

ACC, HIMSS and RSNA
Integrating the Healthcare Enterprise



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**IHE Cardiology Technical Framework
Supplement 2007**

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**Evidence Documents Profile
Cardiology Options:
Stress Testing
CT/MR Angiography**

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<Trial Implementation Version 0.06>

June 6, 2007

1 Foreword

20 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
25 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.

The approach employed in the IHE initiative is not to define new integration standards, but rather
30 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.

35 The IHE Technical Frameworks for the various domains (Cardiology, Radiology, IT
Infrastructure, Laboratory, etc.) define 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 <http://www.ihe.net> .

40 **This supplement to the IHE Cardiology Technical Framework v2.1 is submitted for Trial
Implementation through 2008.**

Comments on this document may be submitted to:

45 **<http://forums.rsna.org> under the “*IHE - Integrating the Healthcare
Enterprise*” forum**

**Select the “*Cardiology Technical Framework Supplements 2007-2008 for Trial
Implementation*” sub-forum.**

50 **The IHE Cardiology Technical Committee will address comments arising from Trial
Implementation, and will publish a Final Text version in or after June 2008.**

2 Introduction

55 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.

2.1 Open Issues for Trial Implementation

60 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 explicitly 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.

2.2 Closed Issues

70 2. 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.

75 3. 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).

80 4. 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

85 when Supplement 129 is available for use.

Changes to Volume I – Integration Profiles

90 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.	
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Modify the ED Profile in section 7

7.2 Evidence Documents Profile – Cardiology Options

95 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
	<u>CTA/MRA Evidence</u>	<u>CARD-TF 2: 4.2.6</u>
	<u>Stress Test Evidence</u>	<u>CARD-TF 2: 4.2.7</u>
Acquisition Modality	Cath Evidence	CARD-TF 2: 4.2.4
	Echo Evidence	CARD-TF 2: 4.2.5
	<u>CTA/MRA Evidence</u>	<u>CARD-TF 2: 4.2.6</u>
	<u>Stress Test Evidence</u>	<u>CARD-TF 2: 4.2.7</u>
Image Manager/ Image Archive	<i>No options defined</i>	-
Image Display (Report Creator)	Cath Evidence	CARD-TF 2: 4.4.2
	Echo Evidence	CARD-TF 2: 4.4.3
	<u>CTA/MRA Evidence</u>	<u>CARD-TF 2: 4.4.4</u>
	<u>Stress Test Evidence</u>	<u>CARD-TF 2: 4.4.5</u>

100 **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.**

110 **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

115

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.

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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.

125 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

130 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.

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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.

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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.

145 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

150 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

155 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.

160 **Table 4.2-13. Stress Test Evidence Template**

Stress Test Evidence Template
x3300 Stress Testing Report - DICOM Supplement 128

165 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.

170 Notes: 1. DICOM Supplement 128 has completed its period of Public Comment. The expectation is that Supplement 128 will be issued for Letter Ballot in late June 2007, and will be adopted as Final Text in August 2007. If that schedule is maintained, implementations shall conform to the Final Text version of Supplement 128. If Supplement 128 is not adopted as Final Text in August 2007, for the purposes of the January 2008 Connectathon implementations may conform to the Letter Ballot version with provisional “local” codes under Coding Scheme 99SUP as specified in the Letter Ballot version. The most recent version of Supplement 128

175 is available at <ftp://medical.nema.org/medical/dicom/supps/> with a file name beginning with “Sup128”.

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.

180 3. Template x3300 includes all the document sections needed for a full clinical report. In the context of this Transaction, the SR document based on TID x3300 is an evidence document, and therefore optional sections with Concept Names such as (121074, DCM, “Recommendations”) will not be used.

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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.

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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.

- 195 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.
 2. Implementers are cautioned that several errors in Template 3900 were corrected in DICOM CP679, adopted in January 2007 (available at

200 ftp://medical.nema.org/medical/dicom/final/cp679_ft.pdf), but that these do not
 205 appear in the 2007 edition of the DICOM Standard.

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 SCOOD shall provide a hyperlink to display the referenced object with rendering of the specified spatial coordinates.

210 **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

215 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.)

220 **4.4.5.1 Expected Actions**

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

- 225 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.
2. This section will be updated with the final template IDs when DICOM Supplement 128 Final Text is adopted. See the note in Section 4.2.7 about the implications of the adoption schedule for Supplement 128 on trial implementations and testing of this option.

230 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.).

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

240 For SR documents encoded using Template x3300, rendering of the Template x3304 Stress Test Measurement Groups (subsidiary to a Template x3303 Stress Test Phase Data CONTAINER) shall be in a tabular format.

245 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).

250 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.

255 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 /

260 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.

265 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.

270 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.

275 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
280 be targeted to the correct node in the resulting content tree.