and optionally Patient Root – MOVE) SOP Classes are supported. Refer to the DICOM 2011 PS 3.4 for detailed descriptive

4765 semantics.

In the case of retrieving Grayscale Softcopy Presentation State in a Cross-Enterprise, imaging document sharing (XDS-I) network environment, a configuration of mapping the AE Titles to DICOM AE Network Addresses (IP Address and Port number) are needed to be exchanged between the Imaging Document Source and the Imaging Document Consumer. RAD TF-3:

4770 Appendix G describes in details the AE Title mapping to the DICOM AE Network Addresses.

4.17.4.1.1   Trigger Events

The Image Display or Imaging Document Consumer selects specific Grayscale Softcopy Presentation State objects to retrieve from the Image Archive.

4.17.4.1.2   Message Semantics

4775 The message semantics are defined in the DICOM Query/Retrieve Service Class section of the DICOM 2011 PS 3.4: Query/Retrieve Service Class. It is the responsibility of the Image Manager or Imaging Document Source to assure that the patient and procedure information is current in the images and Softcopy Presentation State objects when they are retrieved from the Image Archive or Imaging Document Source.

4780 **4.17.4.1.3   Expected Actions**

The Image Archive or Imaging Document Source receives the C-MOVE request, establishes a DICOM association with the Image Display or Imaging Document Consumer actor, respectively, and uses the DICOM Grayscale Softcopy Presentation State Storage SOP Class to transfer the requested Presentation State objects.

4785 **4.17.4.2 View Presentation States**

This transaction relates to the "View Presentation States" event in the above interaction diagram. Presentation States cannot be viewed separately, but must be applied to an image. Refer to section 4.16 for a description of the transaction used to retrieve images to which Presentation States may be applied.

4790 **4.17.4.2.1   Trigger Events**

The Image Display or Imaging Document Consumer receives Presentation State instances from the Image Archive or Imaging Document Source respectively.

4.17.4.2.2   Invocation Semantics

This is a local invocation of functions resident within the Image Display or Imaging Document
4795 Consumer. The method used by the Image Display or Imaging Document Consumer to present images for viewing by the user after the Presentation State transformations have been applied is outside the scope of the IHE Technical Framework.

4.17.4.2.3   Expected Actions

The Image Display or Imaging Document Consumer applies the transferred Grayscale Softcopy
4800 Presentation State to image data and renders it for viewing. The Image Display shall support pixel rendering according to the Grayscale Standard Display Function (GSDF) defined in DICOM 2011 PS 3.14. The Image Display or Imaging Document Consumer may receive patient data inconsistent with those received from a previously issued query or retrieve operation. For example, in the event that a patient has been renamed, the Image Display or Imaging Document
4805 Consumer will receive Softcopy Presentation State objects with the same Study Instance UID, Series Instance UID and SOP Instance UIDs, but with a different patient name. The Image Display or Imaging Document Consumer shall use the just queried information or the most recently received instances to ensure that the most recent patient data from the Image Manger/Archive or Imaging Document Source is displayed. If the number of frames (0028,0008)
4810 attribute is set to 1, then the Reference Frame Number (0008,1160) shall be ignored.

5715 ## 4.27 Retrieve Reports

Transaction RAD-27 is used by the Report Manager, Report Repository, Imaging Document Source, Report Reader, Imaging Document Consumer and External Report Repository Access actors.

4.27.1 Scope

5720 In the Retrieve Reports Transaction, the requested DICOM Structured Reports are transferred from the Report Manager, Report Repository, Imaging Document Source, or External Report Repository Access to the Report Reader or Imaging Document Consumer for viewing.

4.27.2 Use Case Roles
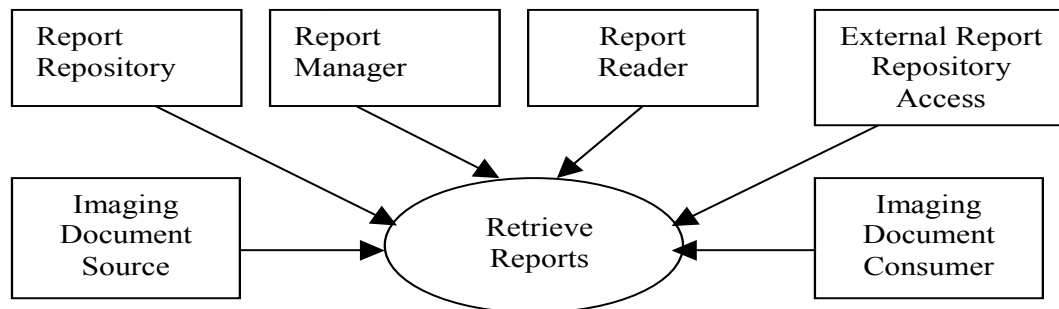
5725

Actor: Report Repository

Role: Sends requested DICOM Structured Reports to Report Reader.

Actor: Imaging Document Source

Role: Sends requested DICOM Structured Reports to the Imaging Document Consumer Actor.

5730 **Actor:** External Report Repository Access

Role: Sends requested DICOM Structured Reports to Report Reader. Such a system may be required to convert reports of different formats (HL7) into DICOM Structured Reports (see appendix C).

Actor: Report Reader

5735 **Role:** Retrieves DICOM Structured Reports from Report Repository or External Report Repository Access and makes them available for viewing.

Actor: Imaging Document Consumer

Role: Retrieves DICOM Structured Reports from the Imaging Document Source Actor and makes them available for viewing.

5740 **Actor:** Report Manager

250

Role: Sends requested DICOM Structured Reports to Report Reader.

4.27.3 Referenced Standards

DICOM 2011 PS 3.4: Query/Retrieve Service Class

DICOM 2011 PS 3.4: Storage SOP Class

5745   DICOM 2011 PS 3.16: Content Mapping Resource

4.27.4 Interaction Diagram
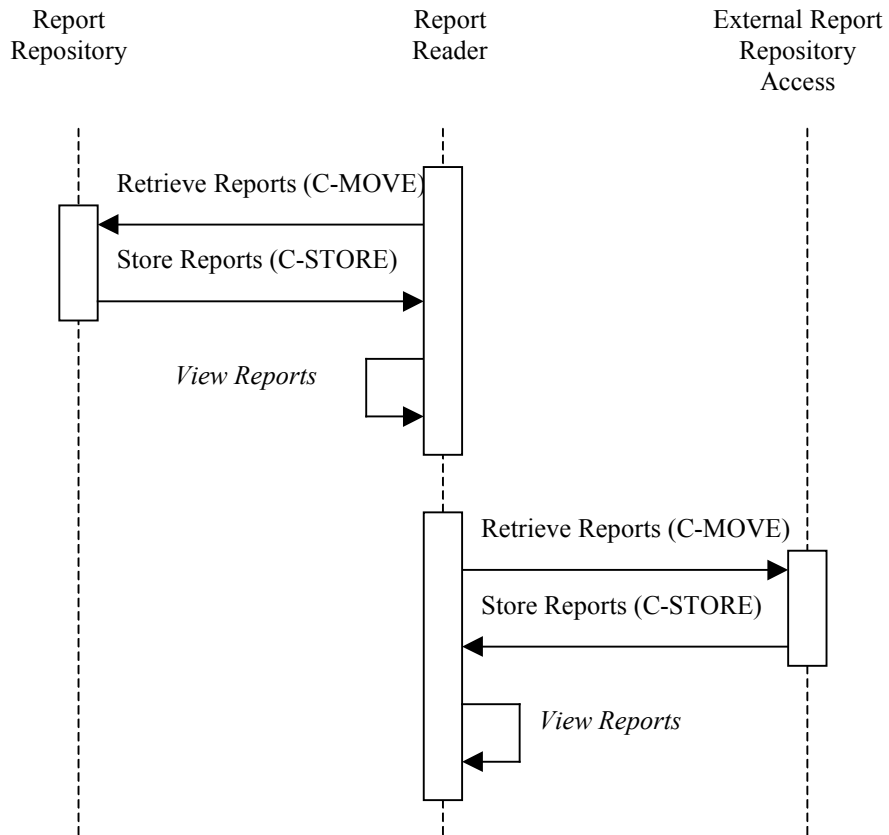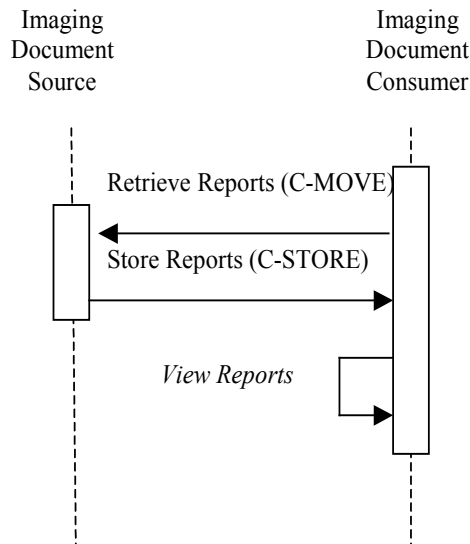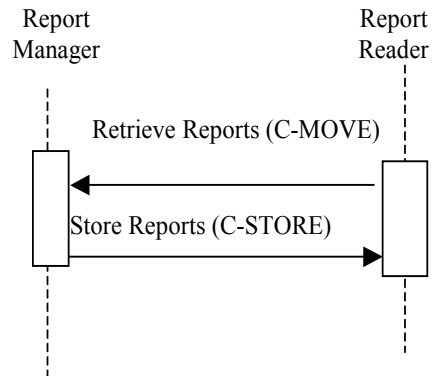
4.27.4.1 Retrieve Reports

5750

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 and Imaging Document Consumer as an SCP shall support the DICOM Basic Text SR Storage SOP Class and optionally the DICOM Enhanced SR Storage SOP Class. The Report Manager, Imaging Document Source and the Report Repository as an SCU shall support both the DICOM Basic Text SR Storage SOP Class and the DICOM Enhanced SR Storage SOP Class. The External Report Repository Access as an SCU shall support the DICOM Basic Text SR Storage SOP Class and optionally the DICOM Enhanced SR Storage SOP Class. Refer to DICOM PS 3.4, Annex C, for detailed descriptive semantics.

5755

4.27.4.1.1 Trigger Events

5760

The user at the Report Reader or Imaging Document Consumer selects specific reports to view.

4.27.4.1.2   Message Semantics

The DICOM Query/Retrieve SOP Classes and the DICOM Structured Report Storage SOP Classes define the message semantics.

5765   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 Manager, Report Repository or External Report Repository Access, or from the Imaging Document Consumer to the Imaging Document Source.

5770   ### 4.27.4.1.3   Expected Actions

The Report Manager, Report Repository, Imaging Document Source or External Report Repository Access receives the C-MOVE request, establishes a DICOM association with the Report Reader or Imaging Document Consumer and uses the appropriate DICOM Structured Report Storage SOP Classes (Basic Text SR Storage SOP Class and/or Enhanced SR Storage

5775   SOP Class) to transfer the requested reports.

Report Repository responds to the queries with the information from the DICOM instances it received from the Report Manager. Typically, Report Manager will apply information updates to the instances of reports it holds and re-issue the reports to the Report Repository. To properly update the content of instances that are no longer present on the Report Manager, the update

5780   shall be performed by retrieval and re-submission of the report through the Report Manager. It may also be done by grouping the Report Repository and Report Manager.

4.27.4.2 View Reports

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

4.27.4.2.1   Trigger Events

5785   The Report Reader or Imaging Document Consumer receives reports from the Report Repository, Imaging Document Source or External Report Repository Access.

4.27.4.2.2   Invocation Semantics

This is a local invocation of functions at the Report Reader or Imaging Document Consumer, and the method used by the Report Reader or Imaging Document Consumer to interpret and display

5790   the report data in a meaningful way is outside the scope of the IHE Technical Framework. At a minimum the Report Reader or Imaging Document Consumer shall be able to correctly display reports defined in RAD TF-1: 9.4. The Report Reader or Imaging Document Consumer shall be able to display reports based on the Simple Image Report (RAD TF-1: 9.4.1). If the Report Reader or Imaging Document Consumer supports the Enhanced SR Information Object

5795   Definition then it shall also support display of Simple Image and Numeric Reports (RAD TF-1: 9.4.2). Even though the IHE Technical Framework sets boundaries on the complexity of SR objects, the Report Reader or Imaging Document Consumer must still be able to receive, store and view any Basic Text SR object and optionally any Enhanced SR object in order to conform

to the DICOM Standard. An implementation may not be able to render, in a meaningful way, reports more complex than those specified in RAD TF-1: 9.4.

If a DICOM Structured Report references other DICOM composite objects, such as images, and softcopy presentation states, it is optional for the Report Reader or Imaging Document Consumer to actually retrieve and display/apply these objects, but the Report Reader or Imaging Document Consumer must convey to the user that such references exist in the report.

4.27.4.2.2.1 Retrieve AE Title

If the Report Reader is grouped with an Image Display and capable of retrieving objects referenced in a DICOM Structured Report then the Report Reader shall retrieve these objects from the device matching the appropriate Retrieve AE Title attribute (0008,0054) included in the DICOM Structured Report. If the Retrieve AE Title attribute is not specified or configured, then the Report Reader may use some other configurable Retrieve AE Title.

In the case of retrieving reports in a Cross-Enterprise, imaging document sharing (XDS-I) network environment, a configuration of mapping the AE Titles to DICOM AE Network Addresses (IP Address and Port number) are needed to be exchanged between the Imaging Document Source and the Imaging Document Consumer. RAD TF-3: Appendix G describes in details the AE Title mapping to the DICOM AE Network Addresses.

4.27.4.2.3 Expected Actions

The Report Reader or Imaging Document Consumer presents to the user a DICOM Structured Report.

4.31 Retrieve Key Image Notes

This section corresponds to Transaction RAD-31 of the IHE Technical Framework. Transaction RAD-31 is used by the Image Display and Image Archive actors or Imaging Document Consumer and Imaging Document Source.

4.31.1 Scope

In the Retrieve Key Image Notes Transaction, the requested DICOM Key Image Notes are transferred from the Image Manager or Imaging Document Source to the Image Display or Imaging Document Consumer for viewing along with the images flagged by the Key Image Note.

4.31.2 Use Case Roles
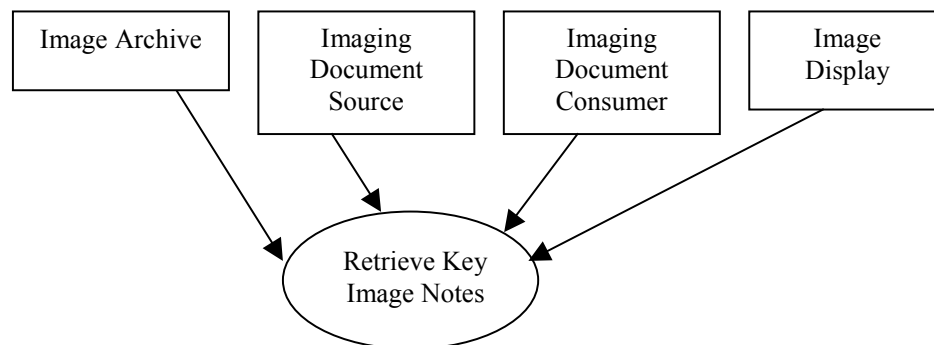
Actor: Image Archive:

Role: Sends requested Key Image Notes to the Image Display Actor.

Actor: Imaging Document Source

Role: Sends requested Key Image Notes to the Imaging Document Consumer Actor.

Actor: Image Display

**Role:** Receives requested Key Image Notes from the Image Archive Actor.

Actor: Imaging Document Consumer

Role: Receives requested Key Images Notes from the Imaging Document Source Actor.

4.31.3 Referenced Standards

DICOM 2011 PS 3.4: Query/Retrieve Service Class

DICOM 2011 PS 3.4: Key Object Selection Document Storage SOP Class

6030 **4.31.4 Interaction Diagram**

Image Archive   Image
                                                 Display

Retrieve Key Image Notes (C-MOVE)

Store Key Image Notes (C-STORE)

*Render Key
Image Notes*

Imaging   Imaging
Document   Document
Source   Consumer

Retrieve Key Image Notes (C-MOVE)

Store Key Image Notes (C-STORE)

*Render Key
Image Notes*
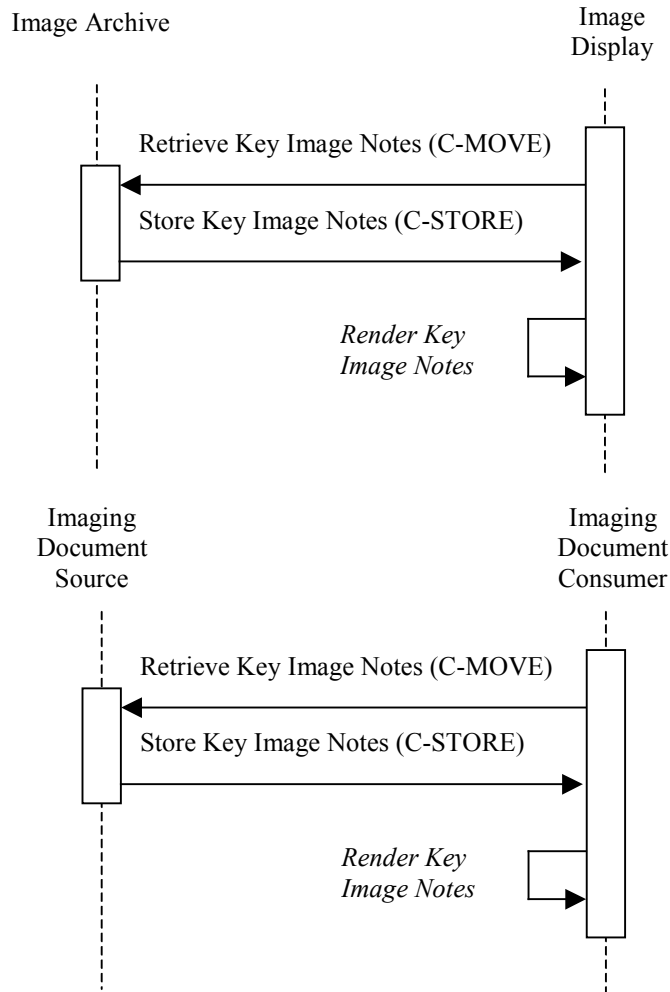
4.31.4.1 Retrieve Key Image Notes

The Retrieve (Study Root – MOVE and optionally Patient Root – MOVE) SOP Classes will be supported. The Image Archive and Imaging Document Source as an SCU shall support DICOM
6035 Image Storage SOP Classes. Refer to DICOM 2011 PS 3.4, Annex C, for detailed descriptive semantics.

4.31.4.1.1   Trigger Events

The Image Display or Imaging Document Consumer selects specific Key Image Note objects to retrieve from the Image Archive or Imaging Document Source.

6040 **4.31.4.1.2   Message Semantics**

The message semantics are defined in the DICOM Query/Retrieve Service Class section of the DICOM 2011 PS 3.4: Query/Retrieve Service Class. It is the responsibility of the Image Manager to assure that the patient and procedure information is current in the images and Key Image Note objects when they are retrieved from the Image Archive. It is the responsibility of

6045   the Imaging Document Source to assure that the patient and procedure information is current in the Key Image Note objects when they are retrieved from this Actor.

4.31.4.1.3   Expected Actions

The Image Archive or Imaging Document Source receives the C-MOVE request, establishes a DICOM association with the Image Display or Imaging Document Consumer, and uses the

6050   DICOM Key Image Note Storage SOP Class to transfer the requested Key Image Note objects.

4.31.4.2 Render Key Image Notes

This transaction relates to the "Render Key Image Notes" event of the above interaction diagram. Key Image Notes cannot be rendered separately, but must be applied to images. Refer to section 4.16 for a description of the transaction used to retrieve images to which Key Image Notes may

6055   be applied.

The Image Display or Imaging Document Consumer is not required to, but may choose to, support retrieval and display of images from other studies than the one to which the Key Image Note belongs

4.31.4.2.1   Trigger Events

6060   The Image Display or Imaging Document Consumer receives Key Image Note instances from the Image Archive or Imaging Document Source.

4.31.4.2.2   Invocation Semantics

This is a local invocation of functions resident within the Image Display or Imaging Document Consumer. The method used by the Image Display or Imaging Document Consumer to present

6065   images for viewing by the user flagged by the Key Image Notes is outside the scope of the IHE Technical Framework.

4.31.4.2.2.1 Retrieve AE Title

If the Image Display is capable of retrieving objects referenced in a DICOM Key Image Note then it shall retrieve these objects from the device matching the appropriate Retrieve AE Title

6070   attribute (0008,0054) included in the DICOM Key Image Note. If the Retrieve AE Title attribute is not specified or configured, then the Image Display shall use some other configurable Retrieve AE Title.

In the case of retrieving DICOM Key Image Notes in a Cross-Enterprise, imaging document sharing (XDS-I) network environment, a configuration of mapping the AE Titles to DICOM AE

6075   Network Addresses (IP Address and Port number) are needed to be exchanged between the

Imaging Document Source and the Imaging Document Consumer. RAD TF-3: Appendix G describes in details the AE Title mapping to the DICOM AE Network Addresses.

4.31.4.2.3   Expected Actions

6080 The Image Display or Imaging Document Consumer flags the images and renders the Key Image Note.

6085

Note: It is recommended to use the just retrieved instance of the Key Image Note to ensure that the most recent patient data be displayed to reflect possible patient merge and patient update in the Image Manager/Image Archive or Imaging Document Source. This patient data may be inconsistent with patient data contained in a previously retrieved copy of the same Key Image Note instance.

4.45 Retrieve Evidence Documents

This section corresponds to Transaction RAD-45 of the IHE Technical Framework. Transaction
1130   RAD-45 is used by the Image Archive, Image Display, Imaging Document Source and Imaging
Document Consumer.

4.45.1 Scope

In the Retrieve Evidence Documents Transaction, the requested DICOM Evidence Documents
are transferred from the Image Archive to the Image Display or from the Imaging Document
1135   Source to the Imaging Document Consumer.

4.45.2 Use Case Roles
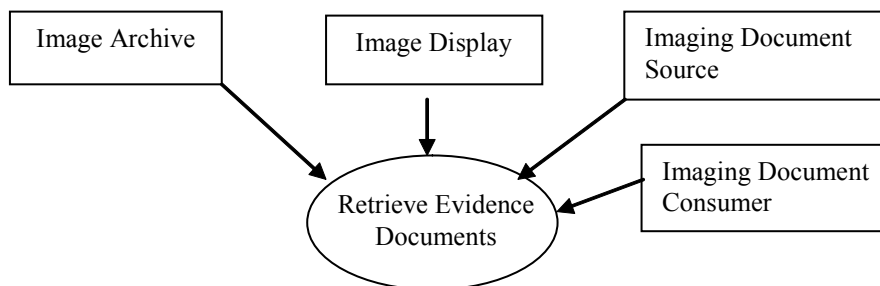
Actor: Image Archive:

Role: Sends requested Evidence Documents to the Image Display Actor.

1140   **Actor**: Imaging Document Source

Role: Sends requested Evidence Documents to the Imaging Document Consumer.

Actor: Image Display

Role: Receives requested Evidence Documents from the Image Archive Actor.

Actor: Imaging Document Consumer

1145 **Role**: Receives requested Evidence Documents from the Imaging Document Source

4.45.3 Referenced Standards

DICOM 2011 PS 3.4: Query/Retrieve Service Class, Storage SOP Class

4.45.4 Interaction Diagram
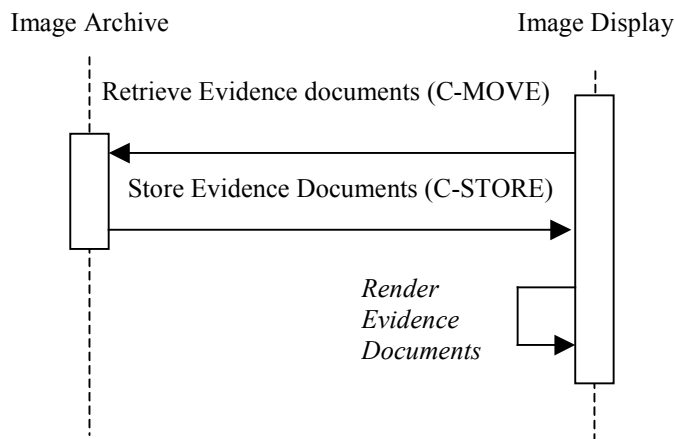
1150 ### 4.45.4.1 Retrieve Evidence Documents

The Retrieve (Study Root – MOVE and optionally Patient Root - MOVE) SOP Classes shall be supported. The Image Archive as an SCU shall support DICOM Storage SOP Classes that may be used as Evidence Documents. The Imaging Document Source as an SCU shall support DICOM Storage SOP Classes that may be used as Evidence Documents it published for sharing.
1155 Refer to DICOM 2011 PS 3.4, Annex C, for detailed descriptive semantics (see table 4.38-1).

In the case of retrieving Evidence Documents in a Cross-Enterprise, imaging document sharing (XDS-I.b) network environment, a configuration of mapping the AE Titles to DICOM AE Network Addresses (IP Address and Port number) is needed to be exchanged between the Imaging Document Source and the Imaging Document Consumer. Appendix G describes in
1160 details the AE Title mapping to the DICOM AE Network Addresses.

4.45.4.1.1   Trigger Events

The Image Display or the Imaging Document Consumer selects specific Evidence Document objects to retrieve from the Image Archive or the Imaging Document Source.

4.45.4.1.2   Message Semantics

1165 The message semantics are defined in the DICOM Query/Retrieve Service Class section of the DICOM 2011 PS 3.4: Query/Retrieve Service Class. It is the responsibility of the Image

Manager or Imaging Document Source to assure that the patient and procedure information is current in the Evidence Document objects when they are retrieved from the Image Archive or Imaging Document Source.

1170 **4.45.4.1.3   Expected Actions**

The Image Archive or the Imaging Document Source receives the C-MOVE request, establishes a DICOM association with the Image Display or the Imaging Document Consumer, and uses the DICOM C-STORE command to transfer the requested Evidence Document objects.

Since the Image Display or the Imaging Document Consumer can select compatible documents
1175 based on the Template IDs returned in the query, the Image Display or the Imaging Document Consumer is required not to return an error to the Image Archive or the Imaging Document Source due to the retrieved document content. The retrieved results may simply be discarded instead.

4.45.4.2 Render Evidence Documents

1180 This transaction relates to the "Render Evidence Documents" event of the above interaction diagram.

4.45.4.2.1   Trigger Events

The Image Display or the Imaging Document Consumer receives Evidence Document instances from the Image Archive or the Imaging Document Source.

1185 **4.45.4.2.2   Invocation Semantics**

This is a local invocation of functions resident within the Image Display or the Imaging Document Consumer. Evidence Documents shall be displayed to the user of the Image Display or the Imaging Document Consumer. The method used by the Image Display or the Imaging Document Consumer to present Evidence Documents for viewing by the user is outside the
1190 scope of the IHE Technical Framework. For example, in the case when an Image Display or an Imaging Document Source is grouped with an Evidence Creator, the Evidence Document may be rendered as input for further processing by the Evidence Creator.

4.45.4.2.3   Expected Actions

The Image Display or the Imaging Document Consumer renders the Evidence Documents
1195 retrieved. If the Image Display or the Imaging Document Consumer is unable to handle parts of the document, it may inform the user and offer the choice of doing a "low-grade" rendering or ignoring the data.

Evidence Documents may contain references to other types of evidence objects. The Image Display or the Imaging Document Consumer shall always be able to render (or "low-grade"
1200 render) referenced Evidence Documents or to invoke other rendering display functionality.

If the Image Display also supports the Consistent Presentation of Images Profile, it is also required to apply any presentation states referenced in the Evidence Document for application to the relevant images.

If the Image Display also supports the Key Image Notes Profile, it is also required to render any Key Image Notes referenced in the Evidence Document.

> Note: It is recommended to use the just retrieved instance of the Evidence Document to ensure that the most recent patient data be displayed to reflect possible patient merge and patient update in the Image Manager/Image Archive. This patient data may be inconsistent with patient data contained in a previously retrieved copy of the same Evidence Document instance.

4.45.4.2.3.1 Mammography Image Profile

Image Display and Image Manager/Image Archive actors supporting the Mammography Image Profile shall support the Mammography CAD SR SOP Class.

Image Display actors shall be able to apply Mammography CAD SR information to displayed images; see RAD TF-2:4.16.4.2.2.1.1.8 Display of CAD Marks. It is not permitted to ignore data that has a rendering intent of presentation required; there is no such thing as a "low-grade" rendering for Mammography CAD SR.

4.55 WADO Retrieve

2345   This section corresponds to Transaction RAD-55 of the IHE Technical Framework. Transaction
RAD-55 is used by the Imaging Document Consumer and the Image Manager/ Image Archive
actors.

4.55.1 Scope

The WADO Retrieve transaction enables an Imaging Document Consumer to access DICOM
2350   SOP Instances with a web-based service through HTTP/HTTPS protocol.

4.55.2 Use Case Roles
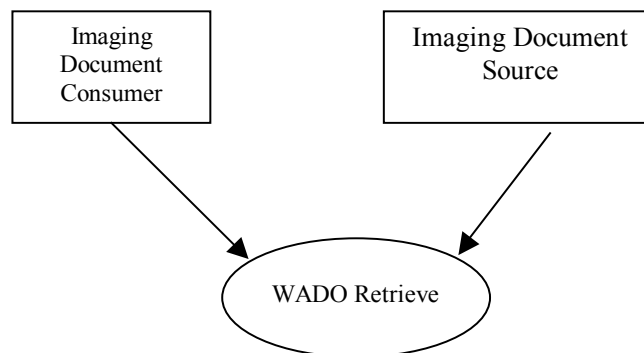
Actor: Imaging Document Consumer

2355   **Role:** Issues an HTTP Get Request to access a DICOM instance.

Actor: Imaging Document Source

Role: Receives an HTTP Get Request for accessing a DICOM instance and generates the HTTP
response with the appropriate content.

4.55.3 Referenced Standard

2360   DICOM 2011 PS 3.18: Web Access to DICOM Persistent Objects (WADO)

4.55.4 Interaction Diagram
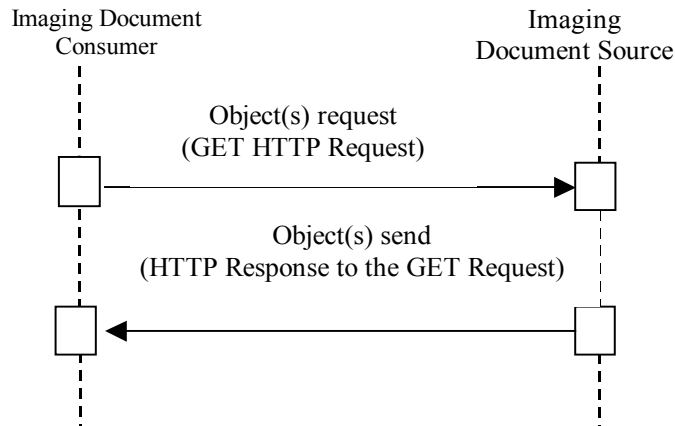
4.55.4.1 WADO Retrieve

2365 The Imaging Document Consumer issues an HTTP Get to request a specific DICOM instance from the Imaging Document Source. The Imaging Document Source receives the request, generates the response with the appropriate content and sends an HTTP Response to the Imaging Document Consumer.

4.55.4.1.1 Trigger Events

2370 The Imaging Document Consumer wishes to retrieve a DICOM instance that is referenced within a DICOM Manifest.

4.55.4.1.2 Message Semantics

The message semantics are defined by the DICOM Web Access to DICOM Persistent Objects (WADO), PS 3.18.

2375 The WADO Retrieve transaction is performed by the Imaging Document Consumer to send a HTTP Request-URI to the web server of the Imaging Document Source. The Imaging Document Consumer generates the HTTP Request-URI to retrieve a DICOM instance. The DICOM instance shall be specified with its Study Instance UID, Series Instance UID, and SOP Instance UID in the HTTP Request-URI. The Imaging Document Consumer must obtain the host information (e.g., web server location, and script language) of the web server to perform this
2380 transaction. The Imaging Document Consumer can map the Retrieve AE Title of the SOP Instance to the web server host information based on its local configuration (see Appendix G).

In addition, the Imaging Document Consumer shall support the following fields in the HTTP request:

Table 4.55-1: WADO HTTP Request Fields

HTTP Field	REQ	Description	Values
Accept	R	This field is used to specify MIME types which are acceptable for the response	At least one of the following values: application/dicom image/jpeg application/text application/html */* Other values may be included as well
Accept-Language	O	This field specifies the language of the object to be retrieved.	Any valid value according to RFC2616

2385   The Imaging Document Source shall list all media types it supports in the Accept field of the HTTP request, and shall use WADO HTTP parameter contentType to request the desired media type of the object to be retrieved in the HTTP response (see Table 4.55-2).

The Imaging Document Source and the Imaging Document Consumer are required to support a number of parameters in the WADO HTTP Request-URI, as described in the following table.

2390

Table 4.55-2: WADO HTTP Request Parameters

Parameter Name	Parameter Description	Requirement		Note
		Imaging Document Source	Imaging Document Consumer	
requestType	Type of the HTTP request performed. It must be "WADO"	R	R	
studyUID	Unique identifier of the study	R	R	
seriesUID	Unique identifier of the series	R	R	
objectUID	Unique identifier of the object	R	R	
contentType	MIME type of the response	R+	R+	IHE-1 IHE-2
charset	Charset of the response	O	O	
anonymize	Anonymize object	O	O	
annotation	Annotation of the object	O	O	IHE-3
rows	Number of pixel rows	O	O	IHE-3
columns	Number of pixel columns	O	O	IHE-3
region	Region of image	O	O	IHE-3
windowCenter	Window center of the image	O	O	IHE-3
windowWidth	Window width of the image	O	O	IHE-3
frameNumber	Frame number of the single frame in a multi-frame image	O	O	IHE-3
imageQuality	Image quality factor	O	O	IHE-3

In addition, the Imaging Document Consumer shall support the following fields in the HTTP request:

Table 4.55-1: WADO HTTP Request Fields

HTTP Field	REQ	Description	Values
Accept	R	This field is used to specify MIME types which are acceptable for the response	At least one of the following values: application/dicom image/jpeg application/text application/html */* Other values may be included as well
Accept-Language	O	This field specifies the language of the object to be retrieved.	Any valid value according to RFC2616

2385 The Imaging Document Source shall list all media types it supports in the Accept field of the HTTP request, and shall use WADO HTTP parameter contentType to request the desired media type of the object to be retrieved in the HTTP response (see Table 4.55-2).

The Imaging Document Source and the Imaging Document Consumer are required to support a number of parameters in the WADO HTTP Request-URI, as described in the following table.

2390

Table 4.55-2: WADO HTTP Request Parameters

Parameter Name	Parameter Description	Requirement		Note
		Imaging Document Source	Imaging Document Consumer	
requestType	Type of the HTTP request performed. It must be "WADO"	R	R	
studyUID	Unique identifier of the study	R	R	
seriesUID	Unique identifier of the series	R	R	
objectUID	Unique identifier of the object	R	R	
contentType	MIME type of the response	R+	R+	IHE-1 IHE-2
charset	Charset of the response	O	O	
anonymize	Anonymize object	O	O	
annotation	Annotation of the object	O	O	IHE-3
rows	Number of pixel rows	O	O	IHE-3
columns	Number of pixel columns	O	O	IHE-3
region	Region of image	O	O	IHE-3
windowCenter	Window center of the image	O	O	IHE-3
windowWidth	Window width of the image	O	O	IHE-3
frameNumber	Frame number of the single frame in a multi-frame image	O	O	IHE-3
imageQuality	Image quality factor	O	O	IHE-3

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Parameter Name	Parameter Description	Requirement		Note
		Imaging Document Source	Imaging Document Consumer	
presentationUID	Unique identifier of the presentation object	O	O	IHE-3
presentationSeriesUID	Unique identifier of the series containing the presentation object	O	O	IHE-3
transferSyntax	Transfer syntax UID used with DICOM image object returned in the response	O	O	IHE-3

IHE-1: The Imaging Document Consumer must use the value "application/dicom" to retrieve a DICOM SOP Instance in the DICOM Part 10 File Format. This allows the Imaging Document Consumer to receive a SOP Instance in the native DICOM format for full data manipulation.

The Imaging Document Consumer can also use the value "application/jpeg" to retrieve an image encoded in JPEG baseline format if it is a single frame DICOM image object or a single frame image encoded in a multi-frame DICOM image object.

The Imaging Document Consumer can also use the values "application/text" or "application/html" to retrieve a DICOM SR object represented in the text or html format.

The Imaging Document Consumer can also use other values for this parameter as specified in DICOM 2011 PS 3.18, if they are supported by the Imaging Document Source.

This parameter is optional in DICOM PS 3.18. Because the default format of the DICOM persistent object returned in the HTTP Get response in the absence of a value in this parameter varies depending on the SOP Class of the retrieved object, this transaction requires that the parameter be supported, to improve interoperability.

IHE-2: This parameter must be compatible to the value(s) that the Imaging Document Consumer placed in the Accept field of the HTTP Request-URI.

IHE-3: The parameter applies only to a DICOM SOP Instance if it is an image object.

4.55.4.1.2.1 Example of WADO Request-URI

The following is an example of HTTP Request-URI for retrieving a persistent DICOM object using WADO:

http://www.hospital/radiology/wado.php?requestType=WADO&studyUID=1.2.250.1.59.40211.12345678.678910&seriesUID=1.2.250.1.59.40211.789001276.14556172.67789&objectUID=1.2.250.1.59.40211.2678810.87991027.899772.2&contentType=application%2Fdicom

This example uses response MIME type application/dicom to request the DICOM SOP Instance returned in the native DICOM Part 10 file format.

4.55.4.1.3 Expected Actions

2425 Upon reception of the WADO HTTP Request, the Imaging Document Source shall parse the request and if there are no errors, shall construct an HTTP Get Response with the requested DICOM instance content and return the response as specified by the DICOM WADO standard, with HTTP response code 200 (OK).

The Imaging Document Source shall return HTTP response code 406 (Not Acceptable), if it cannot serve the requested response MIME type(s) in parameter contentType and/or Accept
2430 Field.

The Imaging Document Source shall return HTTP response code 404 (Not Found) if it cannot locate the requested DICOM SOP Instance or cannot recognize the UID values specified in the received HTTP Request-URI.

The Imaging Document Source shall return HTTP response code 400 (Bad Request) if any
2435 required HTTP field or required WADO HTTP parameters are missing in the received HTTP Request-URI, or any other syntactic error is detected in the HTTP Request-URI (e.g., media type in contentType parameter conflicts with media types in Accept field).

4.55.4.1.4 Audit Trail Trigger Events

IHE specifies a number of events that shall be reportable by means of the IHE Audit Trail (ITI
2440 TF-2a: 3.20). IHE Radiology Audit Trial Option further defines a subset of these events, which are particularly applicable to the radiology transactions.

Table 4.55-3 lists all the radiology audit trial trigger events applied to transaction RAD-55. The last column specifies whether the sender or receiver side of the transaction is required to audit the event.

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Table 4.55-3: Audit Record Trigger Events

IHE Radiology Transaction	ATNA Trigger Event(s)	Audit Recording Requirements
WADO Retrieve [55]	Instance-Stored	Imaging Document Source shall audit
	Study Used	Imaging Document Consumer shall audit

4.68 Provide and Register Imaging Document Set – MTOM/XOP

This section corresponds to Transaction RAD-68 of the IHE Technical Framework. "Provide and
Register Imaging Document Set – MTOM/XOP" is used by the Imaging Document Source to
provide a set of XDS imaging documents to the Document Repository, and to request that the
repository store these documents and then register them with the Document Registry. This
transaction is derived from the Transaction ITI-41 of the IHE IT Infrastructure Technical
Framework. It adds new document content types as well as additional semantics and constraints
on the metadata defined in Transaction ITI-41.

4.68.1 Scope

The Provide and Register Imaging Document Set – MTOM/XOP transaction passes a Repository
Submission Request from an Imaging Document Source to a Document Repository.

A Provider and Register Document Set – MTOM/XOP transaction carries:

3340
- Metadata describing zero or more new documents (e.g., metadata describing zero documents may be used to describe folders containing references to documents that were previously submitted)
- Within metadata, one XDSDocumentEntry object per document
- Submission Set definition along with the linkage to new documents and references to
3345 existing documents
- Zero or more XDS Folder definitions along with linkage to new or existing documents.
- Zero or more documents

4.68.2 Use Case Roles
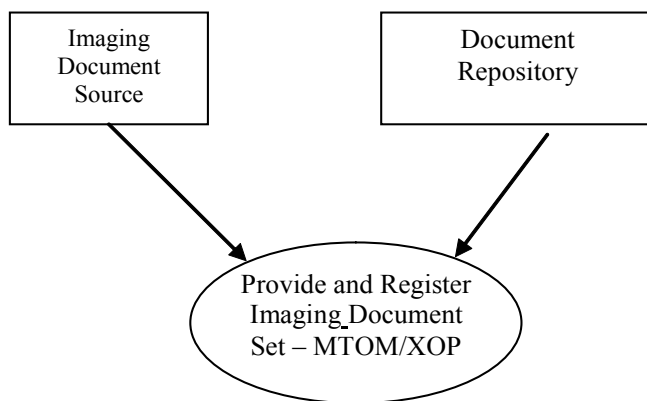
3350

Actor: Imaging Document Source

Role: Submits document(s) with associated metadata to a Document Repository.

Actor: Document Repository

Role: receives documents and associated metadata and:

3355
- Stores the documents
- Augments submitted metadata with repository information to enable later retrieval of documents
- Forwards the enhanced metadata to the Document Registry.

4.68.3 Referenced Standards

3360 For a list of the standards inherited from the underlying ITI-41 Provide and Register Document Set-b, see ITI TF-2b: 3.41.3.

In addition, the following standards are used to define the radiology-specific content:

DICOM 2011 PS 3.3: Key Object Selection Document (KOS)

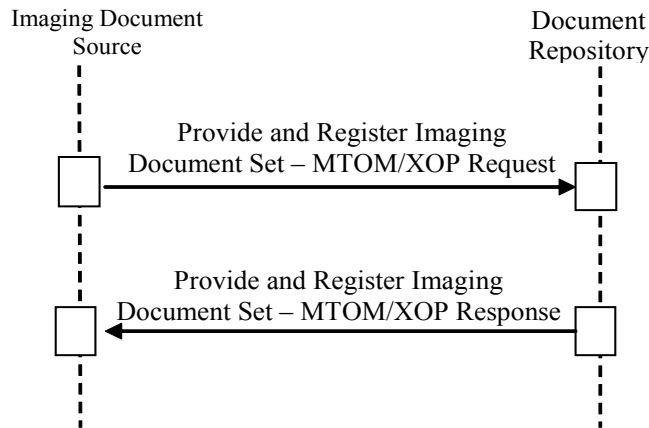DICOM 2011 PS 3.16: Content Mapping Resource

3365 DICOM 2011 PS 3.18: Web Access to DICOM Persistent Objects (WADO)

PDF/A ISO 19005-1. Document management - Electronic document file format for long-term preservation - Part 1: Use of PDF (PDF/A)

HL7 CDA Release 2.0 (denoted HL7 CDA R2, or just CDA, in subsequent text)

4.68.4 Interaction Diagram

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4.68.4.1 Provide and Register Imaging Document Set – MTOM/XOP Request message

An Imaging Document Source Actor sends documents and associated metadata to a Document
3375 Repository Actor. This message is an extension of the Provide and Register Document Set-b transaction as defined in ITI TF-2b: 3.41.

4.68.4.1.1 Trigger Events

The triggers for this transaction are:

- The Imaging Document Source Actor is instructed to submit a set of one or more new
3380 imaging documents for sharing, or
- A previously submitted document or the contents of a previously submitted manifest changes, requiring the Imaging Document Source to submit an update.

4.68.4.1.2 Message Semantics

This transaction extends the message semantics of the ITI-41 Provide and Register Document
3385 Set-b by specifying additional document content types, to allow the sharing of the following types of documents:

1. Sets of DICOM SOP instances

2. Imaging diagnostic reports

To support these content types and their usage, additional requirements and constraints on the
3390   XDS document metadata are specified.

The Provide and Register Imaging Document Set – MTOM/XOP Request message semantics are
specified in the following subsections:

1.   Sharing of Persistent DICOM Instances via a Manifest document

2.   Sharing of radiology diagnostic report in PDF or Text formats

3395   3.   XDS-I.b document metadata specification

4.   Use of XDS Submission Set concept in sharing of radiology imaging information.

The wsdl definition for this Provide-and-Register transaction sent by the Imaging Document
Source is no different than the Provide-and-Register transaction sent by the XDS.b Document
Source in ITI-41. The wsdl definition for the Provide-and-Register transaction can be found on
3400   the IHE FTP server at:
ftp://ftp.ihe.net/TF_Implementation_Material/ITI/wsdl/XDS.b_DocumentRepository.wsdl

4.68.4.1.2.1 Sharing of Set of DICOM Instances

The Imaging Document Source creates a manifest that describes and collects references to
DICOM SOP instances that are intended for sharing. The manifest, a Key Object Selection
3405   (KOS) Document Instance, is the actual document provided to the Document Repository and
registered at the Document Registry.

As specified in IHE ITI XDS.b Integration Profile, the structure of the message between the
Document Source and the Document Repository is an MTOM/ XOP formatted message. In this
transaction, the source actor is the Imaging Document Source, but the above requirement still
3410   applies. The KOS Document Instance is encoded in the message as a DICOM Part 10 File format
having a MIME type of "application/dicom".

The Imaging Document Source shall ensure that the DICOM SOP Instances referenced from
within the manifest are available to be retrieved. If the Imaging Document Source makes one or
more SOP Instances unavailable that are referenced in a published manifest, then it shall submit
3415   a new manifest as a replacement for the published manifest already in the Document Repository
and Document Registry (IHE ITI TF-3:4.1.6). The new manifest shall have the updated list of
DICOM SOP Instances with the unavailable instances removed. If the Imaging Document
Source makes all referenced DICOM SOP Instances unavailable in a published manifest, then it
shall deprecate the published manifest without any replacement (IHE ITI XDS Metadata Update
3420   Supplement).

4.68.4.1.2.1.1   Manifest KOS Document

The references to the DICOM SOP Instances shall be included in the Current Requested
Procedure Evidence Sequence (0040,A375) attribute of the KOS Manifest Document.

The Imaging Document Source shall support a number of attributes in Current Requested
3425   Procedure Evidence Sequence (0040,A375), which are represented in the Hierarchical SOP
Instance Reference Macro, as described in the following table:

Table 4.68.4.1.2.1-1: Attributes of Hierarchical SOP Instance Reference Macro in KOS Manifest Document

Attribute Name	Tag	Imaging Document Source
Study Instance UID	(0020,000D)	R
Referenced Series Sequence	(0008,1115)	R
> Series Instance UID	(0020,000E)	R
> Retrieve AE Title	(0008,0054)	R+
> Retrieve Location UID	(0040,E011)	R+
> Storage Media File-Set ID	(0088,0130)	O
> Storage Media File-Set UID	(0088,0140)	O
> Referenced SOP Sequence	(0008,1199)	R
>> Referenced SOP Class UID	(0008,1150)	R
>> Referenced SOP Instance UID	(0008,1155)	R

3430 Some of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+). Specifically, the Imaging Document Source shall include its own identification in the Retrieve AE Title (0008,0054) and Retrieve Location UID (0040,E011) attributes. These attributes will enable subsequent retrieval of the DICOM objects referenced within the KOS manifest.

4.68.4.1.2.2 Sharing of Report

3435

Since text reports address many of the weaknesses of PDF reports and vice versa, it is required that the Imaging Document Source shall support shared reports in at least one of the following two different formats:

- CDA wrapped Text, or
3440 - PDF

To maximize interoperability of the chosen formats, the following restrictions shall be required:

- For PDF documents:

  - We are not requiring a particular PDF version but we recommend the use of the PDF/A (ISO 19005-1)

3445 - For CDA wrapped Text Documents:

  - Text shall be encoded with UTF-8 UNICODE format. Refer to section 4.68.4.1.2.3.5 for constraints on the CDA wrapper. To the extent possible, the specification for the CDA wrapper for the report text has been made consistent with the CDA metadata specified in the ITI XDS Scanned Documents (XDS-SD) Profile (see also ITI TF-3:
3450   5.2.2 and 5.2.3).

A report (no matter what document format is chosen) can be shared with or without image reference(s).

If a shared report includes image reference(s), it can embed selected images in its PDF format or it can include fully resolved hyperlinks that point to the selected images; these hyperlinks can be interactively clickable (e.g., PDF) or can be processed or copied (e.g., text).

The Imaging Document Source that provides and registers the shared report is responsible for formatting the hyperlink to reference relevant images. The referenced images within a shared imaging report are meant to be accessed without the need for specialized (e.g., DICOM) viewing applications.

The hyperlink that references the selected image shall be formatted as a DICOM WADO URI. Since the sharing environment is inherently cross-enterprise, the secured version of HTTP (i.e., HTTPs) shall be used when formatting the hyperlink.

The Imaging Document Source is required to ensure that image references are valid links.

Even though significant images can be shared as non-DICOM format (embedded picture in PDF report or hyperlinks in PDF or Text report), it is required that sharing of a large set of DICOM images be achieved by sharing a set of DICOM SOP instances by providing and registering a manifest document. This is to avoid registration of a large number of individual documents in the XDS Document Registry.

4.68.4.1.2.3 Metadata

The Provide and Register Imaging Document Set – MTOM/XOP Request message shall include the metadata attributes that will be forwarded by the XDS Document Repository Actor to the XDS Registry Actor using the Register Document Set-b Transaction (ITI-42).

The Imaging Document Source supplies all necessary registry object attributes of an XDSDocumentEntry.

4.68.4.1.2.3.1 Metadata Attributes: Author Information and Document Creation Time

In XDS, a registered document directly contains the clinical information of interest for sharing. Therefore, its metadata for registration can be populated directly from the document content. For example, a discharge letter is submitted to the Document Repository, so its author and creation information is populated into the XDS Document metadata.

In XDS-I.b, the Manifest document submitted to the Document Repository usually does not directly constitute clinical information of interest for sharing, but rather is a set of references to such clinical information. Thus, the metadata of the Manifest document shall be related to the referenced source content or its creation process, to reflect the clinical nature of the shared information. This affects the metadata attributes including, but not limited to, authorSpecialty, authorInstitution, authorPerson, authorRole, creationTime, and title.

If the manifest references source data from multiple authors, then one primary author, source data creation time and document title shall be chosen. Note that this metadata shall be populated from the part of the source data that most closely represents the main content for sharing in order to best support a user query to the Registry for finding this data. For example, a manifest

referencing a current report, a current study as well as a prior report and study, will register metadata populated from the current report (which is the clinical content of interest for sharing).

In cases where the data to be shared is transformed from its original format (e.g., DICOM) to another format (e.g., PDF) in advance of sending it to the Repository, the metadata of such newly
3495   generated shared information shall be populated from the original source data (e.g., DICOM data)

In summary, XDS-I.b metadata always reflects the main clinical content of a shared document, which may be described directly in the document, or in the source data referenced within the document, or in the source data from which the document is transformed.

3500   **4.68.4.1.2.3.2 XDSDocumentEntry Metadata**

Table 4.68.4.1.2.3-1 lists XDS document metadata elements that are either further constrained by XDS-I.b, or have XDS-I.b specific instructions for how the Imaging Document Source is expected to populate them. Unless otherwise specified, the "optionality" of the attributes listed in the table below is the same as what is required by XDS for the source actor.

3505   For a full description of all the metadata attributes associated with an XDS document, see Table 4.1-5 in ITI TF-2b: 4.1.7.

Table 4.68.4.1.2.3-1: XDS-I.b-specific Metadata Requirements

XDSDocumentEntry Attribute	XDS-I.b-specific Requirements
creationTime	This attribute value shall be populated by the Imaging Document Source actor to record the date and time at which the clinical content conveyed in the shared document is created. If the published document is a DICOM object or is transformed from a DICOM information object, this attribute value should be taken from the tags Instance Creation Date (0008,0012) and Instance Creation Time (0008,0013) of the DICOM object.
eventCodeList	This attribute is required to be included in the metadata if known by the Imaging Document Source. In other words, it is "promoted" from an optional (O) attribute in XDS to a "required if known" (R2) attribute in XDS-I.b. This attribute shall be populated by the Imaging Document Source from code(s) in DCMR Context Group CID 29 for Acquisition Modality and from code(s) in DCMR Context Group CID 4 for Anatomic Region. See DICOM 2011 PS 3.16 for DICOM Context Group definitions. This attribute can contain multiple codes and there is not any specific ordering assumed in these codes.
eventCodeDisplayNameList	This attribute is required to be included in the metadata if the eventCodeList attribute is present. This attribute contains the Code Meaning text(s) of the code(s) for Acquisition Modality and for Anatomic Region valued in eventCodeList, from DCMR Context Group CID 29 and from DCMR Context Group CID 4, respectively. See DICOM 2011 PS 3.16 for DICOM Context Group definitions. Note that the ordering of the Code Meaning texts populated in this attribute shall be sorted in the same order of the corresponding codes in eventCodeList.
formatCode	This attribute shall be populated by the Imaging Document Source from one of the following values:

XDSDocumentEntry Attribute	XDS-I.b-specific Requirements
	"1.2.840.10008.5.1.4.1.1.88.59" (DICOM KOS SOP Class UID) as the Format Code Value and "1.2.840.10008.2.6.1" (DICOM UID Registry UID) as the Format Coding Scheme OID for a DICOM Manifest document.
	"urn:ihe:rad:TEXT" for a TEXT report wrapped into a CDA document
	"urn:ihe:rad:PDF" for a PDF report document
mimeType	This attribute shall be populated by the Imaging Document Source from one of the following values:
	"application/dicom" for a DICOM Manifest document
	"text/xml" for a TEXT report wrapped into a CDA document.
	"application/pdf" for a PDF report
practiceSettingCode	This attribute shall be populated by the Imaging Document Source by taking a fixed code defined by the XDS Affinity Domain to designate "Radiology"
serviceStartTime	This attribute shall be populated by the Imaging Document Source for a date and time that indicates the imaging service start time.
	As an example, the Imaging Document Source could take the value of Study Date (0008,0020) and Study Time (0008,0030) from the associated DICOM study
sourcePatientInfo	This attribute shall represent the Patient demographics information used in the Imaging Document Source actor system to identify the patient.
	This attribute allows multiple values for different pieces of patient demographics, see metadata specification of the IHE ITI XDS Integration Profile (Table 4.1-5 in ITI TF-3:4.1.7).
	As an example, this information can be transformed from DICOM Patient's Name (0010,0010), Patient's Birth Date (0010,0030), and Patient's Sex (0010,0040).
typeCode	This attribute shall be populated by the source actor from a coding system of the Requested Procedure Code of the Requested Procedure, to which the document is associated. In certain special cases previously defined in other IHE Profiles some sort of user intervention will be necessary to select the single Procedure Code used to populate this attribute. For example, handling the "Group Case" as defined in Scheduled Workflow will require the user to select a single, pre-coordinated procedure code that represents the multiple Requested Procedures that were acquired as a single study.
	The coding system of the Radiology Imaging Requested Procedure Code will be designated by the XDS Affinity Domain and shared by all Imaging Document Sources in the XDS Affinity Domain.
typeCodeDisplayName	This attribute shall be filled by the source actor using the code meaning text of the corresponding Requested Procedure Code valued in typeCode.
uniqueId	This attribute shall contain the Document unique ID generated by the source actor. It shall be an ISO OID.
	For a DICOM Manifest document, this attribute value shall be the same as the SOP Instance UID of the corresponding DICOM KOS object. In the event that **any** information in the manifest changes and it needs to be resubmitted from the Imaging Document Source to the Document Repository, the Imaging Document Source shall generate a new SOP Instance UID for the DICOM KOS object to ensure that its submission to the Repository will succeed.
	For a CDA wrapped text report, this value shall be formulated from the HL7 CDA R2 header as follows:
	ClinicalDocument/id@root.ClinicalDocument/id@extension

3510 **4.68.4.1.2.3.3 Transformation of DICOM VR to XDS Document Metadata Data Types**

A number of XDS document metadata attributes use HL7 data types for value representation. Some of the metadata attributes may be transformed from data elements of the corresponding DICOM SOP Instance. In this section, transformations of DICOM VR (Value Representation) to 3515 the HL7 data types used in XDS metadata are described.

Note that term HL7 Data Type in the following transformations refers to their specified usage in XDS document metadata as defined in IHE ITI XDS Integration Profile.

4.68.4.1.2.3.3.1   CX – Extended Composite ID

Table 4.68.4.1.2.3-2 describes the transformation of data element of DICOM VR to CX data type 3520 as specified in IHE XDS Integration Profile:

Table 4.68.4.1.2.3-2: CX Data type mapping

CX Data Component	Component Name	DICOM VR	Comment
1	ID Number	LO	This attribute represent the value of Patient ID issued by an Assigning Authority as indicated in component 3. In DICOM, it is data element (0010,0020).
4.2	Assigning Authority – Universal ID		Assigning Authority information is not required in DICOM instance. The Imaging Document Source must use its local configuration to populate this subcomponent, to indicate the Patient ID Domain, from which the Patient ID value in component 1 has been issued. This must be an ISO OID
4.3	Assigning Authority – Universal ID Type		This must be "ISO"
5	Identifier Type		Patient ID Type information is not required in DICOM instance. The Imaging Document Source can use its local configuration to populate this component, to indicate the type of the Patient ID value in component 1.

HL7 CX data components not listed in the table are not used in XDS document metadata and shall be left empty.

4.68.4.1.2.3.3.2   DTM – Date / Time

3525 HL7 DTM Data Type can be represented in the following regular expression:

YYYY[MM[DD[HH[MM[SS]]]]]

This can be transformed from DICOM elements of VR DA (format: YYYYMMDD) and TM (format: HHMMSS.fraction).

4.68.4.1.2.3.3.3 XCN – Extended Composite ID Number and Name for Person

3530 Table 4.68.4.1.2.3-3 describes the transformation of DICOM VR to XCN data type as specified in IHE XDS Integration Profile:

Table 4.68.4.1.2.3-3: XCN Data type mapping

XCN Data Component	Component Name	DICOM Data Element	Comment
1	ID Number		This attribute component is not required in DICOM. The Imaging Document Source must use its local configuration or personnel directory service to populate this component.
2	Family Name	1st Component of PN	A data element of VR PN, like (0010,0010) for Patient Name
3	Given Name	2nd Component of PN	
4	Second or Further Given Names or Initials thereof	3rd Component of PN	
5	Suffix	5th Component of PN	
6	Prefix	4th Component of PN	
7	Degree		This attribute component is not included in DICOM.

HL7 XCN data components not listed in the table are not used in XDS document metadata and shall be left empty.

3535 4.68.4.1.2.3.3.4 XON – Extended Composite Name and Identification Number for Organization

Table 4.68.4.1.2.3-4 describes the transformation of DICOM VR to XON data type as specified in IHE XDS Integration Profile:

Table 4.68.4.1.2.3-4: XON Data type mapping

XON Data Component	Component Name	DICOM Data Element	Comment
1	Organization Name	LO	A data element of VR LO, like (0008,0080) for institution name

3540 HL7 XON data components not listed in the table are not used in XDS document metadata and shall be left empty.

4.68.4.1.2.3.4 XDS/XDS-I.b Metadata Values represented as HL7 v2.5 Data Types

XDS/ XDS-I.b Metadata that is represented as an HL7 v2.5 data type will require transformation
3545 from its corresponding HL7 CDA R2 header component. The following table (4.68.4.1.2.3-5) guides this transformation and indirectly imposes requirements on the configuration of and/or user interaction with implementations supporting this transaction. Additionally, this table further

4.68.4.1.2.3.3.3   XCN – Extended Composite ID Number and Name for Person

3530   Table 4.68.4.1.2.3-3 describes the transformation of DICOM VR to XCN data type as specified in IHE XDS Integration Profile:

Table 4.68.4.1.2.3-3: XCN Data type mapping

XCN Data Component	Component Name	DICOM Data Element	Comment
1	ID Number		This attribute component is not required in DICOM. The Imaging Document Source must use its local configuration or personnel directory service to populate this component.
2	Family Name	1st Component of PN	A data element of VR PN, like (0010,0010) for Patient Name
3	Given Name	2nd Component of PN	
4	Second or Further Given Names or Initials thereof	3rd Component of PN	
5	Suffix	5th Component of PN	
6	Prefix	4th Component of PN	
7	Degree		This attribute component is not included in DICOM.

HL7 XCN data components not listed in the table are not used in XDS document metadata and shall be left empty.

4.68.4.1.2.3.3.4   XON – Extended Composite Name and Identification Number for Organization

3535

Table 4.68.4.1.2.3-4 describes the transformation of DICOM VR to XON data type as specified in IHE XDS Integration Profile:

Table 4.68.4.1.2.3-4: XON Data type mapping

XON Data Component	Component Name	DICOM Data Element	Comment
1	Organization Name	LO	A data element of VR LO, like (0008,0080) for institution name

3540   HL7 XON data components not listed in the table are not used in XDS document metadata and shall be left empty.

4.68.4.1.2.3.4   XDS/XDS-I.b Metadata Values represented as HL7 v2.5 Data Types

XDS/ XDS-I.b Metadata that is represented as an HL7 v2.5 data type will require transformation
3545   from its corresponding HL7 CDA R2 header component. The following table (4.68.4.1.2.3-5) guides this transformation and indirectly imposes requirements on the configuration of and/or user interaction with implementations supporting this transaction. Additionally, this table further

---

restricts the HL7 CDA R2 specification. IDs in metadata that correspond to IDs in the CDA header (as II types) are required to have both a root and an extension attribute.

3550

Table 4.68.4.1.2.3-5: HL7 v2.5 and CDA Data type mapping

XDS/ XDS-I.b Metadata			HL7 CDA Header	
HL7 v2.5 Data Type	**Subcomponent index**	**Subcomponent name**	**HL7 CDA R2 Data element**	**HL7 CDA R2 Sub-element or attribute**
CX (SEE NOTE 1)			II	
	1	Id number	II	@extension
	4.1	AssigningAuthority. namespace	II	@assigningAuthorityName
	4.2	AssigningAuthority. uid	II	@root
DTM	1 (only)	Date/Time	TS or IVL_TS	@value (NOTE: format is compatible with DTM)
XCN			II and PN	
	1	Id number	II	@extension
	2.1	FamilyName.surnName	PN	Family
	3	Given Name	PN	Given
	4	Second (middle) Name	PN	Given
	5	Suffix	PN	Suffix
	6	Prefix	PN	Prefix
	9.1	AssigningAuthority. namespace	II	@assigningAuthorityName
	9.2	AssigningAuthority. uid	II	@root
XON			II and ON	
	1	Organization Name		
	3	Id number	II	@extension
	5.1	AssigningAuthority. namespace	II	@assigningAuthorityName
	5.2	AssigningAuthority. uid	II	@root

Note 1: XDS restricts the formatting of the CX datatype. See ITI TF-2x: Appendix E.

4.68.4.1.2.3.5 CDA Wrapper – Text Report [CDA] Option

This section outlines the content of the HL7 CDA R2 wrapper for the text content. We note here that requirements specified below are to ensure the presence of a minimum amount of wrapper data in order to enhance description and facilitate sharing of the document. It should be noted that the "nullFlavor" value expresses missing values in the CDA, e.g., it may be appropriate if such information cannot be derived from DICOM objects.

Implementers of the "Text Report [CDA]" Profile Option can and should make use of additional annotation within the CDA header to provide richer context. The examples in the following sections contain the minimal amount of wrapper data, as specified, and in many cases do make use of additional CDA header elements for enriched context.

To the extent possible, the specification for the CDA wrapper for the report text has been made consistent with the CDA metadata specified in the ITI XDS Scanned Documents (XDS-SD) Profile (see ITI TF-3: 5.2.3) and has be replicated here for the readers' convenience.

Elements and attributes that apply to the XDS-SD use case(s) but not to the use case of sharing an electronically transmitted radiology report have been omitted, where allowed by the CDA R2 specification. Descriptions for how to populate certain elements and attributes consistent with the "sharing a text-based radiology report" use case have been included.

4.68.4.1.2.3.5.1 Wrapper Format – HL7 CDA R2

The CDA metadata wrapper for plain text reports is the same as defined in the ITI XDS-SD Profile (see the metadata specification table in ITI TF-3: 5.2.3) with the exceptions described below and in the following subsections:

- The ClinicalDocument/dataEnterer element, as it is defined in XDS-SD, does not apply to the report sharing use case and thus may be omitted.

4.68.4.1.2.3.5.1.1 ClinicalDocument Child-less Elements

The requirements for the ClinicalDocument Child-less elements for CDA-wrapped plain text reports is the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.1), with the following exceptions/ clarifications:

- The ClinicalDocument/templateId element shall be 1.3.6.1.4.1.19376.1.2.21
- The ClinicalDocument/code element shall be set with the following attribute values:
  - code="11528-7"
  - codeSystem="2.16.840.1.113883.6.1"
  - codeSystemName="LOINC"
  - displayName="Radiology Report"/>

- The ClinicalDocument/effectiveTime shall denote the time at which the CDA text document was recorded. At a minimum, the time shall be precise to the day and shall include the time zone offset from GMT.

Example:

```
<ClinicalDocument xmlns="urn:hl7-org:v3">
  <typeId extension="POCD_HD000040" root="2.16.840.1.113883.1.3"/>
  <templateId root="1.3.6.1.4.1.19376.1.2.21">
  <id root="1.3.6.4.1.4.1.2835.2.7777"/>
  <code code="11528-7"  codeSystem="2.16.840.1.113883.6.1"
      codeSystemName="LOINC" displayName="Radiology Report"/>
  <title>Chest X-Ray</title>
  <effectiveTime value="20050329224411+0500"/>
  <confidentialityCode code="N" codeSystem="2.16.840.1.113883.5.25"/>
  <languageCode code="en-US"/>
```

3590

4.68.4.1.2.3.5.1.2   ClinicalDocument/recordTarget

The requirements and example for the ClinicalDocument/recordTarget element for CDA-wrapped plain text reports is the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 3595   5.2.3.2).

4.68.4.1.2.3.5.1.3   ClinicalDocument/author (original)

The requirements and example for the ClinicalDocument/author element (that represents the original author of the report) for CDA-wrapped plain text reports is the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.3).

3600   ### 4.68.4.1.2.3.5.1.4   ClinicalDocument/author (reporting system)

The requirements for the ClinicalDocument/author element (that represents the reporting system and software used to produce the report content) for CDA-wrapped plain text reports is the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.4), with the following exceptions/ clarifications:

3605   • When reading the XDS-SD specification, references to scanned, scanning, scanned content etc. refer to reporting, report content etc. in this context.
• When reading the XDS-SD specification concerning the ClinicalDocument/author/assignedAuthor/assignedAuthoringDevice/code element references to CDA-wrapped PDF can be ignored since they do not apply to the radiology 3610   report sharing use case.

Example:

```
  <author>
    <time value="20050329224411+0500"/>
    <assignedAuthor>
      <templateId root="1.3.6.1.4.1.19376.1.2.20.2"/>
     <id root="1.3.6.4.1.4.1.2835.2.1234"/>
     <assignedAuthoringDevice>
     <code code="WSD" displayName="Workstation" codeSystem="
     1.2.840.10008.2.16.4" />
        <manufacturerModelName>SOME REPORTING NAME AND MODEL
        </manufacturerModelName>
         <softwareName> REPORTING SOFTWARE NAME v0.0</softwareName>
      </assignedAuthoringDevice>
      <representedOrganization>
         <id root="1.3.6.4.1.4.1.2835.2"/>
         <name>SOME REPORTING Facility</name>
         <addr>
           <streetAddressLine>21 North Ave</streetAddressLine>
           <city>Burlington</city>
           <state>MA</state>
           <postalCode>01803</postalCode>
           <country>USA</country>
         </addr>
      </representedOrganization>
    </assignedAuthor>
</author>
```

4.68.4.1.2.3.5.1.5   ClinicalDocument/custodian

3615 The requirements and example for the ClinicalDocument/custodian element for CDA-wrapped plain text reports are the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.6). Its context is left up to the reporting facility to define in accordance with local policies and to reflect the entity responsible for the report content. In most cases this will be the reporting facility.

4.68.4.1.2.3.5.1.6   ClinicalDocument/legalAuthenticator

3620 The requirements and example for the ClinicalDocument/legalAuthenticator element for CDA-wrapped plain text reports are the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.7) and its context is left up to the reporting facility to define in accordance with local policies.

4.68.4.1.2.3.5.1.7   ClinicalDocument/documentationOf

3625 The requirements and example for the ClinicalDocument/documentationOf element for CDA-wrapped plain text reports are the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.8).

4.68.4.1.2.3.5.1.8   ClinicalDocument/component/nonXMLBody

This ClinicalDocument/component/nonXMLBody element shall be present and used to wrap the text content. The requirements for the nonXMLBody are the same as defined in the ITI XDS-SD Profile (see ITI TF-3: 5.2.3.9), with the following exceptions/ clarifications:

- When reading the XDS-SD specification, references to scanned, scanning, scanned content etc. refer to reporting, report content etc. in this context.
- When reading the XDS-SD specification concerning the ClinicalDocument/component/nonXMLBody element, references to CDA-wrapped PDF can be ignored since they do not apply to the radiology report sharing use case.

Example (report text content is in the same language as the wrapper):

```
<component>
  <nonXMLBody>
    <text mediaType="text/plain" representation="B64">
JVBERi0xLjMKJcfsj6IKNSAwIG9iago8PC9MZW5ndGggNiAwIFIvRmlsdGVyIC9GbGF
0ZURlY29kZT4+CnN0cmVhbQp4nGWPMWsDMQyFd/8KjfJwqmVbkr0GQqFbg7fQoSRNWu
hBQ/4/1L67TEEYme+9J1s3CMQQRm39NLuXg8H17gK89nN1N8eLAbZ2mmHXuql2QDVUh
nZxa5iBcyQtoMIUM7TZHbH5KZEVDgm//SSUswbFHx/JzBLeu5yYxOIzE8bPcRWqdaGD
mcZOBWc/9bfUNOPfOte44O9jxtcIKskqp0JZouJ5deYqeBn58ZmKtIU+2ptjqWQRJpG
yrHDuK7CXIe2be+/1DzXQP+RlbmRzdHJlYW0KZW5kb2JqCjYgMCBvYmoKMjAxCmVuZG
9iago0
    </text>
  </nonXMLBody>
</component>
</ClinicalDocument>
```

4.68.4.1.2.4 Use of XDS Submission Set

4.68.4.1.2.4.1   Linking Report to Set of DICOM Instances

Figure 4.68.4.1.2.4-1 shows examples of three Submission Sets:

- Submission Set 1 includes a report and a Manifest that are stored in the Document Repository. The manifest references DICOM instances that are archived in the IM/IA.
- Submission Set 2 includes one single manifest.
- Submission Set 3 includes a report and references the manifest from Submission Set 2 since it was generated by interpreting the images referenced by that manifest. Submission Set 3 also references the report and the manifest from Submission Set 1 since that report and images that are referenced by that manifest were used for the interpretation.
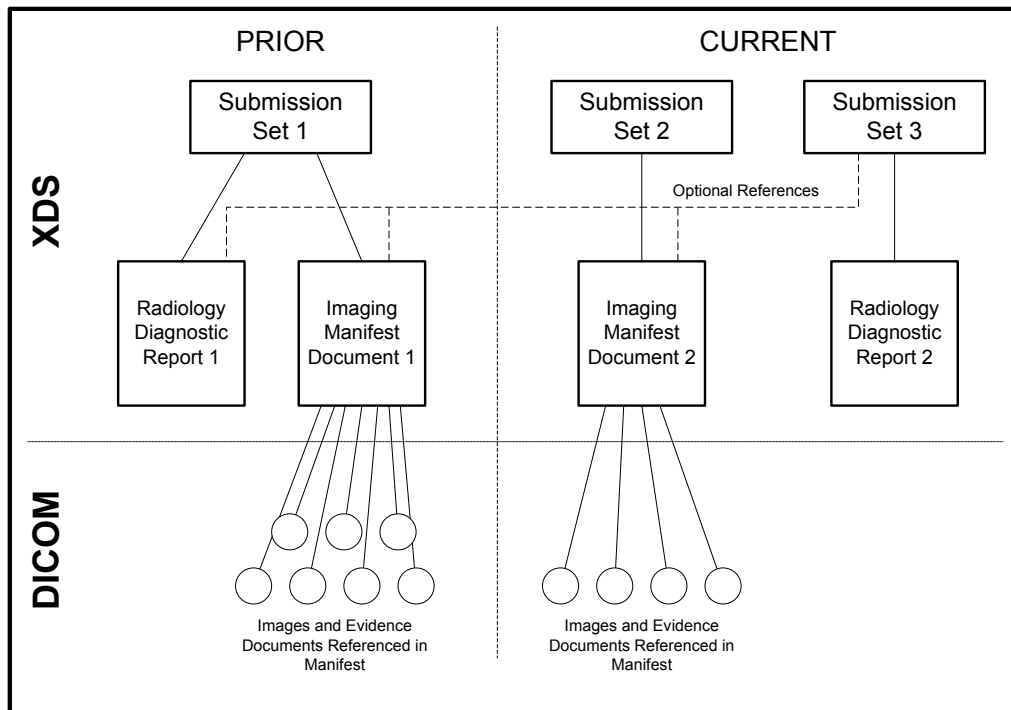
3650

Figure 4.68.4.1.2.4-1: Imaging Information Sharing Submission Set

4.68.4.1.2.4.2   Linking Report to prior report

The Report Submission Set can reference the manifest for a set of prior images published if the prior images were used in creating the interpretation. Likewise the report submission set can
3655   reference a report from a previous submission.

4.68.4.1.3   Expected Actions

The Document Repository Actor will receive this message and will process it according to the requirements specified in ITI TF-2b: 3.41.4.1.3.

4.68.4.2 Provide and Register Imaging Document Set – MTOM/XOP Response
3660   **message**

The Document Repository sends a Provide and Register Imaging Document Set – MTOM/XOP Response message when the processing of a Provide and Register Imaging Document Set – MTOM/XOP Request message is complete. The specification of the trigger events, message semantics and expected actions are the same as those specified in ITI TF-2b: 3.41.4.2.

3665   The conditions of failure and possible error messages are given in the ebRS standard. The Imaging Document Source shall handle all error messages detailed for the Provide and Register transaction in ITI TF-3: 4.1.13 "Error Reporting".

4.69 Retrieve Imaging Document Set

3670 This section corresponds to Transaction RAD-69 of the IHE Technical Framework. "Retrieve Imaging Document Set" is used by the Imaging Document Consumer to retrieve DICOM objects from an Imaging Document Source. The objects retrieved are those that are referenced within an XDS-I.b manifest document as described in RAD TF-3: 4.68. This transaction is derived from, and is nearly identical to, the "Retrieve Document Set" Transaction (ITI-43) of the IHE IT

3675 Infrastructure Technical Framework. It adds minor additional semantics and constraints on the requirements defined in Transaction ITI-43.

4.69.1 Scope

This transaction is used by the Imaging Document Consumer to retrieve a set of DICOM objects from the Imaging Document Source. The Imaging Document Consumer gains access to the

3680 manifest object (KOS) previously retrieved from the Document Repository by the grouped Document Consumer Actor via the Retrieve Document Set transaction. The Imaging Document Consumer extracts the XDSDocumentEntry.uniqueId and a repositoryUniqueId associated with the Imaging Document Source from the manifest (KOS) object for use in creating the retrieval request.

3685 **4.69.2 Use Case Roles**
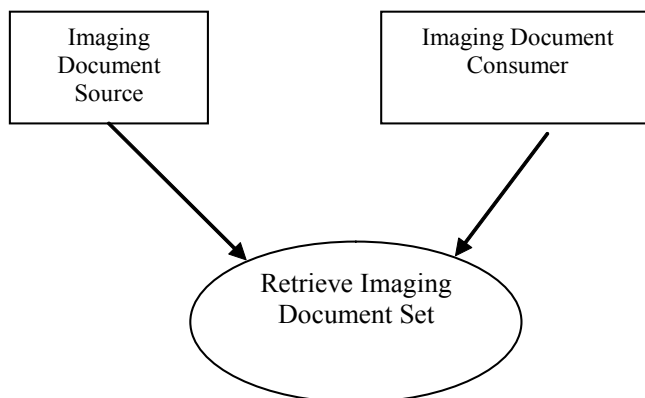
Actor: Imaging Document Consumer

Role: Issues a web service request to retrieve a set of DICOM instances.

Actor: Imaging Document Source

3690 **Role**: Receives a web service request for retrieval of a set of DICOM instances and generates the web service response with the appropriate content.

4.69.3 Referenced Standards

For a list of the standards inherited from the underlying ITI-43 Retrieve Document Set, see ITI TF-2b: 3.43.3.

3695 **4.69.4 Interaction Diagram**
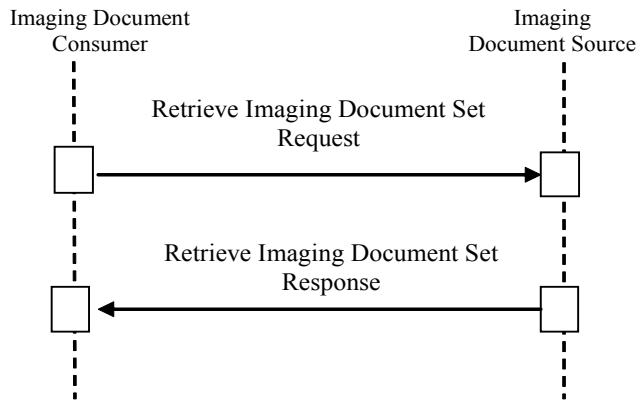
4.69.4.1 Retrieve Imaging Document Set Request message

An Imaging Document Consumer sends a request to an Imaging Document Source to retrieve the
set of images referenced within a manifest object. This message is an extension of the Retrieve
3700 Document Set transaction as defined in ITI TF-2b: 3.43.

4.69.4.1.1 Trigger Events

The Imaging Document Consumer wishes to retrieve a set of DICOM instances that are
referenced within a DICOM Manifest that was previously retrieved by the grouped Document
Consumer Actor. The Imaging Document Consumer obtains the documents' uniqueIds (i.e., the
3705 SOP Instance UIDs referenced within the DICOM manifest) along with the associated study and
series instance UIDs. The Imaging Document Consumer will either compute the
repositoryUniqueId(s) from the Retrieve AE Title attribute(s) within the DICOM manifest or
populate the repositoryUniqueId(s) using the Retrieve Location UID attribute(s) within the
DICOM manifest. The Imaging Document Consumer also maps the repositoryUniqueId(s) to
3710 web services endpoint(s) which are the targets of the message.

Once the documents' uniqueIds and repositoryUniqueId(s) have been obtained, the Imaging
Document Consumer will send the Retrieve Imaging Document Set Request to the Imaging
Document Source.

4.69.4.1.2 Message Semantics

3715 The Retrieve Imaging Document Set Request shall carry the following information:

- A required repositoryUniqueId that identifies the Imaging Document Source from which
  the DICOM instance is to be retrieved. This value shall either be "computed" based on
  the Retrieve AE Title (0008, 0054) attribute(s) present in the DICOM manifest or be
  populated from the Retrieve Location UID (0040,E011) attribute(s) that is present in the
  3720 DICOM manifest. For a description of how this "computation" can be achieved, see IHE
  RAD TF-3: Appendix G.3.

- A required list of one or more documentUniqueIds that identify the documents within the Imaging Document Source. These values correspond to the SOP Instance UIDs referenced within the DICOM manifest.
3725
- A required list of one or more DICOM transfer syntax UIDs that the Imaging Document Consumer is capable of processing.
- A required Study Instance UID value that identifies the study containing the DICOM images/ objects to be retrieved. The Study Instance UID is extracted from the KOS manifest.
3730
- A required Series Instance UID value that identifies the series containing the DICOM images/ objects to be retrieved. The Series Instance UID is extracted from the KOS manifest.

The message shall be structured as described in section 4.69.5 Protocol Requirements.

4.69.4.1.3 Expected Actions

3735 When receiving a Retrieve Imaging Document Set Request, an Imaging Document Source shall generate a Retrieve Document Set Response.

4.69.4.2 Retrieve Imaging Document Set Response message

4.69.4.2.1 Trigger Events

This message will be triggered by receipt of a Retrieve Imaging Document Set Request Message.

3740 **4.69.4.2.2 Message Semantics**

The semantics of the Retrieve Imaging Document Set Response Message are identical to those inherited from the ITI-43 transaction and are specified in ITI TF-2b: 3.43.4.2.2.

4.69.4.2.3 Expected Actions

An Imaging Document Source shall provide the document(s) indicated in the request. The
3745 Imaging Document Source shall return the document(s) or an error code in case the document could not be returned. The pixel data shall be encoded using one of the DICOM transfer syntaxes included in the Retrieve Imaging Document Set Request Message. If the Imaging Document Source cannot encode the pixel data using any of the provided transfer syntaxes then an error status shall be returned.

3750 If the Imaging Document Consumer specifies a transfer syntax field of 1.2.840.10008.1.2.4.94 (DICOM JPIP Referenced Transfer Syntax) or 1.2.840.10008.1.2.4.95 (DICOM JPIP Referenced Deflate Transfer Syntax), the following behavior is expected:

- If the DICOM Image Object(s) have a transfer syntax(es) that match the requested transfer syntax, the Retrieve Imaging Document Set Response shall include the DICOM
3755 Image Objects unchanged.
- If the DICOM Image Object(s) have a transfer syntax that differs from that of the request, the Retrieve Imaging Document Set Response shall include the DICOM image with the

---

transfer syntax changed to the requested transfer syntax. In addition, the pixel data Attribute (7Fe0,0010 tag) will have been removed and replaced with a Pixel Data Provider URL (0028,7FE0 tag). The URL represents the JPIP request and will include the specific target information.

- Upon receipt of this Retrieve Imaging Document Set Response, the Imaging Document Consumer may request the pixel data from the pixel data provider using the supplied URL. Additional parameters required by the application may be appended to the URL when accessing the pixel data provider.
- For example, a JPIP request for a 200 by 200 pixel rendition of the entire image can be constructed from the Pixel Data Provider URL as follows:

  - Pixel Data Provider URL (0028,7FE0) = https://server.xxx/jpipserver.cgi?target=imgxyz.jp2,
  - URL Generated by the application = https://server.xxx/jpipserver.cgi?target=imgxyz.jp2&fsiz=200,200

The conditions of failure and possible error messages are given in the ebRS standard and detailed in ITI TF-3: 4.1.13 "Error Reporting".

4.69.5 Protocol Requirements

Implementors of this transaction shall comply with all requirements described in ITI TF-2x: Appendix V: Web Services for IHE Transactions.

The Retrieve Imaging Document Set transaction shall use SOAP12 and MTOM with XOP encoding (labeled MTOM/XOP in this specification). See ITI TF-2x: Appendix V for details. The Imaging Document Source shall:

- Accept the Retrieve Document Set Request message in MTOM/XOP format.
- Generate the Retrieve Document Set Response message in MTOM/XOP format

The Imaging Document Consumer shall:

- Generate the Retrieve Document Set Request message in MTOM/XOP format.
- Accept the Retrieve Document Set Response message in MTOM/XOP format.

WSDL Namespace Definitions

iherad	urn:ihe:rad:xdsi-b:2009
ihe	urn:ihe:iti:xds-b:2007
rs	urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0
lcm	urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0
query	urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0

These are the requirements for the Retrieve Imaging Document Set transaction presented in the order in which they would appear in the WSDL definition:

- The following types shall be imported (xsd:import) in the /definitions/types section:

3790
- namespace="urn:ihe:rad:xdsi-b:2009", schema="
XDSI.b_ImagingDocumentSource.xsd"
- The baseline XDS.b schema (namespace="urn:ihe:iti:xds-b:2007", schema="
XDS.b_DocumentRepository.xsd")

- The /definitions/message/part/@element attribute of the Retrieve Imaging Document Set
3795
Request message shall be defined as "iherad:RetrieveImagingDocumentSetRequest"
- The /definitions/message/part/@element attribute of the Retrieve Imaging Document Set
Response message shall be defined as "ihe:RetrieveDocumentSetResponse"
- The /definitions/portType/operation/input/@wsaw:Action attribute for the Retrieve
Imaging Document Set Request message shall be defined as
3800
"urn:ihe:rad:2009:RetrieveImagingDocumentSet"
- The /definitions/portType/operation/output/@wsaw:Action attribute for the Retrieve
Imaging Document Set Response message shall be defined as
"urn:ihe:iti:2007:RetrieveDocumentSetResponse"
- The /definitions/binding/operation/soap12:operation/@soapAction attribute shall be
3805
defined as "urn:ihe:rad:2009:RetrieveImagingDocumentSet"

These are the requirements that affect the wire format of the SOAP message. The other WSDL
properties are only used within the WSDL definition and do not affect interoperability. Full
sample request and response messages are in section 4.69.5.1 Sample SOAP Messages.

For informative WSDL for the Imaging Document Source actor see example on the IHE FTP
3810
server at: ftp://ftp.ihe.net/TF_Implementation_Material/RAD.

The <iherad:RetrieveImagingDocumentSetRequest/> element for use with the Retrieve Imaging
Document Set Request Message is defined as:

- One or more <iherad:StudyRequest/> elements each of which includes a
"studyInstanceUID" attribute identifying the study associated with the DICOM images/
3815
objects being retrieved. Each <iherad:StudyRequest/> element shall contain:

  - One or more <iherad:SeriesRequest/> elements each of which includes a
  "seriesInstanceUID" attribute identifying the series associated with the DICOM
  images/ objects being retrieved. Each <iherad:SeriesRequest/> element shall contain:

    - One or more <ihe:DocumentRequest/> elements, each one representing an
3820
    individual document that the Imaging Document Consumer wants to retrieve from
    the Imaging Document Source. Each <ihe:DocumentRequest/> element contains:
    - A required <ihe:RepositoryUniqueId/> element that identifies the Imaging
    Document Source from which the document is to be retrieved. This value
    corresponds to XDSDocumentEntry.repositoryUniqueId.
3825
    - A required <ihe:DocumentUniqueId/> element that identifies the document
    within the Imaging Document Source. This value corresponds to the SOP Instance
    UID referenced within the DICOM manifest.
    - An optional <ihe:HomeCommunityId/> element that corresponds to the home
    attribute of the Identifiable class in ebRIM.

3830
- A required <iherad:TransferSyntaxUIDList/> element which contains a list of one or more <ihe:TransferSyntaxUID> elements. Each of the <iherad:TransferSyntaxUID> elements represent one of the transfer syntax encodings that the Imaging Document Consumer is capable of processing.

3835
This allows the Imaging Document Consumer to specify one or more documents to retrieve from the Document Repository.

The <ihe:RetrieveDocumentResponse/> element for use with the Retrieve Imaging Document Set Response Message is defined as::

- A required /ihe:RetrieveDocumentSetResponse/rs:RegistryResponse element
- An optional sequence of <ihe:DocumentResponse/> elements containing

3840
  - A <ihe:HomeCommunityId/> element. The value of this element shall be the same as the value of the /RetrieveImagingDocumentSetRequest/StudyRequest/SeriesRequest/DocumentReque st/HomeCommunityId element in the Retrieve Document Set Request Message. If the <ihe:HomeCommunityId/> element is not present in the Retrieve Document Set
3845
  Request Message, this value shall not be present.
  - A required <ihe:RepositoryUniqueId/> that identifies the Imaging Document Source from which the document is to be retrieved. The value of this element shall be the same as the value of the /RetrieveImagingDocumentSetRequest/StudyRequest/SeriesRequest/DocumentReque
3850
  st/RepositoryUniqueId element in the original Retrieve Imaging Document Set Request Message. This value corresponds to XDSDocumentEntry.repositoryUniqueId.
  - A required <ihe:DocumentUniqueId/> that identifies the document within the Imaging Document Source. The value of this element shall be the same as the value
3855
  of the /RetrieveImagingDocumentSetRequest/StudyRequest/SeriesRequest/DocumentReque st/DocumentUniqueId element in the original Retrieve Imaging Document Set Request Message. This value corresponds to the SOP Instance UID referenced within the DICOM manifest.
3860
  - A required <ihe:Document/> element that contains the retrieved document in base64binary encoded format
  - A required <ihe:mimeType/> element that indicates the MIME type of the retrieved document

3865
The /RetrieveDocumentSetResponse/rs:RegistryResponse/@status attributes provides the overall status of the request: It shall contain one of the following values:

```
urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success

urn:ihe:iti:2007:ResponseStatusType:PartialSuccess

urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Failure
```

See ITI TF-3: 4.1.13 Error Reporting for the interpretation of these values.

3870   For each document requested in a
/RetrieveImagingDocumentSetRequest/StudyRequest/SeriesRequest/DocumentRequest element:

- If a warning is reported when retrieving the document, then a
  /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:RegistryErrorList/
  rs:RegistryError element shall be returned with:

3875
  - @severity is urn:oasis:names:tc:ebxml-regrep:ErrorSeverityType:Warning
  - @errorCode is specified
  - @codeContext contains the warning message
  - @location contains the DocumentUniqueId of the document requested

- The document shall be returned in an instance of
3880   /RetrieveDocumentSetResponse/DocumentResponse/Document as base64binary encoded
  data. The returned document and warning are correlated via the DocumentUniqueId.
- If an error is reported when retrieving a document, then a
  /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:RegistryErrorList/
  rs:RegistryError element shall be returned with:

3885
  - @severity is urn:oasis:names:tc:ebxml-regrep:ErrorSeverityType:Error
  - @errorCode is specified
  - @codeContext contains the error message
  - @location contains the DocumentUniqueId of the document requested

- No corresponding RetrieveDocumentSetResponse/DocumentResponse element shall be
3890   returned
- If the document is successfully retrieved (without warning) then no
  /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:RegistryErrorList/
  rs:RegistryError element shall be present and a
  /RetrieveDocumentSetResponse/DocumentResponse/Document element shall be returned
3895   containing the document as base64binary encoded data.

The /RetrieveDocumentSetResponse/rs:RegistryResponse/rs:ResponseSlotList element is not
used in this transaction.

The /RetrieveDocumentSetResponse/rs:RegistryResponse/@requestId attribute is not used in this
transaction.

3900   A full XML Schema Document for the XDS.b and XDS-I.b types is available online on the IHE
FTP site at: ftp://ftp.ihe.net/TF_Implementation_Material/RAD (for XDS-I.b) and
ftp://ftp.ihe.net/TF_Implementation_Material/ITI (for XDS.b).

4.69.5.1 Sample SOAP Messages

The samples in the following two sections show a typical SOAP request and its relative SOAP
3905   response. The sample messages also show the WS-Addressing headers <Action/>,
<MessageID/>, <ReplyTo/>…; these WS-Addressing headers are populated according to the
IHE ITI TF-2x: Appendix V: Web Services for IHE Transactions. The body of the SOAP

message is omitted for brevity; in a real scenario the empty element will be populated with the appropriate metadata.

3910 Samples presented in this section are also available online on the IHE FTP site, see ftp://ftp.ihe.net/TF_Implementation_Material/RAD.

4.69.5.1.1   Sample Retrieve Imaging Document Set SOAP Request

```
<s:Envelope
    xmlns:s="http://www.w3.org/2003/05/soap-envelope"
    xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">urn:ihe:rad:2009:RetrieveImagingDocumentSet </a:Action>
    <a:MessageID>urn:uuid:0fbfdced-6c01-4d09-a110-2201afedaa02</a:MessageID>
    <a:ReplyTo s:mustUnderstand="1">
      <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
    </a:ReplyTo>
    <a:To >http://localhost:2647/XdsService/IHEXDSIDocSource.svc</a:To>
  </s:Header>
  <s:Body>
    <RetrieveImagingDocumentSetRequest xmlns:iherad="urn:ihe:rad:xdsi-b:2009"
xmlns:ihe="urn:ihe:iti:xds-b:2007">
      <StudyRequest studyInstanceUID="1.3.6.1.4...101">
        <SeriesRequest seriesInstanceUID="1.3.6.1.4...201">
          <ihe:DocumentRequest>
              <ihe:RepositoryUniqueId>1.3.6.1.4...1000</ihe:RepositoryUniqueId>
              <ihe:DocumentUniqueId>1.3.6.1.4...2300</ihe:DocumentUniqueId>
          </ihe:DocumentRequest>
          <ihe:DocumentRequest>
              <ihe:RepositoryUniqueId>1.3.6.1.4...1000</ihe:RepositoryUniqueId>
              <ihe:DocumentUniqueId>1.3.6.1.4...2301</ihe:DocumentUniqueId>
          </ihe:DocumentRequest>
        </SeriesRequest>
      </StudyRequest>
      <TransferSyntaxUIDList>
          <TransferSyntaxUID> 1.2.840.10008.1.2.1</TransferSyntaxUID>
          <TransferSyntaxUID> 1.2.840.10008.1.2.4.57</TransferSyntaxUID>
          <TransferSyntaxUID> 1.2.840.10008.1.2.4.70</TransferSyntaxUID>
      </TransferSyntaxUIDList>
    </RetrieveImagingDocumentSetRequest>
  </s:Body>
</s:Envelope>
```

4.69.5.1.2   Sample Retrieve Document Set SOAP Response

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">urn:ihe:iti:2007:RetrieveDocumentSetResponse</a:Action>
    <a:RelatesTo>urn:uuid:0fbfdced-6c01-4d09-a110-2201afedaa02</a:RelatesTo>
  </s:Header>
  <s:Body>
    <RetrieveDocumentSetResponse
        xmlns="urn:ihe:iti:xds-b:2007"
        xmlns:lcm="urn:oasis:names:tc:ebxml-regrep:xsd:lcm:3.0"
        xmlns:query="urn:oasis:names:tc:ebxml-regrep:xsd:query:3.0"
        xmlns:rim="urn:oasis:names:tc:ebxml-regrep:xsd:rim:3.0"
        xmlns:rs="urn:oasis:names:tc:ebxml-regrep:xsd:rs:3.0">
      <rs:RegistryResponse status="urn:oasis:names:tc:ebxml-regrep:ResponseStatusType:Success"/>
      <DocumentResponse>
        <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
        <DocumentUniqueId>1.3.6.1.4...2300</DocumentUniqueId>
        <mimeType>application/dicom</mimeType>
        <Document>UjBsR09EbGhjZ0dTQUxNQUFFBUUNBRU1tQ1p0dGGUXhEUzhi</Document>
      </DocumentResponse>
```

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```
3970        <DocumentResponse>
              <RepositoryUniqueId>1.3.6.1.4...1000</RepositoryUniqueId>
              <DocumentUniqueId>1.3.6.1.4...2301</DocumentUniqueId>
              <mimeType>application/dicom</mimeType>
              <Document>UjBsR09EbGhjZ0dTQUxNQUFFBUUNBRU1tQ1p0dU1GUCx4hu</Document>
3975        </DocumentResponse>
          </RetrieveDocumentSetResponse>
        </s:Body>
      </s:Envelope>


3980
```

3.20 Record Audit Event

This section corresponds to Transaction 20 of the IHE IT Infrastructure Technical Framework.
Transaction 20 is used by the all IHE actors that support the Audit Trail and Node Authentication
Integration Profile to communicate with the Audit Record Repository actors.

3.20.1 Scope

In the Record Audit Event transaction, the IHE actor creates an entry in the Audit Log at the
Audit Record Repository.

3.20.2 Use Case Roles
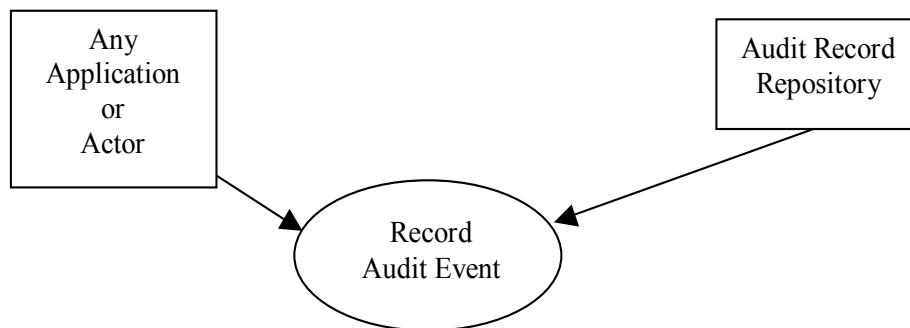
Application or Actor: Any actor or any other application that is grouped with the Secure Node
Actor.

Role: Create an audit record and transmit this record to the Audit Record Repository.

Actor: Audit Record Repository

Role: Receive an audit record from the Audit Record Creator and store this for audit purposes.

3.20.3 Referenced Standards

IETF:	The Syslog Protocol. (RFC 5424);
	Transmission of Syslog Messages over TLS (RFC 5425)
	Transmission of Syslog Messages over UDP (RFC 5426)
	Security Audit and Access Accountability Message XML Data Definitions for Healthcare Applications (RFC 3881).
DICOM:	Supplement 95
ASTM:	E2147-01 Standard Specification for Audit and Disclosure Logs for Use in Health Information Systems.
NIST:	SP 800-92 Guide to Computer Security Log Management.

W3C: Recommendation: Extensible Markup Language (XML) 1.0

3.20.4 Interaction Diagram
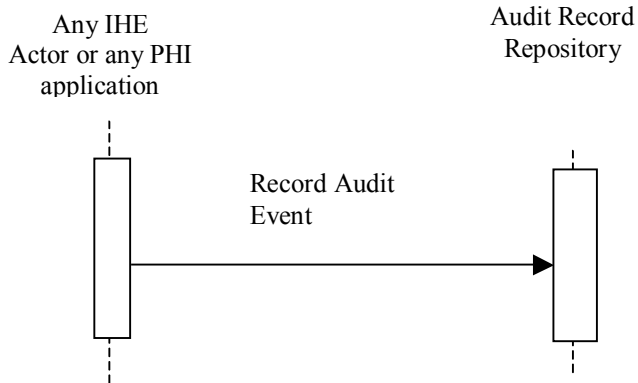
3630   ### 3.20.5 Record Audit Event

The Audit Record Repository shall accept the Audit Record message. The usage of the result by the Audit Record Repository is beyond the scope of the IHE Technical Framework.

3.20.6 Trigger Events and Message semantics

An Audit Log is a record of actions performed on data by users. Actions are queries, views,
3635   additions, deletions and changes. The IHE actor creates an Audit Record when an IHE transaction-related event occurs or when a non-transaction event occurs.

IHE specifies that events defined in Table 3.20.6-1 shall be reportable by means of the IHE Audit Trail. Radiology devices may also find that their subset of events is reportable by means of the IHE Provisional Audit Message Format. This is not recommended other than as a strategy
3640   for managing the upgrade of products and systems to the DICOM Audit Message Standard with IHE Extensions.

Table 3.20.6-1. Audit Record trigger events

Trigger Event	Description	Source Vocabulary
Actor-start-stop	Startup and shutdown of any actor. Applies to all actors. Is distinct from hardware powerup and shutdown.	DICOM (Sup 95) "Application Activity"
Audit-Log-Used	The audit trail repository has been accessed or modified by something other than the arrival of audit trail messages.	DICOM (Sup 95) "Audit Log Used"
Begin-storing-instances	Begin storing SOP Instances for a study. This may be a mix of instances.	DICOM (Sup 95) "Begin Transferring DICOM Instances"
Health-service-event	Health services scheduled and performed within an instance or episode of care. This includes scheduling, initiation, updates or amendments, performing or completing the act,	IHE Extension (ITI TF-2a: 3.20.7.3) "Health Services

Trigger Event	Description	Source Vocabulary
	and cancellation. See note below.	Provision Event"
Instances-deleted	SOP Instances are deleted from a specific study. One event covers all instances deleted for the particular study.	DICOM (Sup 95) "DICOM Instances Accessed" or "DICOM Study Deleted"
Instances-Stored	Instances for a particular study have been stored on this system. One event covers all instances stored for the particular study.	DICOM (Sup 95) "DICOM Instances Transferred"
Medication	Medication orders and administration within an instance or episode of care. This includes initial order, dispensing, delivery, and cancellation. See note below.	IHE Extension (ITI TF-2a: 3.20.7.3) "Medication Event"
Mobile-machine-event	Mobile machine joins or leaves secure domain.	DICOM (Sup 95) "Network Entry"
Node-Authentication-failure	A secure node authentication failure has occurred during TLS negotiation, e.g., invalid certificate.	DICOM (Sup 95) "Security Alert"
Order-record-event	Order record created, accessed, modified or deleted. Involved actors: Order Placer. This includes initial order, updates or amendments, delivery, completion, and cancellation. See note below.	DICOM (Sup 95) "Order Record"
Patient-care-assignment	Staffing or participant assignment actions relevant to the assignment of healthcare professionals, caregivers attending physician, residents, medical students, consultants, etc. to a patient It also includes change in assigned role or authorization, e.g., relative to healthcare status change, and de-assignment	IHE Extension (ITI TF-2a: 3.20.7.3) "Patient Care Resource Assignment"
Patient-care-episode	Specific patient care episodes or problems that occur within an instance of care. This includes initial assignment, updates or amendments, resolution, completion, and cancellation. See note below.	IHE Extension (ITI TF-2a: 3.20.7.3) "Patient Care Episode"
Patient-care-protocol	Patient association with a care protocol. This includes initial assignment, scheduling, updates or amendments, completion, and cancellation. See note below.	IHE Extension (ITI TF-2a: 3.20.7.3) "Patient Care Protocol"
Patient-record-event	Patient record created, modified, or accessed.	DICOM (Sup 95) "Patient Record"
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.	DICOM (Sup 95) "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.	DICOM (Sup 95) "Import"
Procedure-record-event	Procedure record created, modified, accessed or deleted.	DICOM (Sup 95) "Procedure Record"
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 2) Instance or Image Availability Query 3) PIX, PDQ, or XDS Query Notes: The general guidance is to log the query event with	DICOM (Sup 95) "Query"

Trigger Event	Description	Source Vocabulary
	the query parameters and not the result of the query. The result of a query may be very large and is likely to be of limited value vs. the overhead. The query parameters can be used effectively to detect bad behavior and the expectation is that given the query parameters the result could be regenerated if necessary.	
Security Alert	Security Administrative actions create, modify, delete, query, and display the following: 1. Configuration and other changes, e.g., software updates that affect any software that processes protected information. Hardware changes may also be reported in this event. 2. Security attributes and auditable events for the application functions used for patient management, clinical processes, registry of business objects and methods **(e.g., WSDL, UDDI)**, program creation and maintenance, etc. 3. Security domains according to various organizational categories such as entity-wide, institutional, departmental, etc. 4. Security categories or groupings for functions and data such as patient management, nursing, clinical, etc. 5. The allowable access permissions associated with functions and data, such as create, read, update, delete, and execution of specific functional units or object access or manipulation methods. 6. Security roles according to various task-grouping categories such as security administration, admissions desk, nurses, physicians, clinical specialists, etc. It also includes the association of permissions with roles for role-based access control. 7. User accounts. This includes assigning or changing password or other authentication data. It also includes the association of roles with users for role-based access control, or permissions with users for user-based access control. 8. Unauthorized user attempt to use security administration functions. 9. Audit enabling and disabling. 10. User authentication revocation. 11. Emergency Mode Access (aka Break-Glass) Security administration events should always be audited.	DICOM (Sup 95) "Security Alert"
User Authentication	This message describes the event of a user attempting to log on or log off, whether successful or not. No Participant Objects are needed for this message.	DICOM (Sup 95) "User Authentication"
Study-Object-Event	Study is created, modified, accessed, or deleted. This reports on addition of new instances to existing studies as well as creation of new studies.	DICOM (Sup 95) "DICOM Instances Accessed"
Study-used	SOP Instances from a specific study are created, modified or	DICOM (Sup 95) "DICOM

Trigger Event	Description	Source Vocabulary
	accessed. One event covers all instances used for the particular study.	Instances Accessed"

Note: The IHE extension has reduced the scope of many of the IETF events to remove phrases like "checking for clinical contra-indications". This is done to highlight that the events should be reported are those that are related to the access, use, creation, and distribution of PHI. This audit log is not intended to be a general purpose monitoring system to track all kinds of medical activity. As a result, many clinically significant events will not be separately reported.

3.20.6.1 Audit Record Transportation

This profile defines two transport mechanisms for the audit messages:

1. Transmission of Syslog Messages over TLS (RFC5425) with The Syslog Protocol (RFC5424) which formalizes sending syslog messages over a streaming protocol protectable by TLS

2. Transport utilizing the Transmission of Syslog Messages over UDP (RFC5426) with The Syslog Protocol (RFC5424) which formalizes and obsoletes BSD Syslog protocol defined in RFC-3164.

The Audit Record Repository shall support both transport mechanisms for the receipt of messages. Given that Audit Record Repository must accept both transports, the Secure Node Actors may choose to utilize either of the transport mechanisms, unless they also comply with another Profile that further restricts the use.

3.20.6.2 Audit Record format

The IHE defines several audit record formats, and future profiles may define more message formats. An IHE actor shall utilize one or more of these audit record formats. All audit record formats utilize XML encoding and are defined by XML schema.

The present list of audit record schema are:

1. The IHE Audit Trail format. This is a schema based on the standards developed and issued by the IETF, HL7, and DICOM organizations to meet the medical auditing needs as specified by ASTM.

2. IHE Provisional Audit Record format, defined below. This was previously defined as part of the IHE Radiology technical framework. Its use is deprecated, this implies that no extensions will be made and new applications should use the new IHE Audit Trail format.

3.20.6.3   Audit Message Transports

The Secure Node or Secure Application actor will create the Audit Record and transmit this to the Audit Record Repository as soon as possible. When for some reason the Audit Record Repository is not available, the Secure Node or Secure Application actor shall store the Audit Record in a local buffer until the Audit Record Repository is available again. The local Audit

Record at the Secure Node or Secure Application actor may be deleted when this record has been transmitted to the Audit Record Repository.

3680 The syslog message shall be created and transmitted as described in RFC 5424 and the following subsections. ATNA actors shall take into account the following points:

- The XML audit message may contain Unicode characters that are encoded using the UTF-8 encoding rules. UTF-8 avoids utilizing the control characters that are mandated by the syslog protocol, but it may appear to be gibberish to a system that is not prepared for UTF-8.
3685 Audit repositories must accept UTF-8 encodings and store them without damage, e.g., preserve all 8 bits.

- The PRI field shall be set using the facility value of 10 (security/authorization messages). Most messages should have the severity value of 5 (normal but significant), although applications may choose values of 4 (Warning condition) if that is appropriate to the more
3690 detailed information in the audit message. This means that for most audit messages the PRI field will contain the value "<85>". Audit repositories shall be prepared to deal appropriately with any incoming PRI value.

- The MSGID field in the HEADER of the SYSLOG-MSG shall be set to "IHE+RFC-3881" (minus the quotes).

3695 - STRUCTURED-DATA is not used for IHE ATNA audit messages, since the MSG field itself holds structured data.

- The MSG field of the SYSLOG-MSG shall be present and shall be an XML structure following the RFC 3881 format, as specified in this profile.

3.20.6.3.1 Reliable Syslog

3700 The Reliable Syslog "cooked" mode is no longer specified by this profile. Applications using Reliable Syslog should switch to transmission of syslog messages over TLS.

3.20.6.3.2 Transmission of Syslog Messages over UDP (formerly:BSD Syslog)

Transmission of Syslog Messages over UDP (RFC5426) with The Syslog Protocol (RFC5424) formalizes and obsoletes the BSD syslog protocol (RFC3164). This syslog is appropriate in some
3705 situations, it was defined in the IHE Rad Technical Framework, and it is a widely used legacy protocol.

- Note that the underlying UDP transport might not accept messages longer than 1024 or the MTU size minus the UDP header length. Long syslog messages may be truncated. The Audit Repository must be prepared for arbitrary truncation of messages. The IHE
3710 Provisional schema uses shortened names to reduce the size of messages, but some may exceed the largest size supported by the underlying transport. When syslog messages are truncated the resulting XML will be incorrect and will need to be corrected by the Audit Repository to close the truncated portions of the message.

- Because of this potential for truncated messages and other security concerns, the
3715 transmission of syslog messages over TLS may be preferred.

3.20.6.3.3   Transmission of Syslog Messages over TLS

Transmission of Syslog Messages over TLS (RFC5425) with The Syslog Protocol (RFC5424) formalizes sending syslog messages over a streaming protocol protectable by TLS. The RFC5424 states that this MUST be TLS version 1.2. For this transport that requirement is relaxed to be that it MUST be TLS, version 1.2 is RECOMMENDED.

3.20.7 Audit Message Formats

3.20.7.1 RFC-3881 format

A common XML schema was defined based upon joint work by IHE, HL7, DICOM, ASTM E31, and the Joint NEMA/COCIR/JIRA Security and Privacy Committee. The IHE IT Infrastructure technical framework prefers use of this schema for audit records generated by all IHE actors.   The schema can be found at:

http://www.xml.org/xml/schema/7f0d86bd/healthcare-security-audit.xsd
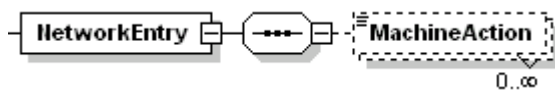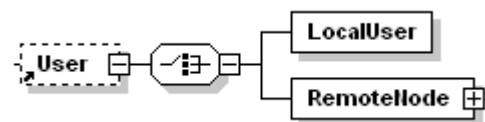
The DICOM Standard, Supplement 95 Audit Trail Messages provides vocabulary and further specification of the use of these schema elements for events that may occur in the context of DICOM equipment. IHE has evaluated this and determined that it is more broadly applicable, and extended it for more general healthcare use.

For reference, the schema elements are diagrammed below. The diagrams are read from left to right: elements to the right are part of the lefthandside element.

 Required single element. A NetworkEntry element consists of exactly one MachineAction element.

 Optional single element. A NetworkEntry element consists of zero or one MachineAction element.

 Optional multiple elements. A NetworkEntry element consists of zero or any number of MachineAction elements.

 Selections of one out of several elements. A user consists either of a LocalUser element or of a RemoteNode element.

 Compound element: The "+" in an element box means that the element consists of further elements. If these expansion elements have not occurred up to this point in the document, can be expected to follow below in the document.

element AuditMessage
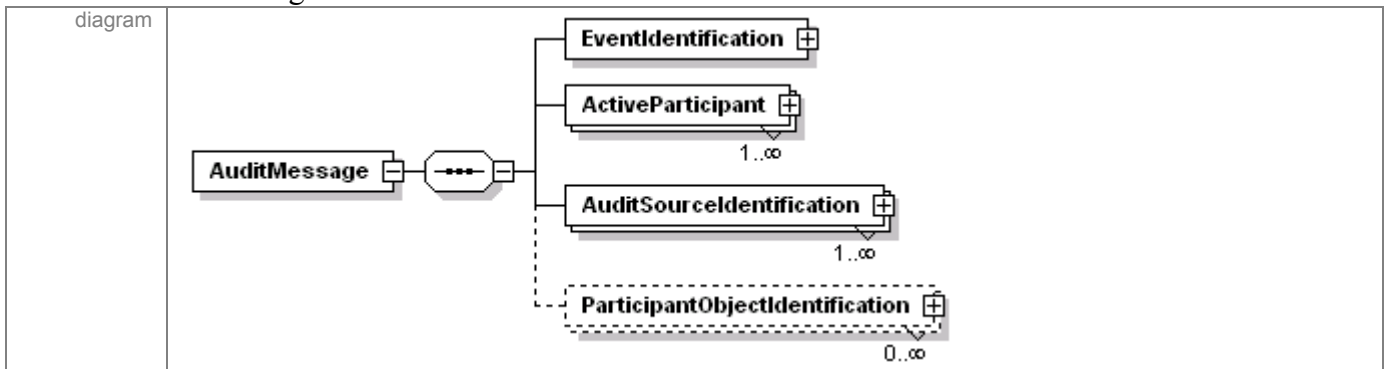
3750   element AuditMessage/EventIdentification
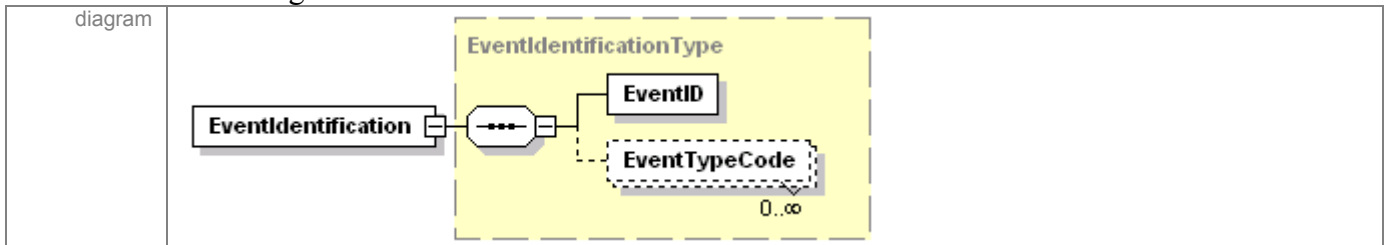
element AuditMessage/ActiveParticipant
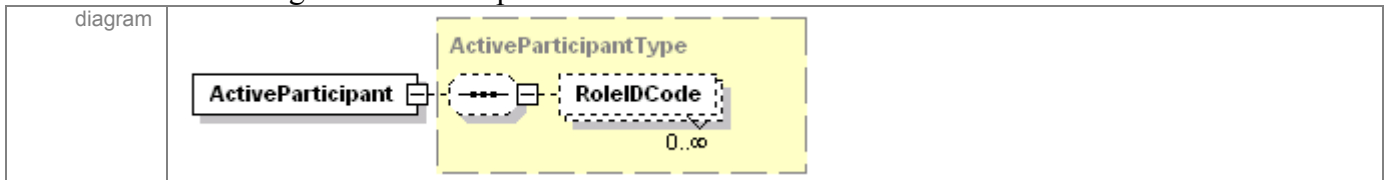
element AuditMessage/AuditSourceIdentification
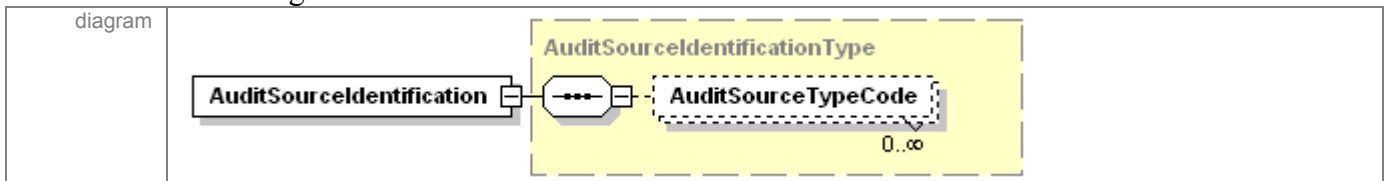
3755

3760

element AuditMessage/ParticipantObjectIdentification
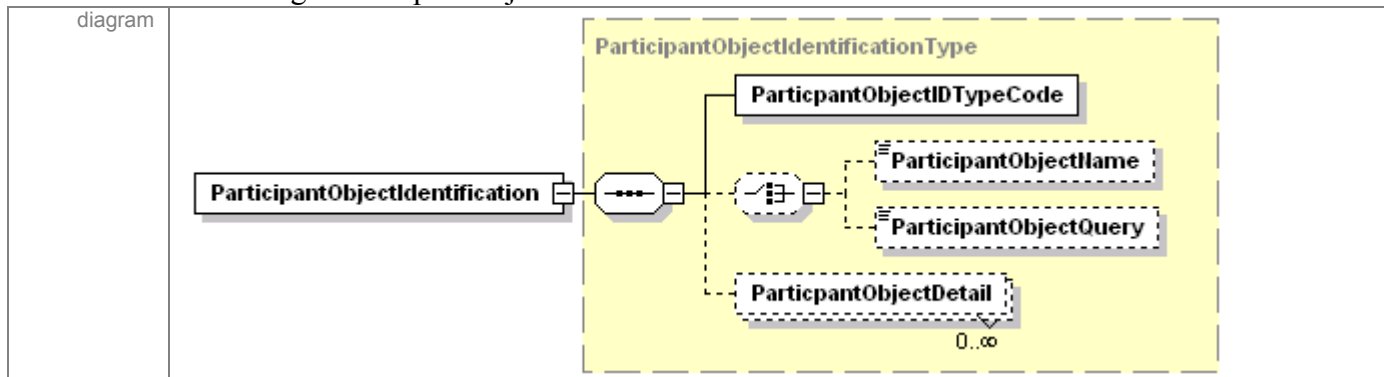
3765 Note: ParticipantObjectDetail should not include unnecessary detail such as duplication of the attributes otherwise encoded in the audit message.

3.20.7.2 DICOM Audit Trail

3770 A Secure Node actor shall be able to detect events that are defined by the DICOM standard in Supplement 95, and generate Record Audit Event transactions that conform to the DICOM standard when these events take place.

The DICOM Standard provides a schema for the basic messages and states that extensions are valid. This profile does not restrict private extensions that comply with the W3C XML encoding rules for the use of schemas, namespaces, etc.

3.20.7.3 IHE Audit Trail

3775 The DICOM standard and RFC-3881 do not address all the kinds of security and privacy events that can take place in the healthcare environment. The additional IHE defined events enumerated in ITI TF-2a: 3.20.7.5 shall be used for their defined purpose.

The notation used in these tables is that used in the DICOM standard. The messages shall be encoded as instances based on the RFC-3881 schema. In cases where there is an event that 3780 applies to more than one patient, there shall be a separate audit message for each patient.

3.20.7.4 Other event reports

Events that do not correspond to DICOM events or IHE Extension events can be reported. They shall comply with RFC-3881. Neither ATNA profile, DICOM, nor RFC-3881 restrict private 3785 extensions to the RFC-3881 schema however any private extensions shall comply with the W3C XML encoding rules for the use of schemas, namespaces, etc.

3.20.7.5 Controlled Terminology for IHE Extensions

This profile defines the following controlled terminology for use in the IHE extensions.

Context ID ccc1
Audit Event ID
Type: Extensible   Version: 2004xxxx

3790

Coding Scheme Designator	Coding Scheme Version	Code Value	Code Meaning
IHE		IHE0001	Health Services Provision Event
IHE		IHE0002	Medication Event
IHE		IHE0003	Patient Care ResourceAssignment
IHE		IHE0004	Patient Care Episode
IHE		IHE0005	Patient Care Protocol

IHE Code Definitions (Coding Scheme Designator "IHE" Coding Scheme Version "2004")

Code Value	Code Meaning	Definition	Notes
IHE0001	Health Services Provision Event	Health services scheduled and performed within an instance or episode of care. This includes scheduling, initiation, updates or amendments, performing or completing the act, and cancellation.	
IHE0002	Medication Event	Medication orders and administration within an instance or episode of care. This includes initial order,dispensing, delivery, and cancellation.	
IHE0003	Patient Care Resource Assignment	Staffing or participant assignment actions relevant to the assignment of healthcare professionals, caregivers attending physician, residents, medical students, consultants, etc. to a patient It also includes change in assigned role or authorization, e.g., relative to healthcare status change, and de-assignment	
IHE0004	Patient Care Episode	Specific patient care episodes or problems that occur within an instance of care. This includes initial assignment, updates or amendments, resolution, completion, and cancellation.	
IHE0005	Patient Care Protocol	Patient association with a care protocol. This includes initial assignment, scheduling, updates or amendments, completion, and cancellation.	

3795 ### 3.20.7.6 IHE Provisional Audit Message Form

A provisional XML Schema was defined for the contents of the audit records generated by the IHE actors in the deprecated Basic Security Integration Profile as part of the IHE Radiology domain. The ATNA profile includes this schema as an alternative format for audit messages. It

is less flexible than the IHE Audit Trail format, and is no longer the recommended format for
3800 IHE use. The preferred format is the IHE Audit Trail format with extensions that is described
above.

However, the IHE Provisional Audit Message format is suitable for many diagnostic equipment
settings and can be transformed into an equivalent IHE Audit Trail format. It is also installed
and in use at many locations. So the IHE Provisional Audit Message format is part of the IHE IT
3805 profile. The transition from its format to the IHE Audit Trail format is encouraged to reduce the
burden on Audit Repositories which may result from processing this alternative format.

A provisional XML Schema has been defined for the contents of the audit records generated by
the IHE actors in the Basic Security Integration Profile from the radiology technical framework.
The audit records are used to generate an audit record log for activities related to protected health
3810 information.

The IHE Provisional Audit Message Schema is described in ITI TF-2x: Appendix F.

3.20.7.7 RoleIDCode with access control roles

RoleIDCode is a CodedValueType. When describing a human users participation in an event,
3815 this value should represent the access control roles/permissions that authorized the event/trans.
Use of standards based roles/permissions is preferable to site or application specific. As RFC-
3881 indicates Many security systems are unable to produce this data, hence it is optional.

For example: at a site "St Fraser" they have defined a functional role code "NURSEA" for
attending nurse. This can be represented as

3820   EV("NURSEA", "St Fraser", "Attending Nurse")

Candidate standards based structural/functional role codes can be found at ISO, HL7, ASTM,
and various other sources.

Appendix K: XDS Security Environment

This Appendix expands on the summary provided in the XDS specification (ITI TF-1: 10.8).

1235 The XDS operations assume that a suitable security and privacy environment has been established. Almost all of the relevant threats will be managed by agreements, policies, and technologies that are external to the XDS transactions. The few that affect the XDS transactions will be managed by generic security mechanisms that are not unique to XDS.   The threats and security objectives that must be addressed are described in Sections K1 and K2 below. Only a

1240 few of these have issues that are unique to the XDS application.

Section K3 discusses these few threats and objectives in terms of the agreements and policies that need to be established to create a suitable environment for XDS. Establishing these agreements often involves business agreement discussions that are part of establishing the XDS Affinity Domain. These agreements are necessary because the exchange of documents implies

1245 agreeing to the delegation of responsibility for maintaining the security of these documents and for providing the necessary audit and record keeping facilities.

K.1:   Security Environment

K.1.1: Threats

Specific threats to the overall XDS system are listed below. These threats are identified using

1250 the Common Criteria nomenclature defined by ISO 17799. Most of these are mitigated by policies, procedures, and technologies that are not unique to XDS and do not require any special XDS considerations. Many of these mitigations do require that the parties within the XDS Affinity Domain have agreement on details of how they will work together.

T.ADMIN_ERROR Improper administration may result in defeat of specific security features.

1255 **T.ADMIN_ROGUE** Authorized administrator's intentions may become malicious resulting in TSF data to be compromised.

T.AUDIT_CORRUPT   A malicious process or user may cause audit records to be lost or modified, or prevent future records from being recorded by taking actions to exhaust audit storage capacity, thus masking an attacker's actions.

1260 **T.CONFIG_CORRUPT**   A malicious process or user may cause configuration data or other trusted data to be lost or modified.

T.DISASTER System or network may failure due to disaster (e.g., fire, earthquake).

T.DOS   A malicious process or user may block others from system resources via a resource exhaustion denial of service attack.

1265 **T.EAVESDROP**   A malicious process or user may intercept transmitted data inside or outside of the enclave. Some of the XDS environments are not concerned with eavesdrop

exposure. They may employ external protective mechanisms such as physical network security or VPNs to protect against eavesdropping.

T.HARDWARE   Hardware may malfunction.

1270   **T.IMPROPER_INSTALLATION** XDS components may be delivered, installed, or configured in a manner that undermines security.

T.INSECURE_START   Reboot may result in insecure state of the operating system.

T.INTRUSION   Malicious software (e.g., virus) may be introduced into the system.

T.MASQUERADE   A malicious process or user on one machine on the network may
1275   masquerade as an entity on another machine on the same network.

T.OBJECTS_NOT_CLEAN   Systems may not adequately remove the data from objects between usage by different users, thereby releasing information to a user unauthorized for the data. This also includes swapping hard disk with PHI during service and repair.

T.POOR_DESIGN   Unintentional or intentional errors in requirement specification, design or
1280   development of the TOE components may occur.

T.POOR_IMPLEMENTATION   Unintentional or intentional errors in implementing the design of the XDS environment may occur.

T.POOR_TEST   Incorrect system behavior may result from inability to demonstrate that all functions and interactions within the XDS operation are correct.

1285   **T.REPLAY**   A malicious process or user may gain access by replaying authentication (or other) information.

T.SPOOFING   A hostile entity may masquerade itself as part of the XDS Affinity Domain and communicate with authorized users who incorrectly believe they are communicating with authorized members.

1290   **T.SYSACC**   A malicious process or user may gain unauthorized access to the administrator account, or that of other trusted personnel.

T.UNATTENDED_SESSION   A malicious process or user may gain unauthorized access to an unattended session.

T.UNAUTH_ACCESS   Unauthorized access to data by a user may occur. This includes
1295   access via direct user interaction with the device, access via network transactions, and access via removable electronic and printed media.

T.UNAUTH_MODIFICATION   Unauthorized modification or use of XDS attributes and resources may occur.

T.UNDETECTED_ACTIONS   Failure of the XDS components to detect and record
1300   unauthorized actions may occur.

T.UNIDENTIFIED_ACTIONS   Failure of the administrator to identify and act upon unauthorized actions may occur.

T.UNKNOWN_STATE   Upon failure of XDS components, the security of the XDS environment may be unknown.

1305   **T.USER_CORRUPT**   User data may be lost or tampered with by other users.

K.1.2: Security and Privacy Policy

There are a wide variety of security and privacy regulations established by law and regulation. These are interpreted and extended to create individual enterprise policies. This equipment will be installed into a variety of enterprises that are subject to a variety of laws and regulations. The
1310   XDS environment will provide support for the common aspects of these enterprise policies. The policy statements whose enforcement must be provided by the XDS security mechanisms are:

P.ACCOUNT   The users of the system shall be held accountable for their actions within the system.

P.AUTHORIZATION   The system must limit the extent of each user's abilities in
1315   accordance with the TSPP. (See P.PATIENT_CARE)

P.AUTHORIZED_USERS Only those users who have been authorized to access the information within the system may access the system. (See P.PATIENT_CARE)

P.CRYPTOGRAPHY   The system shall use standard approved cryptography (methods and implementations) for key management (i.e., generation, access, distribution, destruction,
1320   handling, and storage of keys) and cryptographic services (i.e., encryption, decryption, signature, hashing, key exchange, and random number generation services).

P.DECLARATIVE_SECURITY   The system shall allow the administrator to define security related rules. Examples include defining access control policies and password expiration restriction.

1325   **P.I_AND_A**   All users must be identified and authenticated prior to accessing any controlled resources with the exception of public objects.

P.OBJECTAUTHORIZATION   The XDS components must enforce the policy regarding how authorization is established for protected objects. The policy determines how access control and other policies are enforced. (This is often considered part of P.Authorization, but in the
1330   XDS context it may make sense to consider this as a separate policy.)

P.PATIENT_CARE The security and privacy measures should not prevent patient care. In particular, there should be emergency bypass mechanisms to override security when necessary to provide patient care.

P.SYSTEM_INTEGRITY The system must have the ability to periodically validate its correct
1335   operation and, with the help of Administrators, Backup and Restore Operators, and Service Personnel, it must be able to recover from any errors that are detected.

P.TRACE   The primary method for enforcing the security and privacy policy is the use of auditing. The XDS components must have the ability to review the actions of individuals. The XDS environment must provide sufficient audit information to external audit and monitoring
1340   systems to permit the review of actions of individuals by that other system.

P.TRUSTED_RECOVERY Procedures and/or mechanisms shall be provided to assure that, after a system failure or other discontinuity, recovery without a protection compromise is obtained

P.VULNERABILITY_SEARCH The XDS environment must undergo an analysis for vulnerabilities beyond those that are obvious.

K.1.3: Security Usage Assumptions

Assumptions of the use of the XDS environment:

A.PHYSICAL It is assumed that appropriate physical security is provided within the domain for the value of the IT assets and the value of the stored, processed, and transmitted information.

A. AUDIT_REVIEW It is assumed that there will be audit repository and review services provided that can accept audit information from the XDS components in real time.

A.OPERATION It is assumed that networks, firewalls, etc. are deployed and maintained to meet appropriate network security levels.

A.PERSONNEL It is assumed that the organization can assure IT user & other workforce personal integrity/trustworthiness.

A.PKI It is assumed that there will be a facility to provide signed certificates as needed for node and user authentication. The key management maybe done manually or automatically depending on the availability of appropriate technology.

K.2: Security Objectives

This section defines the security objectives for the XDS environment. These objectives are suitable to counter all identified threats and cover all identified organizational security policies and assumptions. Common Criteria nomenclature is used. The XDS component security objectives are identified with "O." appended to at the beginning of the name and the environment objectives are identified with "OE." appended to the beginning of the name.

K.2.1: XDS Component Security Objectives

O.ACCESS The XDS components will ensure that users gain only authorized access to it and to the resources that it controls. (See O.EMERGENCY_BYPASS)

O.ACCESS_HISTORY The XDS components will display information (to authorized users) related to previous attempts to establish a session.

O.ADMIN_ROLE The XDS components will provide separate administrator roles to isolate administrative actions. These include a General Administrator role, a Backup and Restore Operator role, a Cryptographic Administrator role, and a Service Personnel role. Additional roles can be defined. These roles are collectively called Administrators.

O.ADMIN_TRAINED The XDS components will provide authorized Administrators with the necessary information for secure management and operation.

O.AUDIT_GENERATION The XDS components will provide the capability to detect and create records of security and privacy relevant events associated with users. The XDS components will reliably transmit this information to the central audit repository, and provide reliable local storage of events until the central audit repository has confirmed receipt. (See OE.AUDIT_REVIEW)

O.AUDIT_PROTECTION Each XDS component will provide the capability to protect audit information within its scope of control.

O.AUDIT_REVIEW If an external central audit repository is not part of the environment, the components will be configured to provide limited capability to analyze and selectively view audit information. (See OE.AUDIT_REVIEW)

O.CONFIG_MGMT All changes to the components and its development evidence will be tracked and controlled.

O.DECLARATIVE_SECURITY The components will allow security functions and access control to be defined by the authorized administrator.

O.DISASTER_RECOVERY The components should allow the authorized Administrators to perform backup and restore of electronic data, and rapid configuration and reconfiguration of device operation. In addition, the TOE should support administrative procedures to restore operation after disasters that may have substantially destroyed portions of the hospital operation and where substitute temporary systems are in place.

O.DISCRETIONARY_ACCESS The components will control accesses to resources based upon the identity of users and the role of users. (See O.EMERGENCY_BYPASS)

O.DISCRETIONARY_USER_CONTROL The components will allow authorized users to specify which resources may be accessed by which users and groups of users. (See O.EMERGENCY_BYPASS)

O.EMERGENCY_BYPASS The XDS components should allow access to any secured data during a declared medical emergency.

O.ENCRYPTED_CHANNEL Based on the environmental policies, encryption may be used to provide confidentiality of protected data in transit over public network.

O.INSTALL The XDS components will be delivered with the appropriate installation guidance in the form of installation manuals and training to establish and maintain component security.

O.INTRUSION_DETECTION The XDS components will ensure intrusion of malicious software (e.g., virus) is detected.

O.MANAGE The XDS components will provide all the functions and facilities necessary to support the authorized Administrators in their management of the security of the TOE.

O.PROTECT The XDS components will provide means to protect user data and resources.

O.RECOVERY Procedures and/or mechanisms will be provided to assure that recovery is
1415 obtained without a protection compromise, such as from system failure or discontinuity.

O.REMOTE_SERVICE The XDS components will provide the means for remote service
without sacrificing security or privacy policy.

O.RESIDUAL_INFORMATION The XDS components will ensure that any information
contained in a protected resource is not released when the resource is reallocated. Information
1420 on permanent media such as hard disk shall be secured during service and repair.

O.RESOURCE_SHARING No user will block others from accessing resources.

O.SELF_PROTECTION Each XDS component will maintain a domain for its own
execution that protects itself and its resources from external interference, tampering, or
unauthorized disclosure.

1425 **O.TRAINED_USERS** The XDS environment will provide authorized users with the
necessary guidance for secure operation.

O.TRUSTED_PATH **The TOE** will provide a means to ensure users are not
communicating with some other entity pretending to be the TOE. This covers entity
authentication. (See O.USER_AUTHENTICATION.)

1430 **O.TRUSTED_SYSTEM_OPERATION** The XDS components will function in a manner that
maintains security.

O.USER_AUTHENTICATION The XDS components will verify the claimed identity of
the interactive user. (See O.ENTITY_AUTHENTICATION.)

O.USER_IDENTIFICATION The XDS components will uniquely identify the interactive
1435 users.

K.2.2: Environment Security Objectives

OE.PHYSICAL Physical security will be provided within the domain for the value of the
IT assets protected by the XDS environment and the value of the stored, processed, and
transmitted information.

1440 **OE.AUDIT_REVIEW** There may be an audit repository and review service provided that
can accept audit information from the XDS environment in real time. This facility will provide
review and analysis functions. (See O.AUDIT_GENERATION, O.AUDIT_REVIEW)

OE.OPERATION Networks, firewalls, etc. are deployed and maintained to meet
appropriate network security levels.

1445 **OE.PERSONNEL** Assure IT user & other workforce personal
integrity/trustworthiness.

OE.PKI There will be a facility to provide signed certificates as needed for node and user
authentication.

K.3: Functional Environment

1450   The XDS can be modeled as having four different organizations that have a delegated responsibility relationship where each organization has a different functional responsibility. In some configurations a single organization is responsible for two or more of these functions, which makes delegation much easier. This section discusses the major areas that must be solved.

The four functions are:

1455   **Creator** – This functional organization has created the PHI and is legally responsible to the patient and others for providing healthcare and for protecting this data.

Repository – This functional organization is responsible for providing access to persistent documents to readers. The creator has delegated responsibility to the repository to provide adequate protection for a subset of the PHI. This subset is called the document.

1460   **Registry** - This functional organization is responsible for providing query services to readers. The creator has delegated responsibility to the to the registry to provide adequate protection for a subset of the PHI. This subset is called the metadata.

Reader – This functional organization is providing healthcare services that make use of data that is contained in the metadata and the documents.

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There are three levels of difficulty in delegation.

"**Trivial**" delegation is that where it is not necessary to delegate the responsibility for implementing the threat mitigation. In those cases it does not matter whether the organizations have the same policy or mitigations. For example, if the registry provides adequate mitigation

1470   against the threat of disaster, it need not be concerned with the disaster related policies of the reader.

"**Easy**" delegation is that where the two organizations have the equivalent policies. In those cases there is an initial difficult phase of discovering that the policies are the same and evaluating that the mitigation strategies are acceptable. This results in a simple binary decision to approve

1475   or disapprove a business relationship permitting the exchange of data. With the exception of the three policy classes described as "hard" below, the details of policies are likely to differ, but the goals are sufficiently uniform that a simple business decision can be made.

For the "easy" delegation, the IHE transactions must provide adequate mitigations for the threats so that the business decision to exchange data can be made based simply on review of the

1480   partners policies and mitigations. This means that some IHE transactions will have additional security requirements attached. For example, encryption to avoid the threat of eavesdropping may be required. These requirements are not unique to XDS and will be able to use standardized security features like TLS and VPN tools. These requirements may be significantly different from the usual practice within an enterprise, because of the differences in the environment.

1485   "**Hard**" delegation is that where the two organizations have different policies or inconsistent/incompatible mitigation strategies. These are likely to occur for the following policies, where organizations often disagree on the details of the policy goals, and where policies often change:

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P.Authorization – The authorized access policies and authorized modification policies often differ, and are often subject to change. The changes that occur are often at a detailed level, e.g., access rights to a particular patient information may change. This means that either there is an agreed mechanism to propagate changes, or an acceptance that policy changes may not be enforced, or there will be restrictions on the data exchange to avoid delegating responsibility for data that is subject to change.

P.Account and P.trace – The policies for accountability and traceability often differ. These are much less subject to change, but it is often difficult to reconcile delegation when these policies differ. This will be an especially difficult issue for repository and registry functions that support multiple different creator organizations.

P.ObjectAuthorization – The policies regarding creation and modification of access rights often differ. In addition, any of the policy and threat mitigations may be determined to be unacceptable by creator, registry, or repository. In the simple situation where there are only four real world participants this simply means that there is no business relationship. In the more complex world where the registry or repository are in many relationships with many creators and readers it introduces a serious problem. Either the registry and repository must limit its relationship to that small set of creators and readers that mutually accept all the policies and mitigations of all the other organizations, or there must be a mitigation strategy so that creators can restrict delegations by the registry and repository to only those readers that have policies and mitigations that are acceptable to the creator.

Mitigations for differences include the following:

Limit the data exchange to that data where the differences are not significant. For example, highly sensitive data like psychiatric notes might not be shared, while relatively insignificant data like allergy information is shared.

Provide a revocation mechanism to deal with policy changes, so that future delegations can be prohibited. It is often impractical to revoke past delegations because the PHI has already been disclosed. But the revocation mechanism can stop further delegation from taking place. This revocation mechanism must be part of the P.Authorization and P.ObjectAuthorization policies and must be mutually acceptable for this mitigation to be effective.

Trusted third party inspections and audits can sometimes deal with reconciliation of differences in P.Account and P.Trace.

An "approved delegation" list identifying acceptable and unacceptable creator/reader pairs can mitigate the repository and registry issues when the reader has incompatible policies with the creator. This does require the creator to accept the approved delegation policy and implementation of the repository and registry, but it reduces the combinatorial explosion of policy combinations between creators, repositories, registries, and readers into a linear growth in complexity.

The "approved delegation" may go further into identification of persons, but this is only a viable path when all parties have policies the easily support delegation of personal responsibility. Persons are usually required to comply with organizational policies, and organizations generally

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use roles rather than persons to establish policies. The often viable exception is the special case of the "deny access to person X". This can be a viable means of dealing with situations involving a conflict of interest. This kind of access denial may be applicable to just a particular subset of the PHI exchanged, (e.g., denying access to an ex-spouse).

These mitigations do not directly change the technical requirements for the XDS transactions. They are policy decisions that may affect how particular actors are configured. The

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implementation of XDS actors will need to be aware that this kind of site-specific configuration management and policy control will be routinely required.

Appendix V: Web Services for IHE Transactions

V.1: Introduction

2340   "Web Services" has become a catch-all phrase describing a wide range of HTTP transactions over a TCP/IP network. A more precise definition of Web Services implies richer infrastructure capabilities with all transactions built using SOAP messages. This appendix provides the guidelines for specifying the use of SOAP-based Web Services as the messaging infrastructure and transport mechanism for IHE transactions.

2345   ## V.2: Relevant Standards

Virtually all web services specifications are developed under the auspices of the World Wide Web Consortium (W3C) or the Organization for the Advancement of Structured Information Standards (OASIS). The Web Services-Interoperability organization (WS-I) publishes profiles, which incorporate several existing standards, and constrain them for interoperability. For each
2350   profile, WS-I also publishes a test assertion document and corresponding interoperability testing tools for Java and C#.

V.2.1: WS-I Profiles

Even though the Web Services for IHE transactions will be based on SOAP 1.2, they will take advantage of the guidelines expressed in the WS-I Basic Profile 1.1 (BP 1.1) and Simple SOAP
2355   Binding Profile 1.0 (SSBP 1.0) where applicable. Some IHE transaction may also take advantage of the WS-I Basic Security Profile 1.0 (BSP 1.0).

V.2.2: WS-* Specifications

In addition to the requirements of the current WS-I profiles, the Web Services for IHE transactions will support the following Web Services standards:

2360   - WS-Addressing
- MTOM
- XOP
- WS-Security

WS-I have started workgroups on defining profiles combining several of the above WS-*
2365   standards, as well as including:

- WS-SecureConversation
- WS-Trust
- WS-Policy
- WS-ReliableMessaging

2370   In the future, the Web Services for IHE transactions will consider support for these new WS-I
        profiles, or particular WS-* standards as needed by specific use cases.

V.2.3: HL7 Web Services Profile

        The HL7 Web Services Profile provides a framework for using Web Services as the transport
        mechanism for HL7 V3 messages. The framework provides a layered approach to specifying
2375   Web Services requirements. IHE will use the same approach as a guideline when specifying Web
        Services transport for IHE transactions and will do its best to maintain this consistency over
        time.

V.2.4: XML Namespaces

        Table V.2.4-1 lists XML namespaces that are used in this appendix. The choice of any
2380   namespace prefix is arbitrary and not semantically significant.

Table V.2.4-1 XML Namespaces and Prefixes

Prefix	Namespace	Specification
wsdl (or default)	http://schemas.xmlsoap.org/wsdl/	WSDL 1.1 binding for SOAP 1.1 WSDL 1.1 binding for SOAP 1.2
wsoap12	http://schemas.xmlsoap.org/wsdl/soap12/	WSDL 1.1 binding for SOAP 1.2
wsoap11	http://schemas.xmlsoap.org/wsdl/soap/	WSDL 1.1 binding for SOAP 1.1
wsoap	Either wsoap11 or wsoap12, depending on context	
wsa	http://www.w3.org/2005/08/addressing	WSA 1.0 - Core
wsaw	http://www.w3.org/2007/05/addressing/metadata	**WSA 1.0 - Metadata**
soap12	http://www.w3.org/2003/05/soap-envelope	SOAP 1.2
soap11	http://schemas.xmlsoap.org/soap/envelope/	SOAP 1.1
soap	Either soap11 or soap12 depending on context	
Hl7	urn:hl7-org:v3	HL7 V3 XML ITS
xsd	http://www.w3.org/2001/XMLSchema	XML Schema
xsi	http://www.w3.org/2001/XMLSchema-instance	XML Schema

V.3: Web Services Requirements

        The requirements in this section represent guidance for IHE Technical Framework authors who
2385   need to use web services in specific transactions. These requirements fall into two categories:

1. Providing consistency and clarity in the IHE specifications.

2. Affecting the wire format of the transactions.

Note: When the requirements for particular text are specified, the following notation is used:

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- curly braces (i.e. {}) are used to denote a part of a string which shall always be replaced with a string corresponding to the specific transaction, actor, or profile;
- square brackets (i.e. []) are used to denote a part of a string which shall be either replaced with a string corresponding to the specific transaction, or shall be completely omitted.

V.3.1: Requirements for Transactions using HL7 V3 Messages

2395 When IHE transactions use HL7 V3 Messages, the Web Services protocol will conform to the HL7 Web Services Basic, Addressing, Security, and Reliable Messaging Profiles, with additional constraints as specified in the following sub-sections.

V.3.1.1: HL7 WS Basic Profile Constraints

The Sender and Receiver shall conform to the HL7 WS Basic Profile with four modifications.
2400 The first modification is the requirement of supporting SOAP 1.2, while the HL7 WS Basic Profile provides the choice of supporting either SOAP 1.1 or SOAP 1.2, or both.

The second modification is to HL7-WSP200, which recommends that a WSDL document describes a specific HL7 application role. For consistency with non-HL7 V3 transactions, IHE specifications shall provide an example WSDL document for all transactions of an actor per
2405 profile (see IHE-WSP200).

The third modification is to HL7-WSP201, which recommends that the HL7 Application Role ID is to be used as the name of the WSDL definition. For consistency with non-HL7 V3 transactions the name of the example WSDL definition provided in the IHE specification shall be the actor name of the transaction's receiver (see the IHE-WSP201).

2410 The fourth modification is to HL7-WSP202, which specifies the use of the HL7 namespace as the target namespace of the WSDL document. This would prevent creating a single WSDL for actors which use both HL7 V3 and non-HL7 V3 IHE transactions (e.g., an XDS registry implementing the XDS.b profile with the Patient Identity Feed HL7 V3 transaction). For consistency among all IHE transactions, when creating an IHE transaction specification, the
2415 WSDL target namespace shall be specified as "urn:ihe:<committee name>:<profile>:<year> (see IHE-WSP202).

V.3.1.2: HL7 WS Addressing Profile Constraints

The Sender and Receiver should conform to the HL7 WS Addressing Profile. No additional constraints are made in this sub-section.

2420 ### V.3.1.3: HL7 WS Security Profile Constraints

IHE does not specify whether the Sender and Receiver should implement the HL7 WS Security Profile. The decision to implement the HL7 WS Security Profile is left to implementers. Each IHE transaction specifies its ATNA requirements for security and authentication. Security profiles such as Cross-Enterprise User Assertion (XUA) contain further security requirements.
2425 With the publication of WS-Security 1.1 and when the WS-I Basic Security Profile 1.1 is released, it is expected that ATNA (or a different profile) may incorporate additional options for Web Services, and the HL7 WS Security Profile will be incorporated in this appendix.

V.3.1.4: HL7 WS Reliable Messaging Profile Constraints

IHE does not specify whether the Sender and Receiver should implement the HL7 WS Reliable
2430 Messaging Profile. The decision to implement the HL7 WS Reliable Messaging Profile is left to implementers. When the WS-I Reliable Secure Profile Working Group releases a profile it is expected that additional options for Web Services may be added, and the HL7 WS Reliable Messaging Profile will be incorporated in this appendix.

V.3.2: Requirements for Transactions which don't use HL7 V3 Messages

2435 The following IHE web services requirements are derived from the HL7 Web Services profile. This provides consistency among the IHE transactions, compatibility to existing Web Services implementations through the WS-I profiles, and a well-defined mechanism for adding additional layers of web services in the future. The HL7 Web Services profile also provides detailed background regarding the requirements presented here.

2440 The numbering scheme for the individual requirements uses the following convention:

- IHE-WS[P|A|S|RM]nnn[.e]) text

P, A, S, and RM represent the Basic, Addressing, Security, and Reliable Messaging requirements sections in this specification, nnn represents a unique number for this specification, and text is the text of the requirement. This directly corresponds to the convention used in the HL7 Web
2445 Services profile, and for easier navigation, the same numbers correspond to the equivalent requirements in both specifications. Note that not all implementation decisions from the HL7 Web Services profile are relevant for non-HL7 web services transactions. If there are cases where an IHE Web Services requirement exists that does not correspond to an implementation decision from the HL7 Web Services Profile, the optional extension to the number (shown as .e
2450 above) can be used to eliminate the possibility of confusion.

Table V.3.2-1 Web Services Requirements for Non-HL7 Transitions

Requirement Identifier	Requirement text	SOAP message format affected?
IHE-WSP200	Example WSDL documents shall implement a specific IHE Actor within a specific IHE Integration Profile.	No
IHE-WSP201	The attribute /wsdl:definitions/@name in the example WSDL document provided with an IHE specification shall be the name of the IHE Actor providing the service.	No
IHE-WSP202	The targetNamespace of the example WSDL shall be urn:ihe:{committee}:{profile}:{year}	No

___

Requirement Identifier	Requirement text	SOAP message format affected?
IHE-WSP203	The example WSDL shall include XML Schema Definition references for the transactions payloads.	No
IHE-WSP205	Two WSDL messages shall be defined for a request-response transaction.	No
IHE-WSP206	In the example WSDL provided by an IHE specification a single WSDL part named Body shall be defined for each WSDL message and the part type shall refer to an element defined in the Schema Definition required in IHE-WSP203.	Determines the format of the SOAP Body
IHE_WSP207	For each input and output message defined in the WSDL portType operation an attribute wsaw:Action SHALL be included.	No
IHE_WSP208	WSDL operations SHALL use **wsdl:operation/wsdl:input/@wsaw:Action = "urn:ihe:{committee}:{Year}:{Transaction name}[Operation]"** and **wsdl:operation/wsdl:output/@wsaw:Action = "urn:ihe:{committee}:{Year}:{Transaction name}[Operation]Response"**	Determines the SOAP header content for wsa:Action
IHE_WSP211	Operations defined in the WSDL portType may or may not have a wsoap:operation/@soapAction attribute provided. SOAP message consumers shall ignore any soapAction value found in a SOAP message.	Determines the value of soapAction
IHE_WSP212	The example WSDL provided with an IHE specification shall use the SOAP Binding described in WSDL 1.1 Chapter 3 and the binding extension for SOAP 1.2.	No
IHE_WSP215	IHE transactions referencing the standards specified by Appendix V shall support SOAP 1.2, unless otherwise noted in the transaction. The example WSDL document provided with an IHE specification shall contain a SOAP 1.2 binding unless the transaction specifically notes that SOAP 1.2 is not supported.	Determines the namespace of the SOAP message
IHE_WSP216	For transactions which require SOAP 1.1 (contrary to the default SOAP 1.2) the WSDL shall contain a SOAP 1.1 binding. If the example WSDL document provided with an IHE specification contains a SOAP 1.1 binding, it shall use the SOAP Binding described in WSDL 1.1 Chapter 3.	Determines the namespace of the SOAP message
IHE_WSP300	SOAP messages and WSDL documents shall conform to the WS-I Basic Profile 1.1 (within the requirements for IHE-WSP215).	Yes
IHE_WSA100	The example WSDL provided with IHE transactions shall use the WS-Addressing framework when specifying the Web Services protocol.	Determines the WSA content for the SOAP header
IHE_WSA101	All `<wsa:Action>` elements shall have the mustUnderstand attribute set (`mustUnderstand="1"`)	Ensures that web services frameworks are configured to properly generate and process WS-Addressing headers
IHE_WSA102	The `<wsa:ReplyTo>` element of the initiating message	Ensures that responses

Requirement Identifier	Requirement text	SOAP message format affected?
	shall be present and shall have the mustUnderstand attribute set (`mustUnderstand="1"`)	are routed to the appropriate web services end point, or as an immediate response

V.3.2.1:   Basic Requirements

V.3.2.1.1.   Naming conventions and namespaces

IHE-WSP200) Example WSDL documents shall implement a specific IHE Actor within a specific IHE Integration Profile.

This editorial requirement means that if several IHE actors within a profile are combined, then separate WSDL documents for each actor need to be provided. This only applies to actors, which provide a particular service, i.e. the receivers in an IHE transaction.

IHE-WSP201)

IHE requires the profile writers and recommends the implementers to use the following naming convention for WSDL artifacts.

- NAME – represents the formal IHE Actor Name of the actor providing the service with spaces omitted from the name (ex. DocumentRegistry is the NAME value for the XDS.b Document Registry Actor). Specifically, NAME is the value of the /wsdl:definitions/@name attribute which will be specified for each transaction.

- Transaction Name – represents the formal IHE Transaction Name for this particular web-service exchange with spaces omitted from the name (ex. RegistryStoredQuery is the TRANSACTION_for the XDS.b Registry Stored Query Transaction)

WSDL Artifact	Proposed Naming
message request	{Transaction Name}_Message
message response	{Transaction Name}Response_Message
portType	{NAME}_PortType
Operation	{NAME}_{Transaction Name}[_OperationID]
SOAP 1.1 binding	{NAME}_Binding_Soap11
SOAP 1.1 port	{NAME}_Port_Soap11
SOAP 1.2 binding	{NAME}_Binding_Soap12
SOAP 1.2 port	{NAME}_Port_Soap12

Here is an example of how the nomenclature is applied:

```
For wsdl:definitions/@name="DocumentRegistry":

    message request          -> "RegistryStoredQuery_Message"
```

```
        message response        -> RegistryStoredQueryResponse_Message

        portType        -> "DocumentRegistry_PortType"

2475    operation       -> "DocumentRegistry_RegistryStoredQuery_Request"

        SOAP 1.2 binding -> "DocumentRegistry_Binding_Soap12"

        SOAP 1.2 port   -> "DocumentRegistry_Port_Soap12"

        SOAP 1.1 binding -> "DocumentRegistry_Binding_Soap11"

        SOAP 1.1 port   -> "DocumentRegistry_Port_Soap11"
```

2480 **IHE-WSP202)**

IHE requires the use of the following naming convention for targetNamespace of example WSDL.

- DOMAIN – represents the acronym of the IHE domain who authored this web-service transaction (ex. iti)

2485 - PROFILE – represents the acronym of the IHE profile which references this web-service transaction (ex. xds-b)

- YEAR – represents the four digit year that this transaction was first published within a Trial Implementation profile

- TYPE – optional extension of which other IHE specifications already using XML
2490 namespaces may make use

The targetNamespace of the example WSDL shall be

urn:ihe:{DOMAIN}:{PROFILE}:{YEAR} and may be extended to

urn:ihe:{DOMAIN}:{PROFILE}:{YEAR}:{TYPE}

As an example the namespace for the 2008 XDS.b Integration Profile is `urn:ihe:iti:xds-`
2495 `b:2007`.

IHE-WSP203) The example WSDL shall include XML Schema Definition references for the transactions payloads.

The purpose of this requirement is to specify how authors of IHE profiles specify the transactions which use web services. This requires both the existence of an XML schema
2500 definition for the transaction payloads, and the manner in which it is specified in the WSDL file – by reference.

V.3.2.1.2: Message and portType Definitions

IHE-WSP205) Two WSDL messages shall be defined for a request-response transaction.

IHE-WSP206) In the example WSDL provided by an IHE specification a single WSDL part
2505 named Body shall be defined for each WSDL message and the part type shall refer to an element defined in the Schema Definition required in IHE-WSP203.

IHE-WSP207) For each input and output message defined in the WSDL portType operation an attribute wsaw:Action SHALL be included.

For compatibility with the Addressing requirements and consistency with naming across IHE Web Services implementations, the wsaw:Action attribute for each WSDL input and output message must be defined.

The wsaw:Action attribute shall be ignored by Web Services implementations that do not support WS-Addressing. It is very important to have the attribute in mixed cases where just one of the endpoints might support the WS-Addressing specification to avoid communication or routing errors.

IHE-WSP208) WSDL operations SHALL use **wsdl:operation/wsdl:input/@wsaw:Action = "urn:ihe:{Domain}:{Year}:{Transaction name}" and wsdl:operation/wsdl:output/@wsaw:Action = "urn:ihe:{Domain}:{Year}:{Transaction name}Response"**

For example, the wsaw:Action value for the Registry Stored Query (ITI-18) transaction is specified as "`urn:ihe:iti:2007:RegistryStoredQuery`" and "`urn:ihe:iti:2007:RegistryStoredQueryResponse`".

V.3.2.1.3: Binding

Multiple WSDL bindings can be defined in order to support different protocols and transports. The naming is consistent with the naming rules specified in the previous section.

IHE-WSP211) For each operation defined in the WSDL portType a wsoap:operation/@soapAction attribute shall be provided. The value of wsoap:operation/@soapAction shall be consistent with the name for the corresponding WSDL operation defined in the WSDL portType (see IHE-WSP207 and IHE-WSP208)

IHE-WSP212) The example WSDL provided with an IHE specification shall use the SOAP Binding described in WSDL 1.1 Chapter 3 and the binding extension for SOAP 1.2.

IHE-WSP215) IHE transactions referencing the standards specified by Appendix V shall support SOAP 1.2, unless otherwise noted in the transaction. The example WSDL document provided with an IHE specification shall contain a SOAP 1.2 binding unless the transaction specifically notes that SOAP 1.2 is not supported.

SOAP 1.2 is the base standard for several WS specification, and has many available and easily accessible implementations.

IHE-WSP216) For transactions which require SOAP 1.1 (contrary to the default SOAP 1.2) the WSDL shall contain a SOAP 1.1 binding. If the example WSDL document provided with an IHE specification contains a SOAP 1.1 binding, it shall use the SOAP Binding described in WSDL 1.1 Chapter 3.

A SOAP 1.1 binding can be useful for backwards compatibility.

IHE-WSP300) SOAP messages and WSDL documents shall conform to the WS-I Basic Profile
2545 1.1 (within the requirements for IHE-WSP215).

Example 1: Example WSDL File with an Non-HL7 Transaction

```
<definitions xmlns:wsoap11="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:ihe="urn:ihe:iti:xds-b:2007" xmlns:rs="urn:oasis:names:tc:ebxml-
regrep:xsd:rs:3.0"
    targetNamespace="urn:ihe:iti:xds-b:2007"
xmlns:wsoap12="http://schemas.xmlsoap.org/wsdl/soap12/"
    xmlns:wsaw="http://www.w3.org/2007/05/addressing/wsdl"
name="XDSRepository">
    <documentation>IHE XDS Document Repository</documentation>
    <types>
        <xsd:schema elementFormDefault="qualified">
            <xsd:import namespace="urn:oasis:names:tc:ebxml-
regrep:xsd:rs:3.0"
                schemaLocation="../schema/ebXML_RS/rs.xsd"/>
            <xsd:import namespace="urn:ihe:iti:xds-b:2007"
schemaLocation="../schema/IHE/IHEXDS.xsd"/>
        </xsd:schema>
    </types>
    <message name="RetrieveDocumentSet_Message">
        <documentation>Retrieve Document Set</documentation>
        <part name="body" element="ihe:RetrieveDocumentSetRequest"/>
    </message>
    <message name="RetrieveDocumentSetResponse_Message">
        <documentation>Retrieve Document Set Response</documentation>
        <part name="body" element="ihe:RetrieveDocumentSetResponse"/>
    </message>
    <message name="ProvideAndRegisterDocumentSet_Message">
        <documentation>Provide and Register Document Set</documentation>
        <part name="body"
element="ihe:ProvideAndRegisterDocumentSetRequest"/>
    </message>
    <message name="ProvideAndRegisterDocumentSetResponse_Message">
        <documentation>Provide And Register Document Set
Response</documentation>
        <part name="body" element="rs:RegistryResponse"/>
    </message>
    <portType name="XDSDocumentRepository_PortType">
        <operation name="ProvideAndRegisterDocumentSet">
            <input message="ihe:ProvideAndRegisterDocumentSet_Message"
                wsaw:Action="urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-
b"/>
            <output
message="ihe:ProvideAndRegisterDocumentSetResponse_Message"
                wsaw:Action="urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-
bResponse"/>
        </operation>
        <operation name="RetrieveDocumentSet">
            <input message="ihe:RetrieveDocumentSet_Message"
```

```
                         wsaw:Action="urn:ihe:iti:2007:RetrieveDocumentSet"/>
                    <output message="ihe:RetrieveDocumentSetResponse_Message"
                         wsaw:Action="urn:ihe:iti:2007:RetrieveDocumentSetResponse"/>
             </operation>
        </portType>
        <binding name="XDSDocumentRepository_Binding_Soap11"
type="ihe:XDSDocumentRepository_PortType">
             <wsoap11:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
             <operation name="ProvideAndRegisterDocumentSet">
                 <wsoap11:operation
soapAction="urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-b"/>
                 <input>
                     <wsoap11:body use="literal"/>
                 </input>
                 <output>
                     <wsoap11:body use="literal"/>
                 </output>
             </operation>
             <operation name="RetrieveDocumentSet">
                 <wsoap11:operation
soapAction="urn:ihe:iti:2007:RetrieveDocumentSet"/>
                 <input>
                     <wsoap11:body use="literal"/>
                 </input>
                 <output>
                     <wsoap11:body use="literal"/>
                 </output>
             </operation>
        </binding>
        <binding name="XDSDocumentRepository_Binding_Soap12"
type="ihe:XDSDocumentRepository_PortType">
             <wsoap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
             <operation name="ProvideAndRegisterDocumentSet">
                 <wsoap12:operation
soapAction="urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-b"/>
                 <input>
                     <wsoap12:body use="literal"/>
                 </input>
                 <output>
                     <wsoap12:body use="literal"/>
                 </output>
             </operation>
             <operation name="RetrieveDocumentSet">
                 <wsoap12:operation
soapAction="urn:ihe:iti:2007:RetrieveDocumentSet"/>
                 <input>
                     <wsoap12:body use="literal"/>
                 </input>
                 <output>
                     <wsoap12:body use="literal"/>
                 </output>
```

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```
2650          </operation>
          </binding>
          <service name="XDSDocumentRepository_Service">
              <port name="XDSDocumentRepository_Port_Soap11"
binding="ihe:XDSDocumentRepository_Binding_Soap11">
                  <wsoap11:address
2655 location="http://servicelocation/XDSDocumentRepository_Service"/>
              </port>
              <port name="XDSDocumentRepository_Port_Soap12"
                  binding="ihe:XDSDocumentRepository_Binding_Soap12">
                  <wsoap12:address
2660 location="http://servicelocation/XDSDocumentRepository_Service"/>
              </port>
          </service>
</definitions>
```

V.3.2.2: Addressing Requirements

2665 The Web Services Addressing specification (WS-Addressing) defines a framework for a transport-neutral SOAP messaging. Although understanding the concepts outlined in WS-Addressing is important, most of the underlying details will be shielded by the abstraction layers provided to developers. This specification assumes an abstract separation between the application layer, the Web services messaging infrastructure layer, and the message transport 2670 layer.

The IHE transaction is built at the application layer, it is passed to the Web services messaging infrastructure layer where the SOAP message is constructed according to the rules set in the WSDL. The action value specified in the WSDL is used to construct the <wsa:Action> SOAP header. The endpoint address specified in the WSDL (or the supplied end point reference) is used 2675 to construct the <wsa:To>. Depending on the message exchange pattern (e.g., one-way, request-response), other WS-Addressing headers may be added at this point (e.g., <wsa:From>, <wsa:ReplyTo>, etc.).

IHE-WSA100) The example WSDL provided with IHE transactions shall use the WS-Addressing framework when specifying the Web Services protocol.

2680 **IHE-WSA101)** All <wsa:Action> elements shall have the mustUnderstand attribute set (mustUnderstand="1")

IHE-WSA102) The <wsa:ReplyTo> element of the initiating message shall be present and shall have the mustUnderstand attribute set (mustUnderstand="1")

Example 2: Request Message

```
2685 <soap12:Envelope xmlns:soap12="http://www.w3.org/2003/05/soap-envelope"
xmlns:wsa="http://www.w3.org/2005/08/addressing">
      <soap12:Header>
          <wsa:Action
soap12:mustUnderstand="1">urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-
2690 b</wsa:Action>
          <wsa:MessageID>urn:uuid:1600bc1a-10fd-4c3a-b41b-
7a15f4f46fb9</wsa:MessageID>
```

```
                    <wsa:ReplyTo soap12:mustUnderstand="1">

2695          <wsa:Address>http://www.w3.org/2005/08/addressing/anonymous</wsa:Addres
       s>
                    </wsa:ReplyTo>
                    <wsa:To>
       http://localhost:2647/XdsService/IHEXDSRepository.svc
2700       </wsa:To>
              </soap12:Header>
              <soap12:Body>
                    <ProvideAndRegisterDocumentSetRequest xmlns="urn:ihe:iti:xds-
       b:2007"/>
2705          </soap12:Body>
       </soap12:Envelope>
```

Example 3: Response Message

```
<soap12:Envelope xmlns:soap12="http://www.w3.org/2003/05/soap-envelope"
xmlns:wsa="http://www.w3.org/2005/08/addressing">
2710       <soap12:Header>
                <wsa:Action
soap12:mustUnderstand="1">urn:ihe:iti:2007:ProvideAndRegisterDocumentSet-
bResponse</wsa:Action>
                <wsa:RelatesTo>urn:uuid:1600bc1a-10fd-4c3a-b41b-
2715   7a15f4f46fb9</wsa:RelatesTo>
          </soap12:Header>
          <soap12:Body>
                <rs:RegistryResponse xmlns:rs="urn:oasis:names:tc:ebxml-
regrep:xsd:rs:3.0"/>
2720          </soap12:Body>
</soap12:Envelope>
```

V.3.2.3: Security Requirements

The IHE ATNA Integration Profile contains requirements which address certain aspects of
security and authentication, including HTTPS transport requirements. Individual transactions
2725 which use Web Services will incorporate these requirements depending on their needs. Security
profiles such as Cross-Enterprise User Assertion (IHE XUA) contain further security
requirements. With the publication of the WS-I Basic Security Profile it is expected that ATNA
will incorporate additional options for Web Services, and this appendix will reflect any
requirements specific for Web Services for IHE transactions.

V.4: Web Services for specific IHE Transactions

The Web Services specification is provided in three parts. The first part will be in Volumes 2a
and 2b, where a separate subsection shall be added for each affected IHE transaction at the end
of the "Message Semantics" section. This subsection shall detail the types and message parts of
the WSDL. The actor-specific constraints against the IHE Web Services Requirements specified
2735 above shall be added at the end of each "Expected Actions" section.

2740 The second, informative part of the specification shall be on the IHE ftp site (See ITI TF-2x: Appendix W), which shall contain a complete WSDL (Web Services Description Language) description of the web service, which aggregates the snippets from Volumes 2a and 2b described above. There will be one WSDL contract per actor per profile. Each transaction is represented by a port type, where the operations names and message names follow the requirements specified in ITI TF-2x: V.3.2.1.1. The complete WSDL is for reference purposes for implementers.

V.5: Web Services Standards Evolution

2745 As the industry acceptance of newer standards/newer versions of existing standards progresses, new options will be added to existing transactions. One such expected change is the support for WS-Security and WS-Reliable Messaging as new options to web services transactions.

V.6: Web Services References

WS-I: http://ws-i.org/

WS-I Basic Profile 1.1: http://www.ws-i.org/Profiles/BasicProfile-1.1.html

WS-I Simple SOAP Binding Profile: http://www.ws-i.org/Profiles/SimpleSoapBindingProfile-1.0.html

2750 SOAP 1.1: http://www.w3.org/TR/2000/NOTE-SOAP-20000508/

SOAP 1.2: http://www.w3.org/TR/soap12-part0/

WSDL 1.1 SOAP 1.1 binding (Chapter 3): http://www.w3.org/TR/wsdl.html#_soap-b

WSDL 1.1 SOAP 1.2 binding: http://www.w3.org/Submission/wsdl11soap12/

2755 HL7 V3 Web Services Profile: http://www.hl7.org/v3ballot/html/infrastructure/transport/transport-wsprofiles.htm

WS-Addressing: http://www.w3.org/TR/ws-addr-core

WS-I Basic Security Profile: http://www.ws-i.org/Profiles/BasicSecurityProfile-1.0.html

MTOM: http://www.w3.org/TR/soap12-mtom/

2760 XOP: http://www.w3.org/TR/xop10/

WS-Security 1.0: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wss#technical

WS-Security 1.1: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wss#technical

2765 WS-Secure Conversation: http://specs.xmlsoap.org/ws/2005/02/sc/WS-SecureConversation.pdf

WS-Trust: http://docs.oasis-open.org/ws-sx/ws-trust/v1.3/ws-trust.html

WS-Policy: http://www.w3.org/Submission/WS-Policy/

WS-Reliable Messaging: http://docs.oasis-open.org/ws-rx/wsrm/200702

Appendix W: Implementation Material

2770   Implementation material for ITI profiles such as XDS, XCA, RFD can be found on the IHE FTP site under ftp://ftp.ihe.net/TF_Implementation_Material/ITI/.

Some of the types of implementation material available are schema, examples and informative WSDL.