Integrating the Healthcare Enterprise

IHE IT Infrastructure
Technical Framework Supplement

XAD-PID Change Management
(XPID)

Rev. 1.5 – Trial Implementation

Date: August 5, 2016

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Foreword

This is a supplement to the IHE IT Infrastructure Technical Framework V13.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on August 5, 2016 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the IT Infrastructure Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/ITI_Public_Comments.

This supplement describes changes to the existing technical framework documents.

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

Amend Section X.X by the following:

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

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

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

Information about the structure of IHE Technical Frameworks and Supplements can be found at: http://www.ihe.net/IHE_Process and http://www.ihe.net/Profiles.

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

55 **CONTENTS**

100

Introduction

The XAD-PID Change Management (XPID) Profile provides a means by which a XDS Document Registry can be notified of external changes to XDS Affinity Domain Patient IDs (XAD-PIDs) links so that it can affect these changes, as appropriate, in its database.

105 The XAD-PID is a critical attribute of every document contained in a XDS Document Registry. It provides the only manner by which documents pertaining to the same person can be grouped together in a longitudinal view, thus the imperative of having a correct identifier in every entry.

This profile addresses only the linking of patient identifiers. Linking of patient identifiers supports an environment where multiple patient identifier domains are being used and translation
110 among those patient identifiers is needed to enable patient identification across patient identifier domains. Patient identifiers across patient identifier domains can be linked, reflecting that the same patient is identified by all linked identifiers, and can be unlinked, reflecting that it was later found that the identifiers previously linked are not referring to the same patient. This profile supports a subset of all link/unlink events because it enables only linking with an XAD-PID and
115 enables link and unlink in a single transaction – Notify XAD-PID Link Change.

Merging of patient identifiers supports an environment where two patient identifiers, generally in the same patient identifier domain, are found to refer to the same patient and one is subsumed by the other. In this environment the subsumed patient identifier is no longer used and all records are merged in with the surviving patient identifier. Merge is supported within the XDS Profile
120 through a Patient Feed message that communicates to the XDS Document Registry that a subsumed patient identifier has been merged into a surviving patient identifier. Having received this message the XDS Document Registry will no longer use the subsumed patient identifier. Unmerge is the reverse of this operation and is not supported directly by IHE but may be supported through an administrative interface on an XDS Document Registry or through a non
125 IHE mechanism.

In many XDS implementations, the XAD-PID is determined by linking local patient identifiers (i.e., those used by the Document Source) with identifiers managed by the XAD patient identification domain. Once established, this relationship will be used to index every document with the corresponding XAD-PID. It is assumed that a Patient Identifier Cross-reference
130 Manager is the system that creates and manages these links.

The problem addressed by this profile is what should happen if one or more links are discovered to have been created incorrectly, that in fact a local patient identifier should have been linked to a different XAD-PID. The Patient Identifier Cross-reference Manager is certainly able to detect the situation and corrects its own internal linkage sets. However, this change must now be
135 communicated to other systems, in particular the XDS Document Registry, so that that actor may also correct the error within its databases.

When evaluating the possible solutions to the problem, it was determined that existing IHE transactions would not be appropriate for this purpose. They were either too large and complex, carrying unnecessary information, or required the coordination of two or more messages to

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140   properly communicate all aspects of the link change, which in turn would create some grave complexities on the receiver side to ensure the atomicity of the event.

The existing PIX Update Notification transaction [ITI-10] is designed to inform interested consumers of changes to any patient ID associations, not only those relating to XAD-PIDs. For example, if a local patient ID is part of a relationship set with 5 other patient IDs from other

145   domains (one likely being the current XAD-PID), and is re-linked to another relationship set with 2 other patient IDs (including the new XAD-PID), this event would trigger 7 notifications. What is sought in this profile is a single, directed notification that can let the consumer (i.e., the Document Registry) know that a given local patient ID is now assigned to a new XAD-PID.

Consequently, a new transaction is used to communicate the external event that may require an

150   action by the Document Registry:

- Notify XAD-PID Link Change [ITI-64]: informs when a different XAD-PID is assigned to a local domain PID;

In reviewing possible standard message options, the HL7®[1] v2 candidate messages fell into two groups: those that would require a pair of matched messages and those that would only require

155   one message. Given the need to ensure the integrity of systems and atomicity of the change processing, the options that required paired messages were dropped.

The decision was then left to which single-message should be used. The decision was based on two factors: smaller footprint for the message and adoption by existing systems. The first criteria aimed to address the fact that HL7 v2 provides a broad set of options for most use cases and that,

160   given the choice, it would be best to use the message type that required the fewest data elements, in order to improve performance and reduce complexity.

The second criteria addresses the fact that some HL7 v2 messages, particularly around ADT events, have gone through an evolutionary process, where new sets of message types were defined to support new requirements. Unfortunately, it was not always the case that the previous

165   sets were deprecated or replaced in real implementations. So, it was important to choose a message type from the most current ADT sets which will have the most likely chance of being used by vendors.

After all these considerations, the new transaction uses ADT^A43.

Profile Abstract

170   The XPID profiles describes a mechanism for communicating a change to the XDS Affinity Domain Patient ID (XAD-PID) linked to a local Patient ID and the expected behavior of the Document Registry when such change occurs.

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

Open Issues and Questions

None

Closed Issues

XPID.1) Should this be a separate profile?

> *Yes*

XPID.2) Do we want to document the "unmerge" use case?

> *Not at this time. This scenario is considered complex and would require much better understanding of the needs of implementation projects.*

XPID.3) Should we have HL7 v2 and HL7 v3 options for this profile?

> *Not at this time. This could be added as a future enhancement as was done for the PIX/PDQ Profiles.*

XPID.4) Need to explain the "new" role of sourcePatientID (or do we need a new metadata element)?

> *Addressed.*

XPID.5) Consistency of this profile with the PIX update notifications – are they two sides of the same coin? Should they be aligned/consistent and if not, why not?

> *Text added to the introduction section.*

XPID.6) is the technical approach documented in the deprecated merge supplement still valid?

> *To be discussed in the new CP (see XPID 7 below)*

XPID.7) Should merge be resolved via CP?

> *Yes*

XPID.8) should this profile extend beyond just XDS?

> *Due to concerns about scope and effort, the committee has agreed to keep this profile to XDS environments only (maybe just for now).*

XPID.9) document the use the MU as basis for the link handling, including associations.

> *Done*

XPID.10) Include in the introduction (maybe in the appendix?) text about relationship between link/unlink and merge/unmerge – describe what we mean by each term and make reference to the merge CP – make clear that IHE covers both (excluding unmerge) – may want to include why we're not addressing unmerge.

> *Done.*

XPID.11) current direction is to allow Document Registry updates to proceed even if there are
205 *errors in associations and to log the errors. Is the reporting of this kind of errors an*
interoperability concern? This needs to be validated. An important issue: do we need to establish
interoperability and access to said failures?

Reporting is not an interoperability concern but was described as part of the possible strategies implementers need to consider.

210 *XPID.12) Can this approach be extended for a (new) use case where multiple localPatientIDs are being changed to the same XAD-PID concurrently?*

Possibly, but it has not been addressed in this version of the profile.

XPID.13) Reference to Section 4.1.15 in Volume 3 – is the current wording adequate for the purpose in which it is used in this profile? Is there a need to revisit the wording and make it
215 *more appropriate?*

Resolved

XPID.14) Should this profile allow the Document Registry to put a "hold" on acting on the change notification if it would cause any inconsistency (e.g., documents with different patientId in the same folder)in its metadata representation? (in this case the entire transaction is passed
220 *to a system administrator to review and act upon as appropriate)*

Yes. See Volume 2, 3.64.4.1.3 Expected Actions.

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225 **General Introduction**

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

Appendix A – Actor Summary Definitions

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

230   No new actors

Appendix B – Transaction Summary Definitions

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

Transaction	Definition
Notify XAD-PID Link Change [ITI-64]	This transaction informs the recipient that there has been a change to the link between a **"local patient ID"** (i.e., that used by the Document Source) and its corresponding XAD-PID (XDS Affinity Domain Patient Identifier).

235 **Glossary**

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

Glossary Term	Definition
XAD-PID - XDS Affinity Domain Patient Identifier	XDS assumes that the XDS Affinity Domain will establish common means to create a unique patient identifier for persons involved in the domain and allow Document Sources to find the appropriate patient identifier prior to publishing documents to the XDS infrastructure. This identifier is called the XDS Affinity Domain Patient Identifier

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Volume 1 - Integration Profiles

1.7 History of Annual Changes

Add the following bullet to the end of the bullet list in Section 1.7

Added the XAD-PID Change Management (XPID) Profile that describes how changes to the links between local patient identifiers and the identifier used by the XDS Affinity Domain can be
245 communicated and managed.

Note to readers:

The following information already in the Technical Framework applies

1.n Copyright Permission

Health Level Seven, Inc. (HL7) has granted permission to the IHE to reproduce tables from the
250 *HL7 standard. The HL7 tables in this document are copyrighted by Health Level Seven, Inc.*

All rights reserved. Material drawn from these documents is credited where used.

2.1 Dependencies among Integration Profiles

Add the following to Table 2-1

XAD-PID Change Management Profile (XPID)	*Consistent Time*	Each XPID actor shall be grouped with the Time Client	Required to manage and resolve conflicts in multiple updates.
XAD-PID Change Management Profile (XPID)	Cross-Enterprise Document Sharing (XDS)	XPID Document Registry shall be grouped with XDS Document Registry	This is a base assumption for this profile.
XAD-PID Change Management Profile (XPID)	Audit Trail and Node Authentication (ATNA)	Each XPID actor shall be grouped with the ATNA Secure Node or Secure Application Actor.	Required by the XDS Profile

255 ## 2.2.31 XAD-PID Change Management Profile Integration Profile

Add the following section to Section 2.2

The XAD-PID Change Management (XPID) Profile describes how changes to the links between local patient identifiers and the identifier used by the XDS Affinity Domain can be communicated and managed.

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31 XAD-PID Change Management (XPID) Integration Profile

Add Section 31

The XAD-PID Change Management (XPID) Profile describes how changes to the links between local patient identifiers and the identifier used by the XDS Affinity Domain can be
265   communicated and managed.

Each clinical system that participates in the XDS Affinity Domain will likely use different identification means for its patients. XDS requires a common, reliable identification scheme that can be used across the entire XDS Affinity Domain. XDS assumes that the XDS Affinity Domain will establish common means to create a unique patient identifier for persons involved
270   in the domain and allow Document Sources to find the appropriate patient identifier prior to publishing documents to the XDS infrastructure. This identifier is called the XDS Affinity Domain Patient Identifier (XAD-PID).

The simplest approach for the XAD-PID is to use a shared patient identification, such as a regional or national patient identifier. In other situations, Patient Identity Cross Reference (PIX)
275   Profile or similar approaches are typically used to manage the correlation of identifiers across the XDS Affinity Domain. A Patient Identity Cross-Reference Manager provides each Document Source and Document Consumer a match between the patient's local identifier and the common XAD-PID.

The key point regarding the matching of local identifier and XAD-PID is that the XDS Affinity
280   Domain patient identifier is the authoritative means for identifying patients and grouping documents within the XDS Document Registry. Although the local patient identifier is also provided with each document, it is not considered authoritative, is not used for grouping and cannot be specified as a query parameter.

This integration profile will establish the transactions and actor behaviors required to support
285   XAD-PID link change events. Merge events of XAD-PIDs are handled in the XDS Profile. Merge events of local patient identifiers are handled in this profile. Unmerge events are considered too complex, often requiring manual intervention, and have not been profiled.

The adoption of this profile requires that the local patient identifier (i.e., *sourcePatientId)* gain significant importance, as it will be used by the XDS Document Registry to determine which
290   objects are affected by a particular link change event. This requirement has obvious and non-trivial impacts to the design and implementation of an XDS Document Registry.

The approach used in this profile is based on link change notifications being sent from the PIX Manager to the Document Registry, which will then perform an update to possibly many objects within its database. The changes reflect the new link between a local patient identifier and the
295   corresponding XAD-PID. These updates follow the same technical requirements and behaviors defined in the Update Document Set [ITI-57] transaction with the change resulting in a new version of all affected objects. After all changes have been performed, one or more associations for the updated objects may no longer be valid. For example, a document may no longer have the

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same patientID as the folder it belonged to previously. The Document Registry will have to
300   detect these occurrences and provide the necessary documentation and alerting actions.

31.1 Actors/ Transactions

Figure 31.1-1 shows the two actors directly involved in the XAD-PID Change Management
Profile and the relevant transaction between them. Other actors that may be indirectly involved
due to their participation in XDS or PIX are not shown.

305
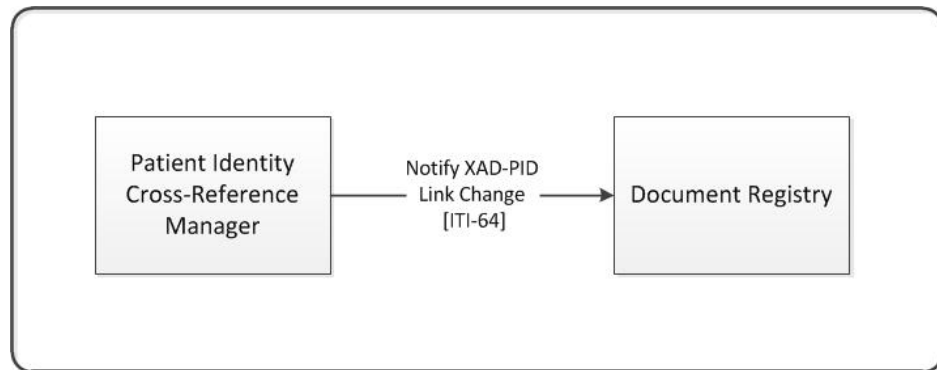
Figure 31.1-1: XAD-PID Change Management Profile Actor Diagram

Table 31.1-1 lists the transactions for each actor directly involved in the XAD-PID Change
310   Management 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 Section 31.2.

315

Table 31.1-1: XAD-PID Change Management Profile - Actors and Transactions

Actors	Transactions	Optionality	Reference
Document Registry	Notify XAD-PID Link Change [ITI-64]	R	ITI TF-2b: 3.64
Patient Identity Cross-Reference Manager	Notify XAD-PID Link Change [ITI-64]	R	ITI TF-2b: 3.64

31.1.1 Actor Descriptions and Requirements

31.1.1.1 Patient Identity Cross-Reference Manager Actor

320 In order for the XAD-PID link changes to be processed according to this profile, the following requirements apply to the Patient Identity Cross-Reference Manager:

1. The Assigning Authority for every applicable *sourcePatientId* is a source to the Patient Identity Cross Reference Manager.

2. The Assigning Authority that manages the XAD-PID domain is also a source to the
325   Patient Identity Cross Reference Manager.

3. The Patient Identity Cross Reference Manager has the ability to identify the Assigning Authority for the XAD-PID domain.

The first two requirements enable the Patient Identity Cross-Reference Manager to establish links between the *sourcePatientId* and the *XAD-PID*, while the third requirement enables it to
330 determine which identifier is the *XAD-PID* and when to trigger the notification transaction.

31.2 Options

Options that may be selected for this Integration Profile are listed in the Table 31.2-1 along with the actors to which they apply. Dependencies between options when applicable are specified in notes.

335

Table 31.2-1: XAD-PID Change Management (XPID) - Actors and Options

Actor	Options	Vol & Section
Document Registry	*No options defined*	- -
Patient Identity Cross-Reference Manager	*No options defined*	- -

13
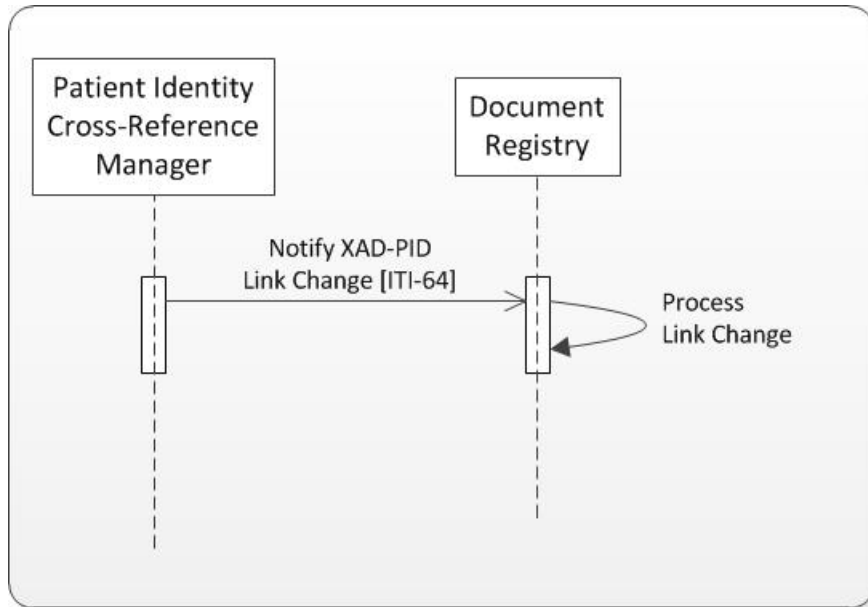
31.3 Process Flow

Figure 31.3-1: Basic Process Flow in XAD-PID Change Management (XPID) Profile

31.4 Use Cases

345   31.4.1 XAD-PID Link Change Use Case

This section illustrates the XAD-PID Link change use case.

In this scenario a patient presents to a service location in a given XDS Affinity Domain for the first time and a set of shareable clinical documents are created for that encounter.

That service location is assumed to be a Patient Identity Source to the XDS Affinity Domain
350   Patient Identity Cross-Reference Manager. The local ID for that patient (MRN 22222) is mapped (i.e., linked) by the Patient Identity Cross-Reference manager to an existing XAD-PID (XAD-PID 33333) (see Figure 31.4.1-1).
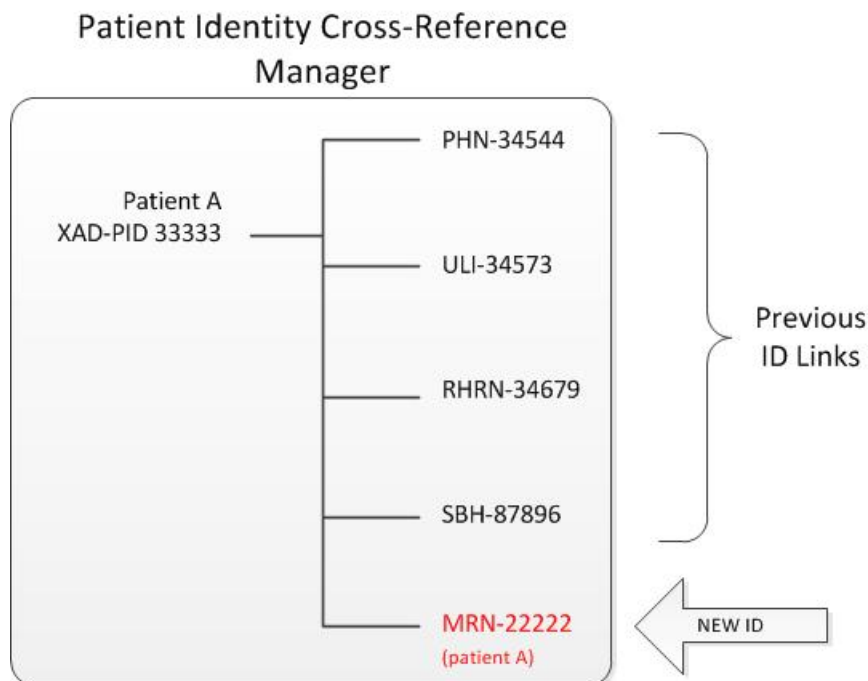
355   **Figure 31.4.1-1: Local Patient Added to the Patient Identity Cross-Reference Manager**

A document (ID #34245) is created from this encounter and published to the XDS Document Repository and XDS Document Registry using that XAD-PID (see Figure 31.4.1-2).

15
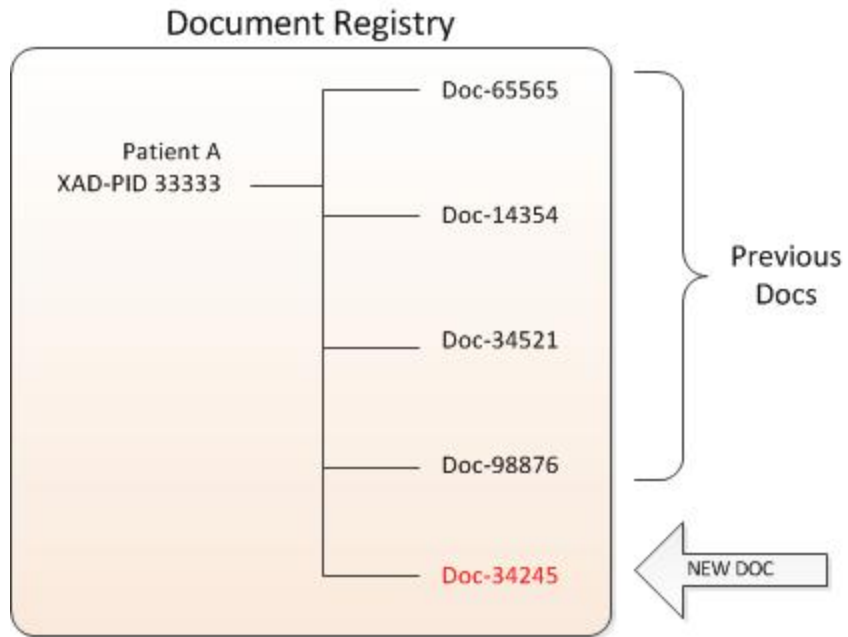
360   **Figure 31.4.1-2: Document Published to Document Registry**

However, at some later time, it is discovered that the local patient ID in this use case should not have been linked to XAD-PID #33333 in the first place and that in fact, it should have been linked to another identifier (XAD-PID #11111) as shown below in Figure 31.4.1-3.

365

Figure 31.4.1-3: Local Patient is Assigned New XAD-PID in Patient Identity Cross-Reference Manager

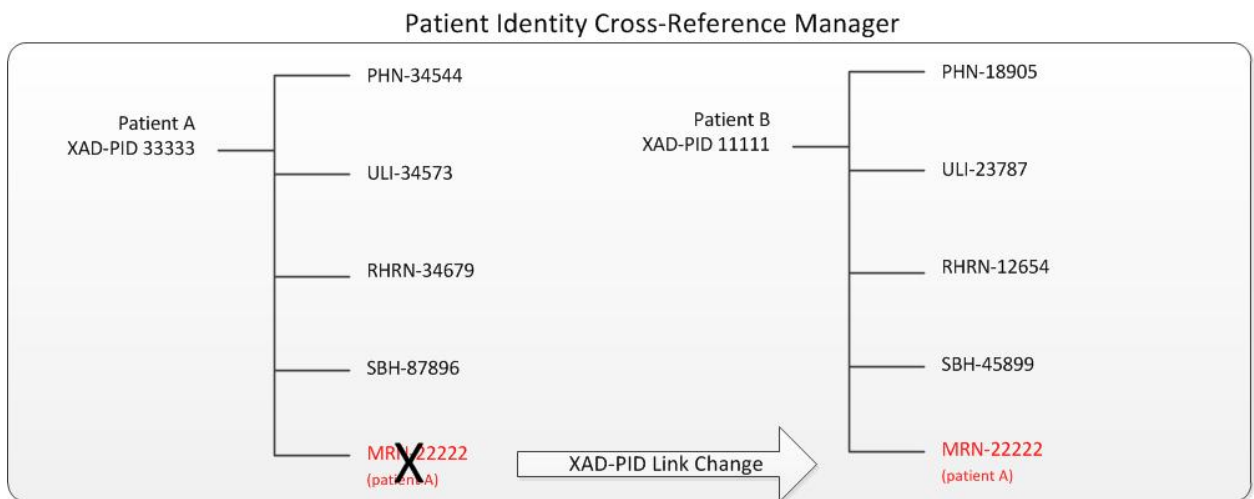Rev. 1.5 – 2016-08-05   Copyright © 2016: IHE International, Inc.

In this case, we see that the correct XAD-PID is 11111 and the change occurs normally within the Patient Identity Cross-Reference Manager from the Patient Identity Feed. However, the previously published document (DOC 34245) needs to be corrected and reflect this change.

Given that the original Document Source may not be aware that the link change event has occurred, it cannot be expected to deprecate and re-publish the document itself. Also, unless some type of notification is sent to the Document Registry, it also cannot process the event (see Figure 31.4.1-4).
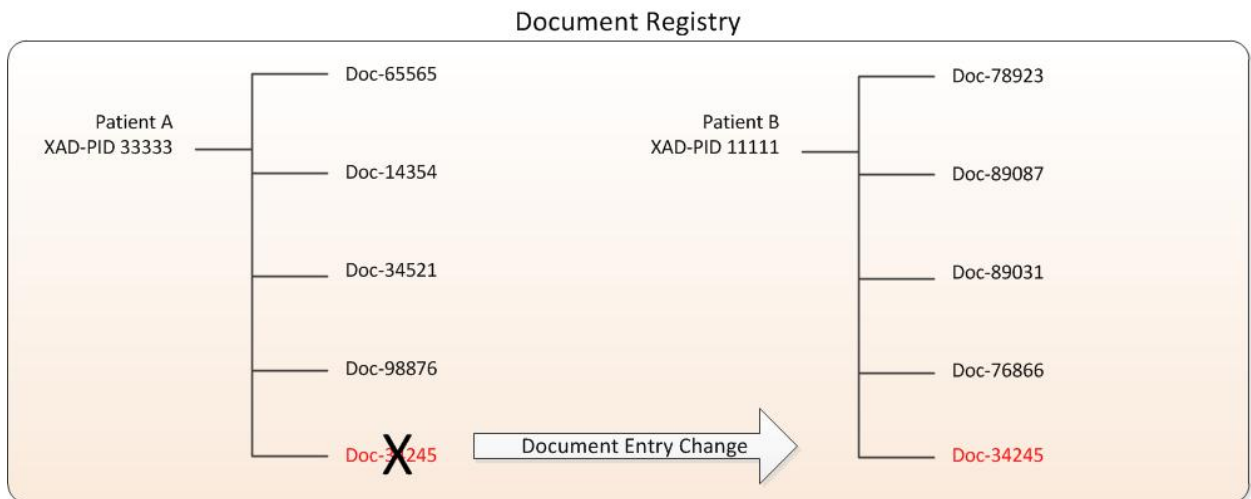
Figure 31.4.1-4: Document Registry Needs to Reflect XAD-PID change

Once the XAD-PID link change event is processed by the Document Registry:

- All documents that were published through an XDS Provide and Register transaction with the local patient identifier (MRN 22222) are now joined with documents belonging to its new common identifier (XAD-PID 11111).

- All XDS Stored Query transactions referencing the new identifier (XAD-PID 11111) will return documents including those belonging to the local patient identifier (MRN 22222).

31.4.2 Local Patient Identifier Merge Use Case

This section illustrates the Local Patient Identifier Merge use case.

Use Case 1: Local patient identifier merge with two different XAD-PID

In this scenario two local identifiers, mapped to two different XAD-PID, are merged due to a change in demographics. Figure 31.4.2-1 shows the initial state, where Lid22 is linked to adPid222, Lid33 is linked to adPid333 and there is a DocumentEntry in the Document Registry for each of these local identifiers.

PIX Manager
Patient ID Mapping

Lid22 => adPid222
Lid33 => adPid333

XDS Document Registry
DocumentEntries

DocEntry#2
Lid22
adPid222

DocEntry#3
Lid33
adPid333
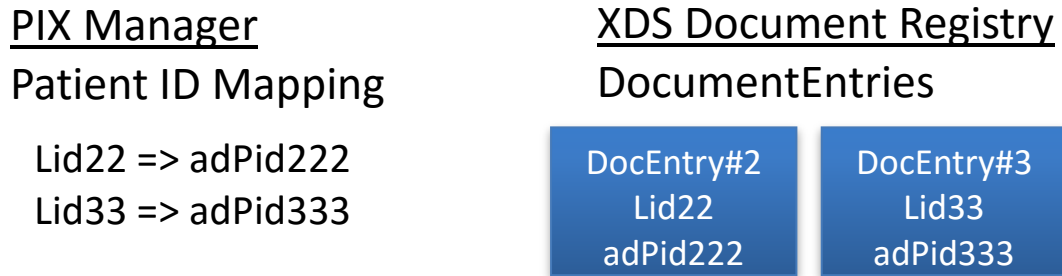
Figure 31.4.2-1: Original State

395

After these documents have been registered in the Document Registry, the Patient Identity Cross-Reference Manager determines, through a demographics change, that Lid22 and Lid33 refer to the same person and need to be merged. It chooses to merge Lid22 into Lid33, resulting in an updated Patient ID Mapping which does not include Lid22 as shown in Figure 31.4.2-2.

PIX Manager

=> adPid222
Lid33 => adPid333

XDS Document Registry

DocEntry#2
Lid22
adPid222

DocEntry#3
Lid33
adPid333

400

Figure 31.4.2-2: Local Patient ID merge

In order to properly update the Document Registry with this change the Patient Identify Cross-Reference Manager must send a XAD-PID link change event, updating the XAD-PID associated
405 with Lid22 to the new XAD-PID and showing the merge of Lid22 into Lid33 as reflected in Figure 31.4.2-3.

Action

Send XAD-PID Link Change
adPID222, Lid22
=> adPid333, Lid33

XDS Document Registry

DocEntry#2
Lid33
adPid333

DocEntry#3
Lid33
adPid333
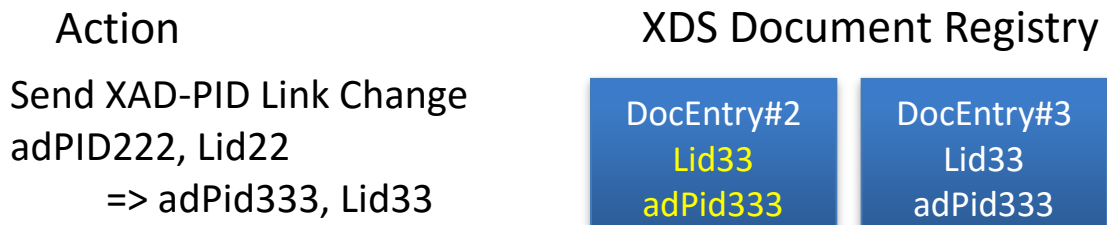
Figure 31.4.2-3: Sent Notify XAD-PID Link Change

410

Use Case 2: Local patient identifier merge mapped to same XAD-PID

The next scenario differs in that the merged local identifiers are already mapped to the same XAD-PID (see Figure 31.4.2-4).

PIX Manager	XDS Document Registry
Lid22 => adPid333 Lid33 => adPid333	DocEntry#2 Lid22 adPid333 — DocEntry#3 Lid33 adPid333
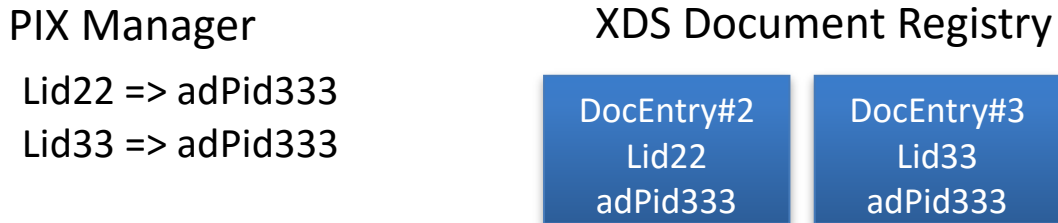
415

Figure 31.4.2-4: Original State same XAD-PID

After the Patient Identity Cross-Reference Manager merges Lid22 into Lid33, the updated Patient ID Mapping does not include Lid22. Figure 31.4.2-5 shows the updated state of the PIX Manager but the Document Registry update has not yet occurred.

PIX Manager	XDS Document Registry
Lid33 => adPid333	DocEntry#2 Lid22 adPid333 — DocEntry#3 Lid33 adPid333
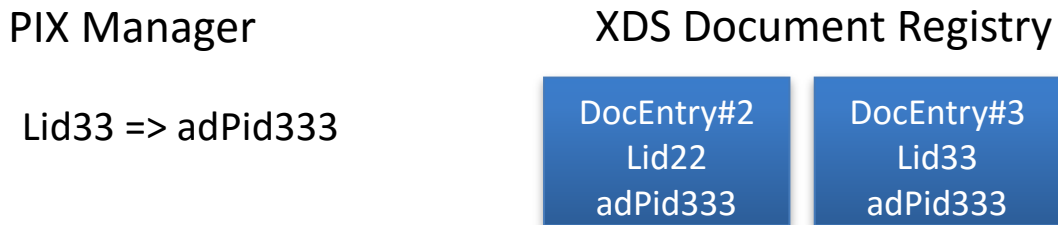
420

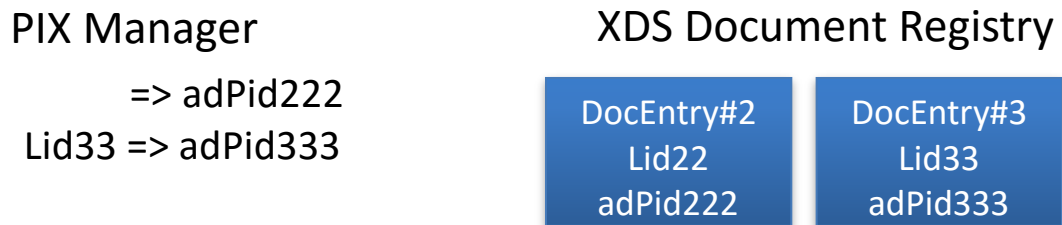**Figure 31.4.2-5: Local Patient ID merge**

To update the Document Registry with this change, the Patient Identify Cross-Reference Manager must send a XAD-PID link change event showing the merge of Lid22 into Lid33 as reflected in Figure 31.4.2-6.

425

Action	XDS Document Registry
Send XAD-PID Link Change adPID333, Lid22 => adPid333, Lid33	DocEntry#2 Lid33 adPid333 — DocEntry#3 Lid33 adPid333

Figure 31.4.2-6: Sent Notify XAD-PID Link Change

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31.5 Security Considerations

430 The risk analysis for this profile enumerates assets, threats, and mitigations. The complete risk data is stored and maintained in a central location. The complete risk data is stored and available from IHE[2].

The purpose of this risk assessment is to notify vendors of some of the risks that they are advised to consider in implementing XPID actors. For general IHE XDS risks and threats please see ITI TF-2x: Appendix K. The vendor is also advised that many risks cannot be mitigated by the IHE

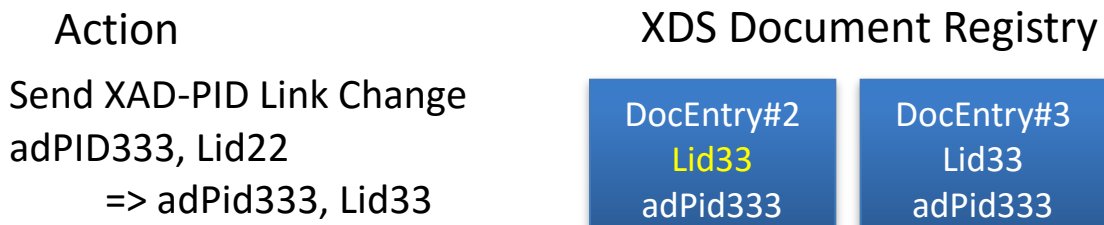435 profile and instead the responsibility for mitigation is transferred to the vendor, and occasionally to the XDS Affinity Domain and enterprises. In these instances, IHE fulfills its responsibility to notify affected parties through the following section.

31.5.1 Requirements/Recommendations

The following mitigations should be implemented by all XPID Actors. These mitigations

440 moderate all high impact risks.

- All actors in XPID shall be grouped with a CT Time Client. This grouping will assure that all systems have a consistent time clock. This is mandatory for ATNA Audit Logging, but may also be utilized by the systems to scope the changes to a time window.

- All actors in XPID shall be grouped with an ATNA Secure Node or ATNA Secure
445 Application. This grouping will assure that only highly trusted systems can send this transaction to the Document Registry and that all changes are recorded in the audit log.

The following mitigations are transferred to the vendors, XDS Affinity Domains, and enterprises.

- Network protection services are recommended to be sufficient to guard against denial of
450 service attacks on all service interfaces.

- A process that reviews audit records and acts on inappropriate actions is recommended.

- It is recommended that service interfaces be implemented with a good design to guard against corruption and denial of service attacks.

Glossary

455 *Add the following terms to the Glossary:*

XAD-PID: XDS Affinity Domain Patient Identifier

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[2] The risk analysis data may be found at:
ftp://ftp.ihe.net/IT_Infrastructure/iheitiyr9-2011-2012/Technical_Cmte/Profile_Work/XDS%20Link-Unlink%20(aka%20XPID)/XPID_Risk_assessment_and_mitigation_table.xls

Volume 2 - Transactions

Add Section 3.64

460 ## 3.64 Notify XAD-PID Link Change

This section corresponds to Transaction ITI-64. "**Notify XAD-PID Link Change**" of the IHE Technical Framework. Transaction ITI-64 is used by the Patient Identity Cross-Reference Manager and Document Registry Actors.

The following definitions are key to understanding this transaction:

465
- **"XAD Assigning Authority"** refers to the patient identifier Assigning Authority that is the authoritative source of patient identifiers for the XDS Affinity Domain.

For a given patient,

- "**XAD-PID**" is a patient identifier created by the XAD Assigning Authority. The patient should only have one XAD-PID assigned.

470
- "**local patient ID**" is the patient ID used by a particular local domain. This value was placed in the "*sourcePatientID*" metadata attribute for all documents related to the patient from that local domain that have been submitted to the Document Registry.

- "**previous XAD-PID**" is the XAD-PID to which the **"local patient ID"** was originally linked. This value was placed in the "*patientID*" metadata attribute for all documents
475   related to the patient from that local domain that have been submitted to the Document Registry

- "**new XAD-PID**" is the correct XAD-PID to which the **"local patient ID"** is now linked. It will replace **"previous XAD-PID"** in all documents submitted to the Document Registry for the given **"local patient ID"**.

480
- "**subsumed local patient ID**" is the patient ID previously used by a local domain that is being merged as a part of this message. On the original submission this value was placed in the "*sourcePatientID*" metadata attribute. As part of this transaction the "*sourcePatientID*" value must be updated to the "*local patient ID*".

3.64.1 Scope

485 This transaction informs the recipient that there has been a change to the link between a **"local patient ID"** (i.e., that used by the Document Source) and its corresponding XAD-PID (XDS Affinity Domain Patient Identifier).

It should not to be confused with the similar link/unlink events documented in the Patient Identity Management [ITI-30] transaction which is used by patient demographic suppliers to
490 notify other interested systems about changes to its own local patient identity records.

The transaction can be used in any setting where it is appropriate to have XAD-PID link changes processed as a single event, rather than require individual metadata updates to each object.

3.64.2 Use Case Roles
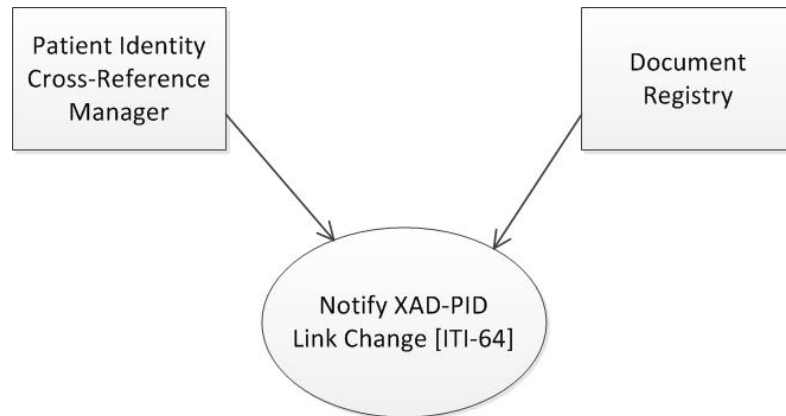
495

Actor: Patient Identity Cross-Reference Manager

Role: Notifies of the occurrence of changes to a link between local patient identifiers and their corresponding XAD-PID

Actor: Document Registry

500   **Role**: Receives notification and performs automatic changes to the metadata of affected objects.

3.64.3 Referenced Standard

HL7 v2.5, chapters 2, 3, 6, 15

3.64.4 Interaction Diagram

505 ### 3.64.4.1 Notify XAD-PID Link Change

3.64.4.1.1 Trigger Events

The Patient Identity Cross-Reference Manager has made a change in the link between a patient's **"local patient ID"** and its corresponding XAD-PID or a "**local patient ID**" has been merged.

3.64.4.1.2 Message Semantics

510 The Patient Identifier Cross-Reference Manager shall encode the Notify XAD-PID Link Change message using the ADT^A43 message. The segments of the message listed in Table 3.64-1 shall be present. Other segments are optional.
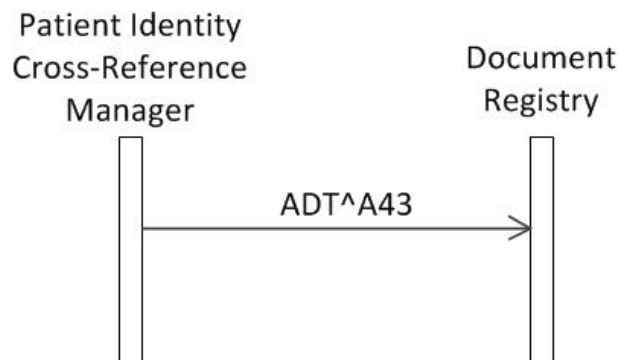
Table 3.64.4.1.2-1: Notify XAD-PID Link Change

ADT	Notify XAD-PID Link Change	Chapters in HL7 2.5
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
MRG	Merge Patient Information	3

515

This transaction shall use the HL7 v2 original acknowledgement mode. The Document Registry shall acknowledge each ADT^A43 message with the HL7 v2 Accept ACK message. See ITI TF-2x: C.2.3, "Acknowledgement Modes" for the definition and discussion of the ACK message.

3.64.4.1.2.1 MSH Segment

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

- Field MSH-3 Sending Application shall contain the OID for the Patient Identity Cross-Reference Manager system. This OID will be different than the OID for the assigning authority.

- Field MSH-9 Message Type shall have a value of ADT^A43.

525 ### 3.64.4.1.2.2 EVN Segment

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

3.64.4.1.2.3 PID Segment

A single PID segment shall include a list with two identifiers in PID-3 as follows:

- The first repetition contains the "**new XAD-PID**", as the one the Patient Identity Cross-
530 Reference Manager has linked to the "**local patient ID**"

- The second repetition contains the "**local patient ID**"

___

Both patient IDs included in PID-3 shall include an Assigning Authority component. The Assigning Authority component returned shall include the subcomponents Universal ID, and Universal ID type. It may include the namespace ID, in which case it shall reference the same 535 entity as is referenced by the other two subcomponents.

To eliminate the issue of multiple name values between Patient Identifier Domains, field PID-5-Patient Name shall have a value of " ", i.e., a single space character (ASCII 0x20).

3.64.4.1.2.4 MRG Segment

A single MRG segment shall include one or two identifiers in MRG-1 as follows:

540 • The first repetition shall contain the "**previous XAD-PID**". If only a local patient identifier merge is being reflected, the "**previous XAD-PID**" shall be the same as the "**new XAD-PID**".

• The second repetition, if present, shall contain the "**subsumed local patient ID**". This identifier shall have the same Assigning Authority as the "**local patient ID**" in the PID 545 Segment. The presence of the "**subsumed local patient ID**" indicates that it is being merged into the "**local patient ID**" specified in the PID segment.

Any patient ID included in MRG-1 shall include an Assigning Authority component. The Assigning Authority component shall include the subcomponents Universal ID, and Universal ID type. It may include the namespace ID, in which case it shall reference the same entity as is 550 referenced by the other two subcomponents.

3.64.4.1.3 Expected Actions

This section documents the expected outcome of the Notify XAD-PID Link Change transaction when received by the Document Registry. It is only applicable when the Document Registry is also supporting the XDS Profile (i.e., the Registry Stored Query [ITI-18] transaction).

555 Upon receipt of this message, the Document Registry shall perform all necessary actions to ensure that it has applied the XAD-PID link change notification to all applicable objects within its database.

After processing the XAD-PID link change, the Document Registry shall ensure that:

1. Responses to any subsequent Registry Stored Query [ITI-18] transaction for documents 560 related to the "**new XAD-PID**" (i.e., patientId in the Document) shall include matching documents for that patientID including all those containing a sourcePatientId value of "**local Patient ID**".

2. Responses to any subsequent Registry Stored Query [ITI-18] for documents related to the "**previous XAD-PID**" shall not include any document with sourcePatientId value of 565 "**local Patient ID**".

3. If "**subsumed local patient ID**" is present, responses to any subsequent Registry Stored Query [ITI-18] shall show the "**local Patient ID**" in the sourcePatientId attribute for any

document that previously contained the "**subsumed local patient ID**" as the sourcePatientId.

570   The first two rules essentially reflect the XPID Profile requirement that all DocumentEntry objects assigned to the **"local patient ID"** must now have a patientID value of **"new XAD-PID"** not **"previous XAD-PID"**. The last rule reflects the XPID Profile requirement that all DocumentEntry objects previously assigned to the "**subsumed local patient ID**" shall now have sourcePatientId equal to "**local Patient ID**" and patientID equal to "**new XAD-PID**".

3.64.4.1.3.1 Document Registry Object Updates

575   This section describes the requirements for Document Registry object updates that result from processing the Notify XAD-PID Link Change transaction. The resulting metadata shall be generated by the Document Registry so that the changes, as viewed through the Registry Stored Query transaction [ITI-18], appear to have been created through the mechanism described in ITI

580   TF-3: 4.1.15 "Metadata Versioning Semantics" (currently in the Trial Implementation Supplement - XDS Metadata Update). This section describes this mechanism as applied to this transaction.

After the Notify XAD-PID Link Change transaction is processed, the contents of the Document Registry shall remain in a consistent state with regard to associations linking objects that carry a

585   Patient ID attribute, specifically, that two objects linked by such an Association shall have the same Patient ID. See Section 3.64.4.1.3.2 for discussion of constraint conflict resolution. The exception is a SubmissionSet to DocumentEntry HasMember association that is labeled 'Reference'. This situation is described in Section 3.64.4.1.3.1.4, item #5.

The following sections detail the required changes for each of the conditions listed. These

590   changes shall be applied to each object to be updated in the Document Registry as described.

3.64.4.1.3.1.1 Creation of a New SubmissionSet

Each Notify XAD-PID Link Change transaction, which updates the XAD-PID associated with a single sourcePatientId, shall result in the creation of a new SubmissionSet object in the Document Registry. Changes to Document Registry objects shall be linked to this new

595   SubmissionSet. These changes include:

- Creating a new version of a DocumentEntry and deprecating the previous version
- Creating a new version of a Folder and deprecating the previous version
- Deprecating an Association
- Creating a new Association

600   The following table shall be used to code the attributes of the new SubmissionSet. Attributes missing from the table are unchanged from normal SubmissionSet object coding.

Table 3.64.4.1.3.1.1-1: New SubmissionSet Attributes

Attribute	Description
author	Not included
contentTypeCode	XDS Affinity Domain defined code indicating the SubmissionSet was created as a result of a Notify XAD-PID Link Change transaction
homeCommunityId	Not included
intendedRecipient	Not included
patientId	Value of "**new XAD-PID**"
sourceId	OID for the sending application as provided in the MSH-3 field of the transaction (see Section 3.64.4.1.2.1)
submissionTime	The time the Document Registry processed the transaction

3.64.4.1.3.1.2 Overlapping Updates

When interpreting the rules described in the sections that follow, the results of a single Notify XAD-PID Link Change transaction shall not create two new versions of any logical object. The rules are written from the point of view of non-overlapping updates. The implementer shall manage overlaps.

3.64.4.1.3.1.3 Deprecated Objects

The Document Registry shall not make changes to any DocumentEntry or Folder objects with availabilityStatus of "Deprecated".

3.64.4.1.3.1.4 DocumentEntry, not part of a Folder, not linked to other DocumentEntries

The Document Registry shall:

1. Extract the version and logicalId attributes from the most current version of the DocumentEntry object.

2. Create a new copy of the DocumentEntry adding the following changes:

   - Version attribute has value of one more than the version attribute of the existing DocumentEntry

   - logicalId is kept the same

   - id attribute is a new UUID (this has a cascading effect to some attributes within; Classifications and ExternalIdentifiers within will also need new id attribute values (UUIDs))

---

625   •   The PatientID attribute is set to the "**new XAD-PID**"

         •   If **"subsumed local patient ID"** is present, the sourcePatientId attribute is set to the new **"local Patient Id"**

    3. Assign existing DocumentEntry an availabilityStatus of "Deprecated".

630   4. Create a HasMember Association in the new SubmissionSet linked to the new DocumentEntry. Its PreviousVersion slot shall contain the value of the version attribute of the existing DocumentEntry.

    5. If the existing version is linked to an existing SubmissionSet via a HasMember Association with SubmissionSetStatus set to 'Reference', then deprecate that Association and create a new Association between that existing SubmissionSet and the new
635   DocumentEntry. (Note: this is the only case where associated objects do not have the same PatientID attribute value.)

3.64.4.1.3.1.5 DocumentEntry, not part of a Folder but linked to other DocumentEntries

The Document Registry shall:

640   1. Perform the actions described in Section 3.64.4.1.3.1.4.

    2. For each DocumentEntry to DocumentEntry Association linked to the existing DocumentEntry:

         •   If, after this update, both DocumentEntries will have the "**new XAD-PID**" then create a new copy of the DocumentEntry to DocumentEntry Association linking the
645   associated DocumentEntry to the new version of the changed DocumentEntry. Note that the associated DocumentEntry may or may not have been updated by this transaction. It is the net effect that is important: Patient IDs in these DocumentEntry objects either match or don't match. If both DocumentEntries are updated by this transaction then only a single new Association is created.

650   •   If, after this XAD-PID update, the two DocumentEntries have different XAD-PIDs then a Document Registry constraint conflict can occur. Refer to Section 3.64.4.1.3.2 for various options on how to proceed.

            A side effect of this step is that all RPLC and XFRM_RPLC Associations are lost. The targetObject attribute of these Associations always references a deprecated
655   DocumentEntry that cannot have its XAD-PID updated, as described in Section 3.64.4.1.3.1.3. To trace RPLC and XFRM_RPLC Associations each of the previous versions of the new DocumentEntry must be examined.

3.64.4.1.3.1.6 DocumentEntry, part of a Folder, not linked to other DocumentEntries

660 If all DocumentEntries that are members of the Folder carry the same sourcePatientId then the Document Registry shall:

1. Perform the actions described in Section 3.64.4.1.3.1.4 on each DocumentEntry.

2. Extract the version and logicalId attributes from the existing version of the Folder

3. Create a copy of the Folder adding the following changes:

665 • Version attribute has value of one more than the existing version

• logicalId is kept the same

• id attribute is a new UUID (this has a cascading effect to some attributes within; Classifications and ExternalIdentifiers within will also need new id attribute values (UUIDs))

670 • The Patient ID attribute is set to the new XAD-PID.

4. Assign existing version of the Folder status of "Deprecated".

5. Create a HasMember Association in the new SubmissionSet linked to the new Folder. It will contain a Slot with name PreviousVersion. This Slot shall contain the value of the version attribute of the existing Folder.

675 6. Create a HasMember Association connecting the new Folder to each of the new DocumentEntries according to the usual rules for inclusion in a Folder.

7. Create a HasMember Association in the new SubmissionSet for each of the Associations created in the previous step according to the usual rules for adding DocumentEntries to Folders.

680 If all DocumentEntries that are members of the Folder do not carry the same sourcePatientId then a Document Registry constraint conflict can occur. Refer to Section 3.64.4.1.3.2 for various options on how to proceed.

3.64.4.1.3.1.7 DocumentEntry, part of a Folder and linked to other DocumentEntries via Associations

685 For a single Notify XAD-PID Link Change transaction, the Document Registry shall perform the instructions in Sections 3.64.4.1.3.1.5 and 3.64.4.1.3.1.6, not repeating any operation:

1. A single new version of a particular logical DocumentEntry is created, never more

2. A single new version of a particular logical Folder is created, never more

3. A single new version of a particular logical Association is created, never more

690 An example of the interpretation of these rules is for a DocumentEntry that is both a member of a Folder and part of a DocumentEntry to DocumentEntry Association; only a single new version of

the DocumentEntry is created that becomes part of the new version of the Folder and is also included in the new DocumentEntry to DocumentEntry association.

3.64.4.1.3.2 Constraint Conflict Resolution

695   Implementers of Document Registries must also consider that in addition to Document Entry updates, this transaction will also affect existing associations (XFRM, APND, RPLC and XFRM_RPLC) and folders that involve any of these updated Document Entries. The Document Registry shall maintain all the appropriate validation rules and constraints defined in the XDS metadata model. This includes the requirement that all members of folders and associations must

700   have the same *patientId*. As the Document Registry processes this transaction, this condition may no longer apply, requiring that the Document Registry take corrective action. For example if a folder contains Document Entries with different values for *sourcePatientId*. Since the other documents will preserve their current value for *patientId*, it becomes clear that they cannot all remain together in the same folder. Similar situations can occur with the other association types.

705   The manner by which the Document Registry will handle these situations is not mandated by IHE. However, the approach the Document Registry uses shall preserve the consistency of its database and be properly documented so that users and administrators can have a clear expectation on the system behavior under these conditions and know how to proceed with manual interventions required to correct the Document Registry state.

710   Strategies on how to deal with this problem can vary considerably. Here are two possible approaches that may be used by the implementers:

1. The requirements for this transaction preserve relationships when all participants have the same sourcePatientId. In this first approach, the presence of a single Document Entry with a different value for sourcePatientId would prevent such action and result in all

715   changed Document Entries being dropped from the relationship. This action is only applied to the relationship in question. Since it may not be possible to correctly restore folders for all cases, the update would have to be followed by a report or alert mechanism by which users or (more likely) system administrators could investigate if any of these dropped relationships need to be re-established.

720   2. In another approach, in the presence of a single patientID conflict, the update is aborted and no changes are made to the Document Registry. Rather, it puts a "hold" on the Notify XAD-PID Link Changes transaction. In this approach the entire transaction is passed to a system administrator to manually resolve the discrepancies and complete the transaction.

These are just two possible strategies, and one is not necessarily more "*correct*" than the other.

725   Implementers will have to evaluate the pros-cons of each alternative in respect to their product architecture and the needs of the client environments and decide which one is more appropriate for them. The important point here is that in regards to which strategy is chosen, implementers must provide clear documentation on the matter describing the behavior of their system.

3.64.5 Security Considerations

730 No transaction specific security considerations.

3.64.5.1 Security Audit Considerations

The Notify XAD-PID Link Change transaction (A43) is to be audited as "Patient Record" events, as defined in ITI TF-2a: Table 3.20.4.1.1.1-1. The actors involved in the transaction shall create audit data in conformance with DICOM[3] "Patient Record". Logically, a link change

735 operation consists of updates to possibly many patient records

The following tables show items that are required to be part of the audit record for this transaction.

_____

3.64.5.1.1 Patient Identity Cross Reference Manager audit message

740 The Patient Identity Cross Reference Manager shall record one audit event as a result of this transaction.

	Field Name	Opt	Value Constraints
Event AuditMessage/EventIdentification	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"U" (update) for A43
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-64", "IHE Transactions", "Notify XAD-PID Link Change")
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)			
sourcePatient Id(1)			
newPatientId(1)			
previousPatientId(1)			

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identity Cross-Reference Manager 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	*U*	*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

745

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	*U*	*not specialized*
	RoleIDCode	U	Access Control role(s) the user holds that allows this transaction.
	NetworkAccessPointTypeCode	*U*	*not specialized*
	NetworkAccessPointID	*U*	*not specialized*

_____

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the 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.

Audit Source AuditMessage/ AuditSourceIdentif ication	*AuditSourceID*	*U*	*not specialized*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

sourcePatien tId (AuditMessage/ ParticipantObjectId entificationSource)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	*M*	*not specialized*
	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)

newPatientId (AuditMessage/ ParticipantObjectId entificationNew)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	*M*	*not specialized*
	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)

750

previousPat ientId	ParticipantObjectTypeCode	M	"1" (person)
(AuditMessage/ ParticipantObject IdentificationPrev ious)	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	*M*	*not specialized*
	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)

755 ## 3.64.5.1.2 Document Registry audit message

The Document Registry shall record one audit event as a result of this transaction.

	Field Name	**Opt**	**Value Constraints**
Event AuditMessage/ EventIdentificati on	EventID	M	EV(110110, DCM, "Patient Record")
	EventActionCode	M	"U" (update) for A43
	EventDateTime	*M*	*not specialized*
	EventOutcomeIndicator	*M*	*not specialized*
	EventTypeCode	M	EV("ITI-64", "IHE Transactions", "Notify XAD-PID Link Change")
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)			
sourcePatientId(1)			
newPatientId(1)			
previousPatientId(1)			

Where:

Source AuditMessage/ ActiveParticipant	UserID	M	The identity of the Patient Identity Cross-Reference Manager facility and sending application from the HL7 message; concatenated together, separated by the | character.
	AlternativeUserID	*U*	*not specialized*
	UserName	*U*	*not specialized*
	UserIsRequestor	*U*	*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

760

Destination AuditMessage/ ActiveParticipant	UserID	M	The identity of the 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

Audit Source AuditMessage/ AuditSourceIdenti fication	*AuditSourceID*	*U*	*not specialized*
	AuditEnterpriseSiteID	*U*	*not specialized*
	AuditSourceTypeCode	*U*	*not specialized*

sourcePatien tId (AuditMessage/ ParticipantObjectId entification)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	*M*	*not specialized*
	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)

765

newPatientId (AuditMessage/ ParticipantObjectId entification)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	*M*	*not specialized*
	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)

previousPatientId (AuditMessage/ ParticipantObjectId entification)	ParticipantObjectTypeCode	M	"1" (person)
	ParticipantObjectTypeCodeRole	M	"1" (patient)
	ParticipantObjectDataLifeCycle	*U*	*not specialized*
	ParticipantObjectIDTypeCode	*M*	*not specialized*
	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)

770