Integrating the Healthcare Enterprise

IHE Cardiology

Technical Framework Supplement

Evidence Documents Profile

Cardiology Options:

Stress Testing

CT/MR Angiography

Trial Implementation

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Foreword

This is a supplement to the IHE Cardiology Technical Framework 3.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is submitted for Trial Implementation as of October 15, 2010 and will 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 Cardiology Technical Framework. Comments are invited and may be submitted on the IHE forums at http://forums.rsna.org/forumdisplay.php?f=249 or by email to cardio@ihe.net.

This supplement describes changes to the existing technical framework documents and where indicated amends text by addition (**bold underline**) or removal (~~**bold strikethrough**~~), as well as addition of large new sections introduced by editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

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

Replace Section X.X by the following:

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

Information about the IHE Radiology Domain can be found at: http://www.ihe.net/Domains/index.cfm

Information about the structure of IHE Technical Frameworks and Supplements can be found at: http://www.ihe.net/About/process.cfm and http://www.ihe.net/profiles/index.cfm

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

1 Introduction

This Supplement adds two additional Cardiology Options to the Evidence Documents Profile (defined in the Radiology Technical Framework, and by reference in the Cardiology Technical Framework) in order to add specific requirements for relevant templates in Cardiology scenarios.

1.1 Open Issues for Trial Implementation

1. The Image Display actor for the CTA/MRA Evidence option has a requirement for display of Multiframe CT and MR images, as well as the SR documents. These multiframe objects have been designed to expicitly support the requirements of cardiac imaging, but they introduce new image control structures (functional groups and dimensions). Display of these multiframe images has been required as a way to encourage implementation of the new multiframe objects, but the IHE Cardiology Technical Committee will evaluate the success of this during Trial Implementation. Note that an Image Display may claim compliance to the Evidence Documents Profile (without the CTA/MRA Evidence option) if it does not support the display of these image types.

1.2 Closed Issues

1. The Image Display actor for the Stress Test Evidence option is specified to also support the Stress Test Workflow Profile, and is thus required to display the full set of image and waveform types associated with stress testing (ECG, ultrasound, and nuclear). Note that an Image Display may claim compliance to the Evidence Documents Profile (without the Stress Test Evidence option) if it does not support the display of these image and waveform types.

2. DICOM Supplement 128: Stress Testing SR requires ST elevation / depression measurements in units of mV; however, cardiologists typically describe it in units of mm (based on conventional scaling of ECG paper recordings). The Stress Test Evidence option therefore includes a requirement for a user controlled display setting that would convert the SR measurements from mV into displayed units of mm (based on conventional scaling of 0.1 mV/mm).

3. Electrophysiology Lab SR documents were originally part of the scope of this Supplement; however, those SR templates (in DICOM Supplement 129) will not be released for Public Comment by DICOM WG-6 until September (at the earliest). Implementations can still proceed and be tested at the next Connectathon under the general Evidence Documents Profile using the draft template with provisional codes as needed. The IHE Cardiology Technical Committee intends to add an EP Lab Option when Supplement 129 is available for use.

Changes to Volume 1 – Integration Profiles

Add to Section 2.1

Table 2-1. Integration Profile Dependencies

Evidence Documents	CARD-TF Stress Testing Workflow	An Image Display actor supporting the Stress Test Evidence option shall support the Stress Testing Workflow Profile.	

Modify the ED Profile in section 7

7.2 Evidence Documents Profile – Cardiology Options

The Options defined for the Cardiology domain that may be selected for this Integration Profile are listed in the table 7.2-1 along with the Actors to which they apply.

Table 7.2-1. Evidence Documents - Actors and Options

Actor	Options	Vol & Section
Evidence Creator	Cath Evidence	CARD-TF 2: 4.2.4
	Echo Evidence	CARD-TF 2: 4.2.5
	CTA/MRA Evidence	**CARD-TF 2: 4.2.6**
	Stress Test Evidence	**CARD-TF 2: 4.2.7**
Acquisition Modality	Cath Evidence	CARD-TF 2: 4.2.4
	Echo Evidence	CARD-TF 2: 4.2.5
	CTA/MRA Evidence	**CARD-TF 2: 4.2.6**
	Stress Test Evidence	**CARD-TF 2: 4.2.7**
Image Manager/ Image Archive	*No options defined*	-
Image Display (Report Creator)	Cath Evidence	CARD-TF 2: 4.4.2
	Echo Evidence	CARD-TF 2: 4.4.3
	CTA/MRA Evidence	**CARD-TF 2: 4.4.4**
	Stress Test Evidence	**CARD-TF 2: 4.4.5**

7.3 Evidence Documents Process Flow

Evidence Documents are typically produced in the context of performance of a cardiology procedure. For many types of cardiology procedures, the non-imaging evidence data is as important (or more so) than the imaging or waveform data. The use of Evidence Documents in process flows for cardiology is **therefore** described in Cath Profile Use Case C9, ~~and~~ in Echo Profile Use Case E7**, and in Stress Use Cases S1 and S2**. **In these cases, the workflow management / scheduling process for the procedure includes management of the production of Evidence Documents.**

Evidence Documents are a critical link between the performance of the procedure and the production of the clinical report. Evidence Documents often include preliminary findings, e.g., as produced by a sonographer or radiological tech, that will be verified and used as part of the cardiologist's clinical report. The workflow associated with production of a clinical report, however, is not part of this Profile (see, for instance, the Displayable Reports Profile, or the IHE Radiology Simple Image and Numeric Reports Profile.

Changes to Volume 2 - Transactions

Add the following new sections to 4.2

4.2.6 CTA/MRA Evidence Option

Acquisition Modality and Evidence Creator actors supporting the CTA/MRA Evidence option are required to support the SOP class listed in Table 4.2-10 below.

Table 4.2-10. CTA/MRA Evidence SOP Class

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.88.22	Enhanced SR

See Section 4.2.4 for the IHE criteria for setting the value of the Completion Flag (0040,A491) in SR evidence documents.

The Acquisition Modality or Evidence Creator actor shall use the Template listed in Table 4.2-11 below.

Table 4.2-11. CTA/MRA Evidence Template

CTA/MRA Evidence Template
3900 CT/MR Cardiovascular Analysis Report

This template uses subsidiary Template 300 for the formatting of individual measurements. Template 300 provides for the encoding of a "Normality" flag (for abnormal values) through subsidiary Template 310, and for the encoding of the specific image source of the measurement through subsidiary Template 320. IHE strongly recommends the use of these attributes where appropriate.

Notes: 1. Implementers are cautioned that several errors in Template 3900 were corrected in DICOM CP679, adopted in January 2007 (available at ftp://medical.nema.org/medical/dicom/final/cp679_ft.pdf), but that these do not appear in the 2007 edition of the DICOM Standard.

2. One of the goals of the IHE Trial Implementation process is to validate the readiness of the referenced standards for use in the clinical environment. Issues or errors noted by

implementers should be brought to the attention of the IHE Cardiology Technical Committee for submission of DICOM Change Proposals.

3. Template 3900 includes all the document sections needed for a full clinical report. In the context of this Transaction, the SR document based on TID 3900 is an evidence document, and therefore optional sections with Concept Names such as (121074, DCM, "Recommendations") will not be used.

4.2.7 Stress Test Evidence Option

Acquisition Modality and Evidence Creator actors supporting the Stress Test Evidence option are required to support the SOP class listed in Table 4.2-12 below.

Table 4.2-12. Stress Test Evidence SOP Class

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.88.22	Enhanced SR

See Section 4.2.4 for the IHE criteria for setting the value of the Completion Flag (0040,A491) in SR evidence documents.

The Acquisition Modality or Evidence Creator actor shall use the Template listed in Table 4.2-13 below.

Table 4.2-13. Stress Test Evidence Template

Stress Test Evidence Template
3300 Stress Testing Report

This template uses subsidiary Template 300 for the formatting of individual measurements. Template 300 provides for the encoding of a "Normality" flag (for abnormal values) through subsidiary Template 310, and for the encoding of the specific image or waveform source of the measurement through subsidiary Template 320 or Template 321. IHE strongly recommends the use of these attributes where appropriate.

Notes: 1. One of the goals of the IHE Trial Implementation process is to validate the readiness of the referenced standards for use in the clinical environment. Issues or errors noted by implementers should be brought to the attention of the IHE Cardiology Technical Committee for submission of DICOM Change Proposals.

2. Template 3300 includes all the document sections needed for a full clinical report. In the context of this Transaction, the SR document based on TID 3300 is an evidence document, and therefore optional sections with Concept Names such as (121074, DCM, "Recommendations") will not be used.

Add the following new sections to 4.4

4.4.4 CTA/MRA Evidence Option

Image Display actors supporting the CTA/MRA Evidence option are required to support the SOP classes listed in Table 4.4-8 below.

Table 4.4-8. CTA/MRA Evidence SOP Classes

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.88.22	Enhanced SR
1.2.840.10008.5.1.4.1.1.2	CT Image Storage
1.2.840.10008.5.1.4.1.1.2.1	Enhanced CT Image Storage
1.2.840.10008.5.1.4.1.1.4	MR Image Storage
1.2.840.10008.5.1.4.1.1.4.1	Enhanced MR Image Storage
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.2	Multi-frame Grayscale Byte Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage

4.4.4.1 Expected Actions

The Image Display actor may optimize display for SR documents encoded using Template 3900.

Notes: 1. An Image Display that supports a DICOM SR SOP Class is required (by the DICOM Standard) to unambiguously render all legal SOP Instances within that SOP Class, regardless of the Template used to create it. See DICOM PS3.4 Annex O.

Any measurements that have a subsidiary "HAS PROPERTIES" Content Item with Concept Name (121402, DCM, "Normality") and a Value from Table 4.4-6 shall be rendered with a readily visible emphasis (e.g., font, bold, text or background color, specialized window area, etc.).

Any Content Item with Value Type IMAGE shall be displayed as a hyperlink to display the referenced object. Any Content Item with Value Type SCOORD shall provide a hyperlink to display the referenced object with rendering of the specified spatial coordinates.

4.4.5 Stress Test Evidence Option

Image Display actors supporting the Stress Test Evidence option are required to support the SOP classes listed in Table 4.4-9 below.

Table 4.4-9. Stress Test Evidence SOP Classes

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.1.1.88.22	Enhanced SR
1.2.840.10008.5.1.4.1.1.88.33	Comprehensive SR
1.2.840.10008.5.1.4.1.1.9.1.1	12-Lead ECG Waveform Storage
1.2.840.10008.5.1.4.1.1.9.1.2	General ECG Waveform Storage
1.2.840.10008.5.1.4.1.1.88.40	Procedure Log
1.2.840.10008.5.1.4.1.1.104.1	Encapsulated PDF
1.2.840.10008.5.1.4.1.1.6.1	Ultrasound Image Storage
1.2.840.10008.5.1.4.1.1.3.1	Ultrasound Multi-frame Image Storage
1.2.840.10008.5.1.4.1.1.20	Nuclear Medicine Image Storage
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.2	Multi-frame Grayscale Byte Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.4	Multi-frame True Color Secondary Capture Image Storage

Image Display actors supporting this option are required to participate in the Stress Testing Workflow Profile, and thus to support display of Ultrasound, Nuclear Medicine, and ECG Waveform objects. (See CARD-TF 1:2.1.)

4.4.5.1 Expected Actions

The Image Display actor shall display SR documents in accordance with the following requirements.

Note: An Image Display that supports a DICOM SR SOP Class is required (by the DICOM Standard) to unambiguously render all legal SOP Instances within that SOP Class, regardless of the Template used to create it. See DICOM PS3.4 Annex O.

Any measurements that have a subsidiary "HAS PROPERTIES" Content Item with Concept Name (121402, DCM, "Normality") and a Value from Table 4.4-6 shall be rendered with a readily visible emphasis (e.g., font, bold, text or background color, specialized window area, etc.).

Any Content Item with Value Type IMAGE or WAVEFORM shall be displayed with a hyperlink to display the referenced object. Any Content Item with Value Type TCOORD or

SCOORD shall be displayed with a hyperlink to display the referenced object with rendering of the specified temporal or spatial coordinates.

For SR documents encoded using Template 3300, rendering of the Template 3304 Stress Test Measurement Groups (subsidiary to a Template 3303 Stress Test Phase Data CONTAINER) shall be in a tabular format.

Note: Each instance of a Stress Test Measurement Group represents a group of data elements acquired at approximately the same instant; it is typically generated during the Stress exam whenever a time interval elapses (for example, every minute of the phase), when a technician observes data worth capturing, or when measurements exceed a given range. A tabular format allows a reviewing clinician to easily look at the data collected at a time point (across a row), or the change in a single element (e.g., heart rate) across time (down a column).

The Image Display actor shall provide a user control for rendering of ECG ST elevation or depression measurements either in units of mV or in units of mm (based on conventional scaling of 0.1 mV/mm).

4.4.5.1.1 Grouped Image Display and Report Creator

An implementation that groups an Image Display actor with a Report Creator actor shall be able to copy a user-selected Content Item and its subsidiary content tree from an SR document to the clinical report created by the Report Creator.

If the clinical report created by the Report Creator is an SR, the copied content shall be placed in an appropriate location in the target SR in accordance with its Template. The Image Display / Report Creator shall copy the full subsidiary content tree, including any IMAGE Content Items that are included through by-reference relationships. The Observation Datetime of the copied data shall reflect the effective Observation Datetime of the Content Item in the source SR document.

If the clinical report created by the Report Creator is not an SR (e.g., a PDF or a CDA), the semantics of the copied data is to be appropriately transformed for the format of the report, and does not necessarily require the full coded structures present in the SR.

A clinical report with structured coded content (i.e., an SR or a CDA) shall reference the source SR document by SOP Instance UID.

Notes: 1. The Observation Datetime of the selected Content Item may not be explicitly encoded in that Content Item, but may be inherited from an ancestor Content Item in the source SR document.

2. In an SR clinical report, the SOP Instance UID reference to the source SR document appears in the Predecessor Documents Sequence (0040,A360).

3. This Content Item copy requirement is intended to specifically apply to copy of selected measurements or the LV Wall Motion Analysis container (TID 5204) of the Echocardiography SR evidence document into a Stress Testing SR clinical report.

4. The Echocardiography SR Template specifies that the image references from individual measurements may use by-reference relationships to IMAGE Content Items in the Image Library section of the SR (see TID 5200). Implementers are cautioned about appropriately copying the full subsidiary content tree with such relationships. Such copied image references may be converted to by-value relationships in the target SR, or if kept as by-reference relationships, the links must be targeted to the correct node in the resulting content tree.