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**IHE IT Infrastructure Technical Framework
Supplement 2009-2010**

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**Cross-Enterprise Document Sharing (XDS)
Patient Identity Merge**

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**Trial Implementation Supplement
August 10, 2009**

20 Foreword

Integrating the Healthcare Enterprise (IHE) is an initiative designed to stimulate the integration of the information systems that support modern healthcare institutions. Its fundamental objective is to ensure that in the care of patients all required information for medical decisions is both correct and available to healthcare professionals. The IHE initiative is both a process and a forum for encouraging integration efforts. It defines a technical framework for the implementation of established messaging standards to achieve specific clinical goals. It includes a rigorous testing process for the implementation of this framework. And it organizes educational sessions and exhibits at major meetings of medical professionals to demonstrate the benefits of this framework and encourage its adoption by industry and users.

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30 The approach employed in the IHE initiative is not to define new integration standards, but rather to support the use of existing standards—HL7, DICOM, IETF, and others—as appropriate in their respective domains in an integrated manner, defining configuration choices when necessary. IHE maintain formal relationships with several standards bodies including HL7, DICOM and refers recommendations to them when clarifications or extensions to existing standards are necessary.

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40 This initiative has numerous sponsors and supporting organizations in different medical specialty domains and geographical regions. In North America the primary sponsors are the American College of Cardiology (ACC), the Healthcare Information and Management Systems Society (HIMSS) and the Radiological Society of North America (RSNA). IHE Canada has also been formed. IHE Europe (IHE-EUR) is supported by a large coalition of organizations including the European Association of Radiology (EAR) and European Congress of Radiologists (ECR), the Coordination Committee of the Radiological and Electromedical Industries (COCIR), Deutsche Röntengesellschaft (DRG), the EuroPACS Association, Groupement pour la Modernisation du Système d'Information Hospitalier (GMSIH), Société Française de Radiologie (SFR), Società Italiana di Radiologia Medica (SIRM), the European Institute for health Records (EuroRec), and the European Society of Cardiology (ESC). In Japan IHE-J is sponsored by the Ministry of Economy, Trade, and Industry (METI); the Ministry of Health, Labor, and Welfare; and MEDIS-DC; cooperating organizations include the Japan Industries Association of Radiological Systems (JIRA), the Japan Association of Healthcare Information Systems Industry (JAHIS), Japan Radiological Society (JRS), Japan Society of Radiological Technology (JSRT), and the Japan Association of Medical Informatics (JAMI). Other organizations representing healthcare professionals are invited to join in the expansion of the IHE process across disciplinary and geographic boundaries.

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55 The IHE Technical Frameworks for the various domains (IT Infrastructure, Cardiology, Laboratory, Radiology, etc.) defines specific implementations of established standards to achieve integration goals that promote appropriate sharing of medical information to support optimal patient care. It is expanded annually, after a period of public review, and maintained regularly through the identification and correction of errata. The current version for these Technical Frameworks may be found at www.ihe.net/Technical_Framework.

60 The IHE Technical Framework identifies a subset of the functional components of the healthcare enterprise, called IHE Actors, and specifies their interactions in terms of a set of coordinated, standards-based transactions. It describes this body of transactions in progressively greater

65 depth. The volume I provides a high-level view of IHE functionality, showing the transactions organized into functional units called Integration Profiles that highlight their capacity to address specific clinical needs. The subsequent volumes provide detailed technical descriptions of each IHE transaction.

This IHE IT Infrastructure Technical Framework Supplement is issued for Trial Implementation through May 2010.

70 Comments and change proposals arising from Trial Implementation may be submitted to <http://forums.rsna.org> under the forum:

“Integrating the Healthcare Enterprise”

Select the sub-forum:

“IHE IT Infrastructure 2009-2010 Supplement for Trial Implementation”

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The IHE IT Infrastructure Technical Committee will address these comments resulting from implementation Connectathon testing, and demonstrations such as HIMSS 2010.

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1 Introduction

90 The original XDS Profile defined the need to process Merge Patient ID messages as part of the Patient Identity Feed transaction received by the Document Registry actor. There has been no documentation on how the Document Registry actor reacts to these messages. This supplement provides this necessary documentation as a collection of edits to the Patient Identity Feed [ITI-8], Patient Identity Feed HL7 V3 [ITI-44], Register Document Set [ITI-14], and Registry Stored Query [ITI-18] transactions.

95 A Merge Patient ID message causes one patient identifier to merge into another causing queries for the former to return no results and queries for the latter to return the results previously identified for both. The action merging two patient identifiers is not reversible.

The results of a patient identifier merge are seen in the Registry Stored Query transaction [ITI-18] only. No support for the Query transaction [ITI-16] is profiled in this supplement.

100 This is not a traditional standalone supplement, but rather a series of changes to existing Technical Framework text. It is being distributed for Public Comment because of the scope of the changes resulting from its contents.

1.1 Open Issues and Questions

1. Details of Audit message.
- 105 2. Should the specification of Merge include some features normally associated with Link? It has been suggested that a Register Document Set transaction which includes references to merged patient identifiers (subsumed) should not return errors but instead it should be accepted and updated (or otherwise handled) so that it appears that the correct patient identifiers were submitted. Second, on Registry Stored Query, if the patient identifier specified in the query is a subsumed patient identifier, it should be replaced with the surviving patient identifier and the Registry Stored Query should be processed as if the correct patient identifier were originally specified. Application developers may want to deliver this as a non-IHE conformant capability.
- 110 3. **Edits are specified to update transaction ITI-8. Equivalent edits are still needed for ITI-44** (Patient Identity Feed HL7 V3)

1.2 Closed Issues

- 115 1. Many of the Closed Issues that were documented in this section have been moved to the wiki along with a history of the development of this Supplement. This material can be found at http://wiki.ihe.net/index.php?title=XDS_Merge_Patient_Identifier_Supplement_-_Discussion.
- 120 2. Is Link/UnLink supported?
 - No. The main reasons are:

- 125
- a) Merge is documented in transaction ITI-8 that is already integrated into XDS. Link/UnLink requires the integration of transaction ITI-30 as well. This is considered too much to introduce at this time without concrete use cases to support it.
- b) We understand that Japan and others favor Link over Merge semantics. We will consider this when we have concrete use cases from these regions.
- 130
- c) Additionally, Link/UnLink semantics introduce issues which are difficult to manage in XDS. A document added to a folder where the document and folder have different but linked patient identifiers would be legal. But a subsequent UnLink of the document and folder patient identifiers would render the folder/document combination illegal under the rules of XDS. This needs to be solved before Link/UnLink can be introduced into XDS.
- 135
- d) Introducing Link would require a change in semantics of Registry Stored Query so that Document Consumers would be required to ignore the patient identifier returned in metadata from a Registry Stored Query.
- 140
- e) The semantics of Link/Unlink are not well understood. The discussion of Link in the PAM profile [transaction ITI-30] indicates that two lists of patient identifiers are linked. Additional clarification would be needed from HL7 on how this is to be interpreted.

Volume 2a - Transactions

The following material replaces the paragraph that starts at line 1175 in Section 3.8.4.2.4.

145

The process of merging patient identifiers involves two patient identifiers: the subsumed patient identifier and the surviving patient identifier. The subsumed patient identifier stops being used and all patient records that were associated with that identifier are now associated with the surviving patient identifier. See below for how these identifiers map into the Merge Patient

150 Identifier message.

Three transactions handle processing of merged patient identifiers:

- Patient Identity Feed [ITI-8] (this transaction)– accepts the merge request
- Patient Identity Feed HL7 V3 [ITI-44] – accepts the merge request
- Register Document Set [ITI-14] – accepts metadata containing patient identifiers
- 155 • Registry Stored Query [ITI-18] – retrieves metadata containing patient identifiers.

The above transactions and the profiles that use them do not specify how patient identifier merging is to be implemented. They do specify the results of the merge in terms of:

- Errors returned through the Patient Identity Feed transaction
- Possible rejection of Register Document Set transactions and
- 160 • Results returned in Registry Stored Query transactions.

This specification for merging patient identifiers does not specify changes to the internal state of the registry. Instead it specifies required future behaviors on the part of the three transactions listed above.

165 Changes resulting from an A40 Merge message are not reversible. No UnMerge message is supported by this transaction.

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

An A40 merge message contains two fields of interest:

- 170 • MRG-1 – subsumed patient identifier: the patient identifier whose use is being ended
- PID-3 – surviving patient identifier: the patient identifier whose use continues.

After a merge, the patient identifier PID-3 represents all records formerly represented by either MRG-1 or PID-3. All other fields may be ignored.

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

- 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.
- 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 an earlier message.
- The subsumed patient identifier or the surviving patient identifier or both of them convey patient identifiers unknown to the Registry actor.

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

- A patient identifier merge affects the processing of future Register Document Set [ITI-14] and Registry Stored Query [ITI-18] transactions. See ITI TF-2a: 3.14.4.1.2.12 XDS Registry Adaptor and ITI TF-2a: 3.18.4.1.2.3.8.1 Merge Patient ID for details.
- Register Document Set transactions referencing a subsumed identifier are rejected with an XDSUnknownPatientId error.
- Registry Stored Query transactions referencing a subsumed identifier return no content.
- Registry Stored Query transactions referencing a surviving identifier successfully match the entire recorded merge tree and return appropriate metadata.
- No change in the Registry Query transaction.

200 Results of multiple merge transactions can form a recorded merge tree, where the root node represents the surviving patient identifier, and all other nodes represent the subsumed patient identifiers merged to the surviving identifier via separate merge transactions.

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].

<i>Add the following Section to 3.8.4.2.4 after line 1181</i>

205 **3.8.4.2.4.1 Detecting Errors in the Patient Identity Feed**

The Registry shall reject all future ADT messages with a patient identifier that has been subsumed in a previous merge message. This is needed to endure notification reaches the Patient Identity Source that an inconsistency has been detected in the patient identity feed.

210 ADT messages are rejected by returning the following segments in the HL7 Acknowledgement message:

Comment [LAS1]: Missing Table information?

Segment	Element	Value
MSA	Acknowledgement Code	some error value (help)
MSA	Error Condition	some value (help)
ERR	Error Code and Location	“Subsumed patient identifier (place identifier here) detected in patient identity feed” (is there an appropriate error code?)

Editor: This modification is made to the Query Registry transaction [ITI-16]

215 **3.16.4.1.2 Message Semantics**

XDS specifies the use of SQL as a query language to the registry. There are 2 significant parameters to an AdHocQueryRequest (HTTP-SOAP):

- returnType
- SQL query text

220 **The Query Registry transaction [ITI-16] is not required to reflect in its output the results of merged patient identifiers received in A40 Merge Patient Identifier messages.**

Editor: Add the following material into transaction ITI-18 – Registry Stored Query.

225 **3.18.4.1.2.3.8 Factors Affecting Registry Stored Query**

3.18.4.1.2.3.8.1 Merge Patient ID

Patient identifiers can be merged via messages received through the Patient Identity Feed transaction [ITI-8] or Patient Identity Feed HL7 V3 [ITI-44]. See ITI TF-2a: 3.8.4.2 for details.

230 This section defines the effects that merged patient identifiers have on the Registry Stored Query transaction. The process of merging patient identifiers involves two patient identifiers: the subsumed patient identifier and the surviving patient identifier. The subsumed patient identifier stops being used and all patient records that were associated with that identifier are now associated with the surviving patient identifier. See ITI TF-2a: 3.8.4.2.4 for how these identifiers map into the Merge Patient Identifier message.

235 Four transactions handle processing of merged patient identifiers:

- Patient Identity Feed [ITI-8] – accepts the merge request
- Patient Identity Feed HL7 V3 [ITI-44] – accepts the merge request
- Register Document Set [ITI-14] – accepts metadata containing patient identifiers
- Registry Stored Query [ITI-18] – retrieves metadata containing patient identifiers.

240 The above transactions and the profiles that use them do not specify how patient identifier merging is to be implemented. They do specify the results of the merge in terms of possible rejection of Register Document Set transactions and results returned in Registry Stored Query transactions.

245 The following two sections document the responsibilities of the Document Registry actor and the Document Consumer actor in processing Registry Stored Query transactions that reference patient identifiers that are involved in merges.

3.18.4.1.2.3.8.1.1 Responsibilities of the Document Registry actor

250 The following assertions shall be met by a Document Registry actor when returning metadata in a Registry Stored Query transaction. The terms 'subsumed patient identifier' and 'surviving patient identifier' refer to the contents of any previously received merge message.

- If the query includes a patient identifier parameter and that patient identity matches the subsumed patient identifier of a merge message then the query shall return no results. This is not an error condition and the Registry Stored Query transaction shall not return an error status.
- 255 • If the query includes a patient identifier and that patient identifier matches the surviving patient identifier of a previous merge message then the query shall return the composite of:
 - Metadata registered against the surviving patient identifier
 - Metadata registered against the subsumed patient identifier
- 260 • Metadata returned shall show the surviving patient identifier in these metadata attributes:
 - XDSSubmissionSet.patientId
 - XDSDocumentEntry.patientId
 - XDSFolder.patientId
- 265 • Patient identifiers may be affected by multiple patient identity merges.
 - The subsumed patient identifier may have been referenced in a prior A40 Merge message as the surviving patient identifier.
 - The surviving patient identifier may have been referenced in a prior A40 Merge message as the surviving patient identifier.
- 270 • Metadata registered against the subsumed patient identifier(s) in the recorded merge tree shall not be altered as a result of an A40 Merge.

3.18.4.1.2.3.8.1.2 Responsibilities of the Document Consumer actor

The following assertions affect the Document Consumer actor:

- 275 • The Document Consumer shall depend on the patient identity in the following metadata attributes after a patient identifier is merged:
 - XDSSubmissionSet.patientId
 - XDSDocumentEntry.patientId

- 280
- XDSFolder.patientId
 - The Document Registry is required to return the surviving patient identifier of a merge in place of the original subsumed patient identifier.
 - The Document Consumer shall not depend on the patient demographics found in XDSDocumentEntry.sourcePatientInfo. Patient demographics should be accessed through PIX/PDQ services or their equivalent.

285 **Volume 3**

Replace the entry titled “Validate patient ID” in Section 4.1.11 XDS Registry Adaptor with the text below.

290 **Validate patient ID** – patient identifiers (XSDocumentEntry.patientId, XDSSubmissionSet.patientId, XDSFolder.patientId) shall be validated by:

- Patient identifiers shall be verified against the patient identifiers received from the Patient Identity Feed [ITI-8] indicating that it is registered against the Patient ID Domain of the Affinity Domain.
- Patient identifiers shall be verified against known subsumed patient identifiers received from the Patient Identity Feed [ITI-8]. A submission containing a subsumed patient identifier shall return an XDSUnknownPatientId error. See ITI TF-2a: 3.8.4.2.4 for background on patient identifier merge.

300 *Make the following changes to section 4.1.11 XDS Registry Adaptor: This bullet is to be added to the end of the list of like bullets in the section labeled “Support document replacement”*

- The existing document and the document replacing it shall have the same patient identifier (XSDocumentEntry.patientId attribute). This comparison shall take into consideration patient identity merges as described in ITI TF-2a: 3.8.4.2.4.

305 *Make the following changes to Section 4.1.11 XDS Registry Adaptor*

310 **Validate patientID on documents being added to a Folder** - The patientId attribute of an XSDocumentEntry object shall match the patientId attribute on any folder that holds it. **This comparison shall take into consideration patient identity merges as described in ITI TF-2a: 3.8.4.2.4.**

Add new section to Volume 1 Appendix E

E.4 Race conditions related to PIX and XDS

315 The Document Registry actor within the XDS Profile performs two validations with respect to the patient identifiers included in the Register Document Set [ITI-14] transaction:

- Patient identifiers received in ITI-14 have been previously received as part of the patient identity feed [ITI-8] or [ITI-44].
- Patient identifiers received in ITI-14 have not been declared as subsumed (merged into another id) in a merge patient identifier message as part of the patient identity feed.

320 If either of these conditions are detected, the Register Document Set [ITI-14] transaction is rejected.

Implementers and integrators must be careful when integrating the patient identity feed with the XDS actors Document Source and Document Registry. If the Document Source is late in receiving/processing a merge patient identifier message it could generate an XDS submission that will be rejected by the Document Registry because is used a subsumed patient identifier. If the Document Registry is late in receiving/processing an ADT message announcing a new patient identifier then it could reject an XDS submission issued in good faith by a Document Source.

325 Similar problems can occur when a Document Source actor uses a query (PIX or PDQ) to obtain ADT information and maintains a local cache of the results. An XDS submission rejected because of an unknown patient identifier (as claimed by the Document Registry) could be caused by the Document Source using old ADT information. A patient identity merge could have been distributed since the last PIX/PDQ query for that patient by that Document Source.

330 Problems can occur with the operation of a Document Consumer as well. Issuing a query with a subsumed patient identifier will return no metadata and no error.