

Introduction to the Integrated Healthcare Enterprise (IHE) Software Solution

*The Electronic Document Records Management
and Patient Information Sharing Standard*

by

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Overview:

Because of the high mobility of patients within and among metropolitan areas, there is a growing need for the exchange of patient information among physicians, medical specialists and healthcare organizations over multiple networks that utilize different standards. The Integrated Healthcare Enterprise (IHE) solution is a standards-based software system that was developed to meet this demand while at the same time preserving the security and privacy of each patient's records. Its centralized architecture was designed in close collaboration with the medical information technology and physician communities to enable the secure exchange of both image-based and electronic patient records across networks of healthcare providers and insurance companies. The IHE solution provides physicians, hospitals, insurance carriers and other healthcare professionals with a platform-independent, scalable, upgradeable - and above all, reliable - method of complying with standards that is interoperable with existing networks and systems. Accordingly, the IHE initiative supports the secure sharing of *all* medical data in the USA and abroad and is compliant with HIPAA regulations.

Why IHE:

The IHE standard was designed to optimize communications and interoperability among hospital departments that serve a common set of patients. It significantly reduces the response time that it takes medical personnel to provide critical information to the doctors and nurses who provide the patient with medical services - which invariably improves the quality of patient care. IHE software improves the efficiency of data transfer between patient and doctor by locating all patient information in a central, object-oriented, data repository for diagnostic use by the physician. Then it transmits that information to patient meetings at remote locations for access during each patient-doctor consultation. Given the proliferation of networked workstations in today's healthcare environment, it is not unusual to make pertinent medical information available electronically to nurses and other staff members who work at the patient's bedside.

By establishing a central data repository of information that is readily available to all members of a hospital or clinic staff, the IHE solution eliminates hundreds of duplicate records and redundant expenses. Storing only one copy of each document in the network greatly simplifies business procedures, strengthens the security of patient information, and improves control over the records management cycle by making it easier to destroy a particular document when its record retention period ends.

The superior records management capabilities of the IHE central information and control system also enhance the accreditation and audit process. This is because CFOs with financial responsibility can accurately verify patient medical procedures and audit the performance of hospital staff regarding individual patients during the process of assessing department-wide performance.

Profiles:

IHE software provides profiles for each medical discipline or modality. These profiles effectively integrate communication standards such as DICOM, HL7, and W3C security

measures to provide definitions that precisely meet clinic-specific needs. As of Dec. 1 Profiles for the following domains:

- A: Cardiology
- B: Eye Care
- C: IT Infrastructure
- D: Laboratory Results and Reports
- E: Pathology Reports and Images
- F: Patient Care Coordination and Reports
- G: Patient Care Devices and Monitoring Equipment
- H: Patient Care Quality Reports and Audits
- I: Radiation Oncology
- J: Radiology Images and Reports
- K: Cross Enterprise Document and Image Sharing
- L: Teaching File and Clinical Trial Exports
- M: Patient Identifier Cross Reference and Patient Demographics

Within each of these profiles there are subcategories that represent an a standard for each of the image and data formats used by that discipline or technology. Listed below are outlines of each profile:

A. Cardiology

The Cardiology Profile includes the following features:

1. A standard for digitizing, archiving and retrieving Cardiac Cath Lab Workflow images, and for identifying both diagnostic and therapeutic procedures, (CATH). Included are the ordering, scheduling and imaging acquisition procedures, as well as any audio report and diagnosis of the cardiologist.
2. Echo Cardiography (ECHO) and Electrocardiology ECG studies, including sequential electrocardiograms for review purposes.
3. Evidence Documents (ED) that add cardiology-specific options to a Radiology ED profile.
4. Implantable Device Cardiac Observation (IDCO), data that specifies the creation, transmission, and processing of discrete data and reports associated with the insertion, observations and management of the implantable device.

Stress Testing Workflows (STRESS) includes ordering, collecting of multi-modality data during diagnostic stress testing procedures. 6. Reports (DRPT) display cardiology reports, including graphics and agrams in a PDF format for universal viewing and distribution within the enterprise.

B. Eye Care

The Eye Care Profile includes the following features:

1. Eye Care Workflow (EYECARE) manages eye care workflow, which includes ordering, scheduling, imaging acquisition, storage and viewing.

Capture (RFD) enables EHR applications to directly request forms from clinical trial sponsors and Public Health reporting.

D. Laboratory Results And Reports

The Laboratory Results and Reports Profile includes the following features:

1. Laboratory Scheduled Workflow (LSWF) establishes the continuity and integrity of clinical laboratory testing and observation data throughout the healthcare enterprise.
2. Sharing Laboratory Reports (XD-LAB) describes a clinical electronic document.
3. LOPINC Test Co

E. Pathology Reports and Images

Pathology Reports and Images Profile features the Pathology Workflow (PWF), which establishes the continuity and integrity of basic pathology data acquired for examinations being ordered for an identified inpatient or outpatient.

F. Patient Care Coordination and Reports

The Patient Care Coordination and Reports Profile includes the following features:

1. Medical Summaries (MS) defines the content and format of Discharge Summaries and Referral Notes.
2. Exchange of Personal Health Record Content (XPHR) describes the content and format of summary information extracted from a PHR system for import into an HER system and vice versa.
3. Emergency Department Referral (EDR) allows clinicians to create electronic referrals to the emergency room including the nature of the current problem, past medical history and medications. Upon arrival of the patient to the Emergency Department, the patient is identified as a referral and the transfer document is incorporated into the EDIS. The profile builds on medical summaries by adding structures to pass data specific for ED referrals such as the estimated time of arrival and method of transport.
4. Basic Patient Privacy Consents (BPPC) enables XDS Affinity Domains to be more flexible in the privacy policies that they support by providing mechanisms to record patient privacy consents, enforce these consents, and create Affinity domain defined consent vocabularies that identify information sharing policies.
5. Pre-Procedural History and Physical (PPHP) describes the content and format of an electronic Pre-procedural History and Physical document.
6. Antepartum Care Summary (APS) describes the content and format of summary documents used during antepartum care.
7. Functional Status Assessments (FSA) describes the content and format of Functional Status Assessments that appear within summary documents.
8. Emergency Department Encounter Record (EDER) describes the content and format of records created during an emergency department visit.

9. Query for Existing Data (QED) allows information systems to query data repositories for clinical information on vital signs, problems, medications, immunizations, and diagnostic results.

G. Patient Care Devices and Monitoring Equipment

1. *The Patient Care Devices and Monitoring Equipment Profile* features Device Enterprise Communication (DEC), which sends PCD data to applications (CDS, CDRs, EMRs, ETC.).

H. Patient Care Quality Reports and Audits:

1. Patient Care Quality Reports (PQR) are stored for audit review and other patient inquiries.

I Radiation Oncology

The Radiation Oncology Profile includes the following features:

1. Normal Treatment Planning-Simple (NTPL-S), illustrates flow of treatment planning data from CT to Dose Review.
2. Multimodality Registration for Radiation Oncology (MMR-RO) shows how radiation oncology treatment planning systems integrate PET and MRI data into the contouring and dose review process.
3. Treatment Workflow (TRWF) integrates daily imaging with radiation therapy treatments using workflow charts and diagrams.

J. Radiology Images and Reports

The Pathology Reports and Images Profile includes the following features:

1. Scheduled Workflow (SWF) integrates ordering, scheduling imaging acquisition storage and viewing for Radiology Exams
2. Patient Information Reconciliation (PIR) coordinates reconciliation of the patient record when images are acquired for unidentified (e.g. trauma) or misidentified patients.
3. Post Processing Workflow (PWF) provides work lists, status and result tracking for post acquisition tasks, such as computer aided detection or Image Processing.
4. Reporting Workflow (RWF) provides work lists, status and result tracking for reporting tasks such as dictation, transcription and verification.
5. Portable Data for Imaging (PDI) provides reliable interchange of image data and diagnostic reports on CDs for importing, printing, or optionally displaying in a browser.
6. Nuclear Medicine Image (NM) specifies how Nuclear Medicine images and result screens are created, exchanged, used and displayed.

7. Mammography Image (MAMMO) specifies how Mammography images and evidence objects are created, exchanged, used and displayed.
8. Evidence Documents (ED) specified show data objects such as digital measurements are created, exchanged, and used.
9. Simple Image and Numeric Report (SINR) specifies how diagnostic Radiology Reports (including images and numeric data) are created, exchanged and used.
10. Key Image Note (KIN) lets users flag images as significant (e.g. for referring, for surgery, etc. and add notes to any other images of interest.
11. Consistent Presentation of Images (CPI) maintains consistent intensity and image transformations between different hardcopy and softcopy devices.
12. Presentation of Grouped Procedures (PGP) Facilitates viewing and reporting on images for individual requested procedures (e.g. head, chest, abdomen) that an operator has grouped into a single scan.
13. Image Fusion (FUS) specifies how systems creating and registering image sets and systems display fused images create, exchange and use the image, registration and blended presentation objects.
14. Cross enterprise Document Sharing for Imaging (XDS-I) extends the XDS to share images, diagnostic reports and related informational across a group of care sites.
15. Access to Radiology Information (ARI) shares images, diagnostic reports, and related information inside a single network.
16. Audit Trail and Node Authentication (ATNA) Radiology Option defines Radiology-specific audit trail messages.
17. Charge Posting (CHG) provides timely procedure details from all modalities to the billing systems.

K. Cross Enterprise Document Sharing

The Cross Enterprise Document Sharing Profile features Cross Enterprise Document Sharing (XDS) registers and shares electronic health record documents between healthcare enterprises ranging from Physicians offices to clinics to acute care in-patient facilities.

L. Teaching File and Clinical Trial Export

The Teaching File and Clinical Trial Export Profile features Teaching File and Clinical Trial Exports (TCE), which permits users to flag images and related information for automatic routing to teaching files authoring or clinical trials management systems while insuring that the patient identity if protected and redacted.

M. Patient Identifier Cross Reference and Patient Demographics

The Patient Identifier Cross Reference and Patient Demographics Profile features Patient Identifier Cross Referencing (PIX), which cross references patient identifiers among hospitals, care sites, health information exchanges, etc.

Medical Imaging Resource Center (MIRC)

In addition to all of the individual discipline profiles, the IHE standard includes an organized storage or archive software application called the Medical Imaging Resource Center (MIRC). By providing immediate and complete access to all patient information, the sophisticated MIRC software eliminates the need for an individual medical facility to buy or build its own medical imaging and patient data storage software. MIRC software features the following capabilities:

1. A simple way to identify, index and retrieve images, teaching files and other diagnostic imaging information.
2. The ability to search multiple imaging libraries as if they were a single collection of records, organized by medical categories.
3. An authoring tool that makes it easy to create radiology teaching files and other electronic documents in customizable formats.
4. Tools that enable sites to manage and exchange images and research data sets for use in clinical imaging trials.

RSNA hosts an index site that runs the MIRC storage and query software at *mirc.RSNA.org*. It allows users to access materials published on participating sites from around the world. Currently it includes thousands of teaching files from 10 different sites.

Applications of the IHE Standard

The Philadelphia Health Information Exchange is the first live system in the USA to deploy IHE's Cross Enterprise Document Sharing for imaging (XDS-I) Profile. The network enables the real-world exchange of diagnostic image data among healthcare enterprises in the Philadelphia area. The IHE workstations are interconnected via a secure Internet connection to the Philadelphia Health Information Exchange. The demonstration shows the exchange of anonymous patient information shared by the University of Pennsylvania Health System and the Thomas Jefferson University Hospital, two of the region's largest healthcare providers.

IHE Domains and Annual Work Cycles

IHE is organized across a growing number of clinical and operational domains. Each domain produces its own set of technical framework documents, in close coordination with other IHE domains. Committees review, revise and republish these documents annually, often expanding them with supplements that define new profiles. Initially, each new profile is sent out for public comment. After comments, the revised profile is distributed for trial implementation, for use in the IHE implementation testing process. The related profile is published as final text and incorporated in the latest IHE standard version.

Summary and Conclusion

The IHE solution provides uniform sharing of medical information of all types - text, audio, images and video data - through a central, object-oriented database from which a user can retrieve a complete medical history of any patient in the system in a matter of seconds. With today's mobile patient lifestyles and portable insurance systems, the sharing of patient data between medical facilities is becoming essential. IHE is fast becoming accepted as the standard for sharing patient medical information among hospitals, physicians, medical clinics, healthcare facilities and insurance carriers. Consequently, when medical groups, hospitals or clinics agree to merge they should implement the IHE software system for cost-effective sharing of electronic medical records and diagnostic images. Implementing the IHE software solution significantly improves the efficiency of existing business processes – not to mention the quality of patient care.

IMERGE's Healthcare Consulting Group

If your medical organization is planning a new EMR or PACS systems or is an existing system we recommend it be IHEcompatible in order to facilitate sharing of patient information. Upon your request, IMERGE Healthcare Consulting Group your present system and make recommendations for implementing an IHE-compatible solution.