



American  
Society of  
Echocardiography



# Integrating the Healthcare Enterprise White Paper

## Echocardiography Workflow and Evidence Documents Integration Profiles

This white paper provides information regarding the Echocardiography Workflow, or simply “Echo”, Integration Profile and the Evidence Documents, or echo measurements, Integration Profiles released by IHE Cardiology in Years 1 (2005) and 2 (2006).

**Problem Statement:** As echocardiography becomes digital, there is a need and opportunity to coordinate workflow. When considering echo workflow, transthoracic echo (TTE), transesophageal echo (TEE) and stress echo must all be addressed. An echo study consists of digital images, measurements and an interpretive report. Stress echo is a multi-stage exam with images and data obtained before and after exercise or pharmacologic stress. Images are often obtained by a sonographer who may make preliminary measurements and preliminary observations. The over-reading echocardiographer must have access to all of this data in discrete, structured format to synthesize a final report. In the modern echo lab, all study information must be associated with order entry, scheduling and status reporting. It is optimal to upload the final report to the office or hospital information system. Echocardiography machines are portable and only intermittently connect to the network further complicating the flow of information.

## **Use Cases and Broadened Scope:**

Examples of Echo and Evidence Documents use cases include:

**Ideal:** IHE specifies the ideal situation when a patient is pre-admitted and registered in the Hospital Information System. An order is generated for a procedure which is then scheduled. Demographics and procedure information are transmitted accurately to the echo system. Images are securely stored to an archive and can be displayed at any imaging workstation. Echo measurements, performed anywhere, are correctly associated and securely stored with the study as discrete, structured data which can be interpreted by another workstation and incorporated into a report.

**“Drive-by echo in CCU”:** In another example, IHE addresses the real-world situation where the procedure is not ordered. The mobile echo system has downloaded the day’s worklist and gone on to the Cardiac Care Unit (CCU). While the echo tech is in CCU, a cardiologist requests a stat echo on a patient who is clinically decompensating. The echo tech uses the patient id from the wrist band and completes the exam. Later the echo unit is re-connected to the network and the images downloaded. The IHE workflow automates the reconciliation of the patient demographics (e.g., mis-spellings in patient name or ID), and post-hoc creation of the missing order.

**Stress Echo Image Display:** Stress echo images create a unique problem because the order of the display (by view and by stage) is critical. IHE Cardiology requires specific display requirements based on baseline, pre-, mid-, post-stress, and recovery stages. Views, such as Parasternal short axis, and protocols, such as Modified Bruce Treadmill, are also defined. The images are consistently displayed on any IHE compatible workstation, relieving the sonographer or cardiologist of spending time rearranging image sets.

**Echo Measurements:** Echo measurements have historically been printed to paper and inserted into a patient’s folder. To use those measurements, cardiologists typically had to retype the information into a separate reporting system. A technologist may have to re-record measurements for a registry or clinical trial. IHE Evidence Documents provides for the accurate electronic exchange of echo measurements, including patient identification, measurement definitions and structure, and secure storage.

**Echo and Evidence Documents Profile Benefits:** IHE provides benefits to many of the users in an echo department, specifically:

### Cardiologists

Patient care is improved and cardiologists’ time is saved by:

- Allowing immediate patient care to be the priority, knowing the system will help manage the ordering and accounting on the back end
- Ensuring that images are created with proper identifiers so that image display is consistent, especially for stress echo

- Providing echo measurement interoperability – complete the preliminary echo measurements on the cart and transfer as structured data to the reporting workstation for the final report
- Reducing the need for duplicate procedures
- Reducing delays in charge posting due to improper orders
- Ensuring images and measurements are securely stored
- Uploading echo reports to the hospital or office information system

#### Cardiology Administrators and Technologists

Echo lab workflow is improved and time is saved by:

- Automatically obtaining correct patient demographics and procedure code information
- Automatically correcting demographics in cases such as patient identification not obtained in advance (reduces the need of personnel to “fix” studies and data)
- Accurately identifying data to facilitate easier data collection later (e.g., disease registries or outcomes analysis)
- Improving the handling of *ad hoc* echo procedures which might otherwise not get billed due to insufficient or inaccurate information
- Assisting in maintaining the statuses of procedures in real-time for better lab management
- Verifying that all images obtained, even on mobile systems, are securely archived prior to deletion

#### Cardiology IT Staff

Other IT projects can come to fruition when time is saved in the echo lab by:

- Reducing or eliminating “interface projects”, including specification and testing
- More stable and robust interfaces, including during system upgrades
- Ensuring that a multi-vendor environment will function correctly
- Reduction of “switching costs” when a new system is purchased, including time to configure new ultrasound modalities
- Managing and simplifying RFP’s and purchases by using IHE-specified connectivity profiles
- Selection of the “best solutions” from multiple vendors and reduction of vendor integration issues, eliminating the need for a single vendor all-encompassing solution

#### Patient

The patient also benefits from systems integration in the cath lab by:

- Removing the need to wait while demographics are entered into the various cath lab systems and old reports are pulled.
- Enabling better patient care because the interpreting physician can more accurately assess interim changes.
- Providing cath reports more readily to other care team members within and outside a hospital or office network.

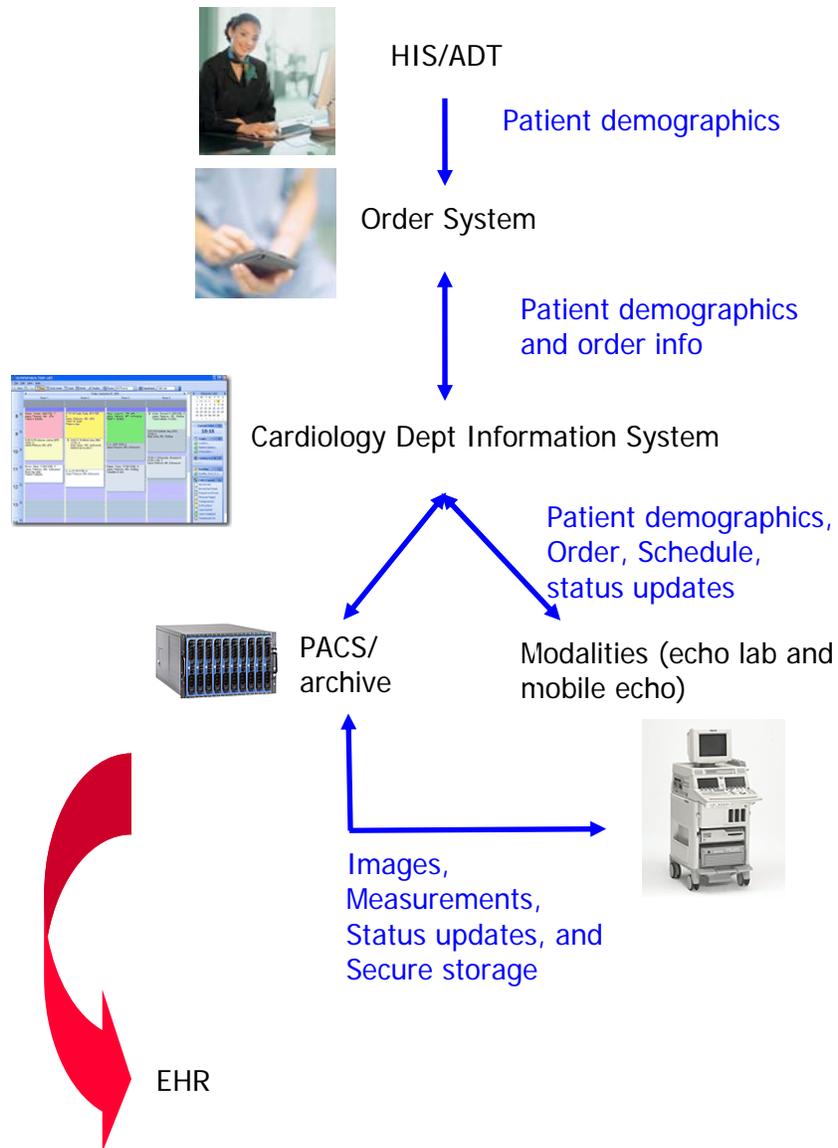
**How the Echo Integration Profile actually works:** IHE defines “actors” which are responsible for performing certain roles. Examples of Actors include an Admission-Discharge-Transfer (ADT), an Image Manager, or an Acquisition Modality. Vendor products in the marketplace often implement more than one IHE actor.

The key Actors in the Echo Workflow and Evidence Documents Profiles, and examples of products which might implement them, are:

- ADT, such as a Hospital Information System (HIS)
- Order Placer, such as a Computerized Physician Order Entry System (CPOE)
- Departmental System Scheduler/Order Filler, such as a Cardiology Information System
- Acquisition Modality, such as an Echo device (mobile or assigned to a specific lab)
- Image Manager/Archive, such as a PACS system, image viewing device, etc.
- Evidence Creator, such as a workstation application that performs measurements

In the best case example where a patient is registered ahead of time, an order is created, and the procedure is scheduled in advance, the Echo workflow transactions would appear as follows.

Figure 1: Simplified IHE Year 1 Echo Workflow



The transactions in this diagram use existing standards such as HL7 and DICOM. For more technical details regarding the IHE transactions, please refer to the [IHE Cardiology Technical Framework](#) document.

**Purchasing Using IHE:** One of the key concepts of IHE is the ability to definitively describe interfaces with a single sentence. Using the statements below mitigates the need for thousands of pages of technical documentation, interface engines, and on-site testing. For example, the following statements should be included in any request for proposal (RFP):

"The **Ultrasound modality** system shall support the IHE Echocardiography Workflow Profile as the Acquisition Modality and Image Display Actors, including the Stress Echo Option. Additionally, the modality system shall support the Evidence Document Profile as an Acquisition Modality Actor with the Echo Option."

"The **Cardiology Information System** shall support the IHE Echocardiography Workflow Profile as the Order Filler/Department System Scheduler Actor."

"The **Cardiology PACS** shall support the Echocardiography Workflow Profile as the Image Manager and Image Display Actors, and the Evidence Documents Profile as the Image Manager, Image Display, and Evidence Creator Actors with the Echo Option."

Other related Profiles to consider include Displayable Reports (DRPT), Retrieve ECG for Display (ECG), Retrieve Information for Display (RID), Portable Data for Imaging (PDI), and Cross-Enterprise Document Sharing (XDS).

**Summary:** IHE Integration Profiles improve patient care and reduce errors and unnecessary work in the echo lab. It is worth your time to learn more about IHE, and time to demand it from your equipment vendors. See [www.ihe.net](http://www.ihe.net) or [www.acc.org/ihe.htm](http://www.acc.org/ihe.htm).

Consider joining the "IHE Cardiology Users' Group", which holds web seminars, teleconferences, and other educational opportunities on an informal basis. For more information, send an email to [ihe@acc.org](mailto:ihe@acc.org).