Imaging
in Indian Health:

Project Overview

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Overview of VistA Imaging

The Veterans Health Information Systems and Technology Architecture (VISTA) Imaging System was developed as an extension of the VistA hospital information system. VistA Imaging captures clinical images, scanned documents, and other non-textual data files and makes them part of the patient's electronic medical record.   Image and text data are provided in an integrated manner that facilitates the clinician's task of correlating the data and making patient care decisions in a timely and accurate way. The system serves as a tool to aid communication and consultation among physicians — whether in the same department, in different services, or at different sites.

VistA Imaging can store and/or display a number of different kinds of images:

- Scanned documents, such as advance directives or consultant reports, for both clinical and administrative purposes;

- Clinical images, such as those from endoscopy, pathology, dermatology, cardiology;

- Radiology and nuclear medicine images;

- EKG waveforms.

VistA Imaging is an important part of the Department of Veterans Affairs VISTA hospital information system. It is designed to inter-relate with VISTA in a way that augments VISTA functionality, minimizing duplication of clinical and/or business processes wherever possible. Similar functionality will be developed for the inter-relationship of VistA Imaging with the Indian Health Service Electronic Health Record.

Key Features of VistA Imaging

Viewing Clinical Images

VistA Imaging provides the multimedia component of the Veterans Health Administration's Computerized Patient Record System (CPRS). It is being offered as the multimedia component of the IHS Electronic Health Record (IHS EHR). Generally, the VistA Imaging display software is used in conjunction with CPRS. Images from VistA Imaging are typically viewed during conferences, rounds, procedures, and operations. Clinicians often review images when placing orders or writing progress notes using CPRS. In addition, a number of clinical services use digital images when making diagnostic interpretations or responding to consult requests.

The patient's EKGs, photo identification, and a menu of thumbnail images will be automatically displayed when the patient is selected in CPRS. Images are associated with progress notes and reports of radiology exams, clinical procedures, surgical operations, and pathology specimens. When an image is present, an image icon will appear to the left of the note title or report in CPRS. When a clinical user clicks on the note or report, the associated images will be displayed for user selection and viewing.
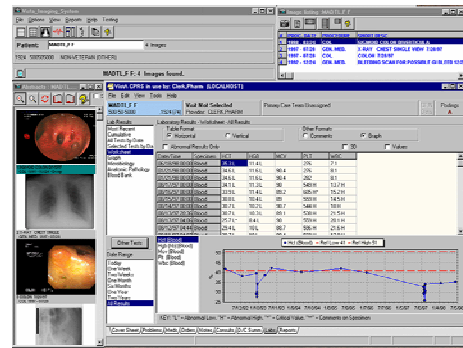
VistA Imaging is loaded on all clinical workstations used for CPRS access in the VHA because VistA Imaging provides an important portion of the electronic patient record. The Joint Commissions on Accreditation of Hospital Organizations has expressed concern that small portions of the medical chart, such as signed consent forms or advance directives, should not be stored separately from the on-line record. Therefore, a major effort is underway in the VHA to support scanned documents as part of VistA Imaging. Scanned document functionality is an important feature of the "core" VistA Imaging implementation.

It is important that VistA Imaging display software be placed on computer systems in conference rooms, ICUs, and shared clinical areas, as well as clinician's offices. Widespread access to VistA Imaging software, as per appropriate security protocols and procedures, helps assure optimal use of its added functionality.

Capturing Images

Images may be captured in several ways:

- Using an image capture workstation with an input device such as a video camera, still digital camera, scanner, or a source of image files on its hard drive;

- Using an automated interface such as a Digital Imaging and Communications in Medicine (DICOM) standard gateway, clinical procedures interface, or interface to a commercial document system.

Image capture workstations are located near the source of the images, unless centralized document scanning is done. For example, in many VA Medical Centers, an image capture workstation should be placed in the gastroenterology (GI) lab or pathology suite. The video output of the camera is then connected to an image capture board in the workstation to allow direct image capture and upload into VistA Imaging.

DICOM is a standard for viewing and distributing medical images, regardless of the image origin. DICOM gateways are interface devices that capture most radiology, and some non-radiology (e.g. dental and ophthalmology), images in a standards-based format. These devices are typically located either in the computer room or radiology department and are accessible at any time. DICOM device purchases must include the VistA Imaging DICOM requirements document as part of the contracting process.

Diagnostic Radiology Workstations

Diagnostic radiology workstations allow radiologists to interpret digital radiology images without printing film. Filmless reading provides a number of important features, including the ability to adjust the density of the images without requiring unnecessary study repeats. It also allows rapid comparison of multiple slices of Computed Tomography (CT) and Magnetic Resonance (MR) studies via the new stack view feature where the user can step through the slices quickly in a motion video type of view. Continuous software enhancements, such as this stack view feature, are made based on clinical user priorities.

Other Imaging System Components

VistA Imaging Systems include a "Core Imaging Infrastructure". This "Core" consists of the following hardware components:

- Network servers, including magnetic and optical disk jukeboxes, for storage of images;

- Network infrastructure, including switches and cabling;

- DICOM gateway systems to communicate with commercial Picture Archiving and Communication Systems (PACS) and modalities such as CT, MR, and Computed Radiography (x-ray) devices;

- A background processor that is responsible for moving images to the proper storage device.

Frequently Asked Questions

What sites need VistA Imaging?

All Indian health facilities using the IHS Electronic Health Record should consider VistA Imaging. VistA Imaging is offered as the imaging program to complement the IHS EHR text-based record. It offers functionality that does not exist in the IHS EHR and is not planned for the IHS EHR.

Is VistA Imaging required for telehealth?

VistA Imaging is not required for telehealth care. However, if sites are part of an Master Person Index solution, VistA Imaging images can be viewed remotely, thus providing telemedicine and/or teleradiology functionality. In addition, as new functionality is added to VistA Imaging, it may offer image storage and display features that are advantageous to telehealth resource-sharing among Indian heath facilities. Certainly, sites and IHS Areas must plan the integration between telehealth functional needs, existing software, VistA Imaging, and the IHS EHR. Such integration is part of IHS Telehealth Program planning.

What cost savings can be anticipated from VistA Imaging?

The core VistA Imaging system provides substantial savings in terms of clinicians' time to perform routine patient care activities. It also reduces risk by presenting the clinician with the complete patient record and enabling consults with specialty physicians across the enterprise.

In addition, sites that implement filmless radiology functionality can expect savings of up to $18 per radiology study performed. These savings are only achieved when facility operates radiology services without printing films. Savings are found in reduced cost of film and film handling, reduced storage costs, and technologist and radiologist productivity increases.

Should every site using VistA Imaging have its own computer server configuration?

Individual sites installing VistA Imaging must assess their respective need for on-site VistA Imaging computer servers. A model of regional server support (i.e. multiple smaller facilities sharing a single VistA Imaging "hardware cluster") has been found effective and cost-efficient within the VHA. Such a model depends on a desired/practical balance reached between broadband telecommunication availability, functional use planned for VistA Imaging (e.g. scanned documents vs. radiology images), and clinician expectations regarding application performance (i.e. speed from "mouse click" request to desktop display of image).

Strategic Directions and Timelines

The Indian Health Service will serve as the distributor of VistA Imaging for IHS, Tribal, and Urban Indian health facilities. As such, the IHS will assure that the use, implementation, and maintenance of VistA Imaging in IHS, Tribal, and Urban facilities occurs in a manner consistent with established Veterans Health Administration (VHA) policy. VistA Imaging is a Medical Device regulated by the U.S. Food and Drug Administration (FDA). The IHS recognizes the importance of adhering to FDA regulation of VistA Imaging as a Class I Medical Device and will monitor VistA Imaging in Indian health to assure that:

- All personnel (support or clinical) who use VistA Imaging are appropriately trained in its use;
- No site implementing VistA Imaging will modify the imaging system code (unless specifically authorized by the VHA to do so);
- The use of VistA Imaging is supported twenty-four hours per day, every day of the year, by staff trained in its operation.

Planned Use of VistA Imaging

The IHS will offer VistA Imaging as an extension of the IHS Resource Patient Management System (RPMS) and the IHS Electronic Health Record (IHS EHR). While it is anticipated that the predominant initial use of VistA Imaging in IHS and Tribal facilities will be for scanned documents and non-radiology clinical image capture and storage, some sites may be interested in using VistA Imaging for the purpose of EKG/medical picture/radiology image capture, display, and storage. Because most sites do not have on-site radiologists, or because those sites with on-site radiologists already have a commercial solution, some Indian health sites may not utilize implement VistA Rad, the Picture Archiving and Communication System (PACS) program available from the VHA for filmless diagnostic study interpretation by on-site radiologists. However, communication between VistA Imaging and existing commercial PACS systems at IHS and Tribal facilities is within the planned scope use of VistA Imaging in Indian health facilities.

Architecture to Support VistA Imaging

The Indian health care system has important differences to the health care system of the Veterans Health Administration. Of note, many IHS, Tribal, and Urban Indian facilities are quite small in comparison with VA Medical Centers. In addition, many Indian health facilities are located in remote environments where local information technology (IT) resources and infrastructure are limited. Consequently, the computer and IT architecture by which IHS, Tribal, and Urban Indian facilities implement VistA Imaging may require adjustments

and modifications to the validated configurations already tested within the VHA environment.

For example, many Indian health facilities may implement VistA Imaging in a regionalized architecture. Such an approach would optimize end-user access to critical VistA Imaging functionality without requiring expenditure and technical support for facilities lacking sufficient information technology resources. While this approach to VistA Imaging access may be similar to that deployed by VHA Community-Based Outpatient Clinics (CBOCs), differences between Indian health facilities and CBOCs may lead to slight alterations in recommended computer hardware installations. Such alterations, as needed, would be reviewed by the IHS VistA Imaging Program Office and forwarded, if appropriate, to the VHA VistA Imaging Project Office for additional review and approval.

Timeline for Deployments

VistA Imaging will be deployed across the Indian health system in a timeline designed to follow that planned for the IHS EHR. Most IHS and Tribal facilities are expected to implement IHS EHR in the year before VistA Imaging implementation. VistA Imaging will be implemented for individual Indian health facilities only when those facilities have reached a comfortable level of familiarity and use of the IHS EHR – or if other needs, such as regionalized support for radiology study routing and archiving, speed the timeline to VistA Imaging implementation and use.

Regional VistA Imaging hardware clusters may be installed in an IHS Area or regional facility, so as to facilitate cost-effective, regional access to VistA Imaging as facilities in the region become ready to use VistA Imaging functionality.

IHS VistA Imaging Program Office

The IHS VistA Imaging Program Office will be administratively supervised by the IHS Telehealth Program. The main responsibilities of the IHS VistA Imaging Program Office are to:

- Facilitate agreements with the VHA regarding ongoing support from the existing VHA VistA Imaging infrastructure. This support will include VistA Imaging Implementation Manager assistance, for site assistance in VistA Imaging site readiness, installation, training, monitoring, and first-level technical support;
- Maintain documentation requirements specific to individual VistA Imaging installations;
- Assure a mechanism is in place for "patch update" distribution to all IHS, Tribal, and Urban Indian health sites that have installed VistA Imaging, as new patches are released by the VHA VistA Imaging Project Office;
- Identify Indian health representation to the VHA VistA Imaging requirements team, so that VistA Imaging application updates will include needs identified within the Indian health system;
- Report any difficulties specific to the implementation and use of VistA Imaging in an Indian health facility to the VHA VistA Imaging Project Office;
- Plan, in conjunction with the VHA VistA Imaging Project Office, for shared VistA Imaging training and technical support resource infrastructure, as such resource-sharing is efficient and of mutual benefit for both Offices;
- Assist Indian health sites requesting VistA Imaging implementation on modified computer/hardware architecture in presenting such requests to the VHA VistA Imaging Project Office for review and possible approval;
- General communication regarding the use of VistA Imaging in Indian health between the IHS and the VHA VistA Imaging Project Office.

Implementation

VistA Imaging software will be available after an installation's **VistA Imaging Project Team** completes implementation steps as appropriate to the complexity of the anticipated imaging system.

A local or regional **VistA Imaging Project Team** will be assembled for each VistA Imaging installation. This team will be comprised of:

- A VHA VistA Imaging Implementation Manager;
- installation site or IHS Area office clinical, technical, and project management personnel, including IHS EHR Clinical Application Coordinators, imaging coordinators and other appropriate information technology staff;
- equipment and modality vendors;
- and pertinent contractors who may be hired to assist with the installation or already under contract with a site or IHS Area office for IT and clinical system support.

The **VistA Imaging Project Team** works to ensure a successful implementation of the VistA Imaging software, as per the VHA seven step process of VIstA Imaging implementation. The seven step process is the defined mechanism by which a facility or IHS Area Office will initiate planning, analyze needs, design and procure equipment and hardware, perform site readiness and validation, install software, and train and evaluate installation site staff. Significant coordination is necessary so that required documentation may be prepared and filed prior to approved installation of VistA Imaging software.

The local site and/or IHS Area information system network is critical to the proper functioning of VistA Imaging. The **VistA Imaging Project Team** will review LAN (local area network) and WAN (wide area network) requirements prior the installation of VistA Imaging software. This approach will not just assure site/IHS Area Office readiness prior to a VistA Imaging implementation. It will also assist installation sites in meeting performance measures for VistA Imaging identified in the site implementation proposal.

Importantly, the **VistA Imaging Project Team** will assess and describe an individual site or installation's needs specific to training, support, and project maintenance, to assist sites or IHS Area Offices in their staffing and resource planning.

Incremental Installation of VistA Imaging

VistA Imaging can be scaled to meet a site's needs. VistA Imaging consists of a number of components that can be installed in various combinations to allow phased implementation of functionality.

Currently available functional components include:

- Display and capture of scanned documents;

- Display of patient's EKGs from an approved EKG storage system;

- Display and capture of patient's color images such as dermatology, wound care, pathology, endoscopy, ultrasound, photo id images, etc.;

- Clinical display of radiology images such as digital radiography (x-ray), CT, MR, angiography, nuclear medicine, etc. (includes automated DICOM capture);

- Filmless diagnostic interpretation of radiology studies;

- Automatic routing of radiology images for remote interpretation (future)

EKG Storage Options

EKGs are not stored within the VistA Imaging application. The VHA has identified a single storage solution for EKGs (the GE/Marquette MUSE system) that is interfaced with the VistA Imaging software. This single solution was established to standardize technical infrastructure needs for the integrated display of EKG information to clinical end-users within the VistA Imaging application.

The IHS is currently exploring alternative options for storage and display of EKGs for Indian health VistA Imaging implementation sites. The IHS VistA Imaging Program Office will work with the VHA VistA Imaging Project Office to help determine the suitability and usability of such an alternative solutions.

Ideally, future enhancements of VistA Imaging will permit the DICOM storage of EKGs, avoiding the selection of single proprietary EKG solutions for diverse sites interested in displaying EKG information through VistA Imaging.

VistA Imaging Implementation Possibilities

The following table provides a clinician's view of various possible VistA Imaging implementations.   VistA Imaging capabilities and basic supporting infrastructure are described for each combination of components. This type of

tiered approach to functionality planning will guide infrastructure requirement determination.

Functionality	Infrastructure	
What the imaging system can do for clinicians	Required Workstations	Required Software and Hardware
Level 1a: View only EKG waveform data	Clinical Display Workstations only	• Software loaded onto VistA (KIDS); Clinical display and capture workstation software; • EKG system interface
Level 1b: View scanned documents attached to CPRS Progress Notes and Reports	Clinical Display and Clinical Capture Workstations	• Software loaded onto VistA (KIDS); Clinical display and capture workstation software **plus** • Magnetic storage servers, Optical Disk Archive, and Background Processor System
Level 2: Level 1a and/or 1b **plus** view color medical pictures (includes documents, color photography, pathology slides and gross anatomy, wound care pictures, etc.)	Clinical Display **and** Clinical Capture Workstations	• Level 1b infrastructure **plus** • Level 1a infrastructure, if EKG display is provided
Level 3: Level 2 **plus** view radiology images captured via DICOM (from modalities such as CT, CR, Ultrasound, etc., and future DICOM modalities as well)	Clinical Display **and** Clinical Capture Workstations	Level 2 infrastructure **plus** DICOM Image & Text Gateways
Level 4: Level 3 **plus** filmless diagnostic study interpretation for radiologists ("soft copy").	Clinical Display and Capture Workstations **plus** VistA Rad Diagnostic Workstations	Level 3 infrastructure **plus** Diagnostic workstations for interpreting digital radiology studies

Training

Appropriate training is vital to the effective and efficient use of VistA Imaging. Training must be tailored to the specific modalities implemented by a site/IHS Area Office and address the respective needs of technical vs. clinical staff. Training must also fulfill FDA-related training requirements as described by the VHA VistA Imaging Project Office.

1. **Daily Operations Training**

   This training will be provided to the VistA Imaging site/IHS Area Office staff by the technical implementation team/integrators during the on-site implementation. A Certificate of Training will be signed by attendees and made part of the records maintained by the IHS VistA Imaging Program Office

2. **Modality-Specific Training**

   Training specific to the functions and use of Clinical Workstations, Document Scanning, and VistA Rad will be offered to site end-users, after the respective modalities a facility will use are installed and certified as working properly.

Annual or "booster" technical and clinical training will be offered for all sites. This training will be provided via a number of options: web-based; regional trainings at designated locations; or national trainings in VistA Imaging offered by the VHA VistA Imaging Program. As much as possible, trainings for Indian health sites implementing VistA Imaging will be offered in web-based formats, to afford sites the maximum availability, flexibility, and cost-savings related to training needs.

The IHS VistA Imaging Program Office is working with the VHA VistA Imaging Project Office to develop mechanisms for sharing training resources between organizations. A training plan specific to VistA Imaging in Indian health – highlighting the specific tools and materials available to Indian health from the Veterans Health Administration - is under development. Additional multimedia training materials will be available for on-line and on-site training as needed.

Technical Support

Technical support will be offered to Indian health VistA Imaging installations in a three-layered tiered model. Given the relative inexperience to date with VistA Imaging in Indian health facilities, this model is an early approximation of the most efficient means for technical support. Modifications to this support model will be made based on additional experience in FY 2006-07.

1. **Local/IHS Area**

   Based on previous training, site and/or IHS Area imaging and IT support staff will attempt first level analysis and resolution of technical problems encountered with VistA Imaging. Site/IHS Area imaging and IT support staff will have access to weekly VistA Imaging conference calls, for information-gathering, pro-active learning, and trouble-shooting advice concerning problems of a non-urgent nature. Centralized IHS Area VistA Imaging installations with a sufficient regional customer base will need to identify dedicated hired/contracted technical support staff. Such staff will be invaluable for successful VistA Imaging use, once implementation in a region or IHS Area reaches a threshold of use resulting in routine trouble-shooting or technical questions. Technical questions of an urgent nature will require rapid escalation to the next level via an algorithm identified by the **VistA Imaging Project Team** during site implementation. This algorithm will clearly indicate the importance of early troubleshooting so that system analysis can pinpoint the type of problem being experienced (i.e. network vs. hardware vs. software). In some cases, the VistA Imaging hardware configuration vendor will be involved early in system troubleshooting.

2. **VHA VistA Imaging Implementation Manager Support**

   VHA VistA Imaging Implementation Manager support will be available during regular working hours to assist with technical issues from Indian health installations. Should this staff be either unavailable or unable to resolve the technical question, escalation to the next level is indicated.

3. **VHA VistA Imaging Program**

   The VHA VistA Enterprise Solution Help Desk will provide for round-the-clock technical support to Indian health installations of VistA Imaging - in the event that local, regional, vendor-specific, or VistA Imaging Implementation Manager support cannot successfully address technical problems concerning VistA Imaging. In some cases, Indian health VistA Imaging sites may develop arrangements with local or regional VA Medical Centers for such support and assistance.

Maintenance

Maintenance of installation site hardware and application software versions is critical to the ongoing success of VistA Imaging in Indian health.

Hardware

Routine hardware upgrades will be the responsibility of the site/IHS Area Office that has performed the initial implementation. Such upgrades include periodic replacement of computer servers and related equipment, or the scheduled addition of additional short-term or long-term storage capacity.

Computer hardware upgrades may also be required for installation sites that wish to advance in levels of VistA Imaging functionality. For example, a site that began with level 1a and 1b functionality and decides to add level 2 or 3 functionality will need to add DICOM-related hardware. The IHS VistA Imaging Program Office and the VHA VistA Imaging Implementation Manager staff will be available to assist with planning for such functional upgrades. Updating is required to Site Implementation Proposals for any functional upgrades in site use of VistA Imaging and should involve the original Vista Imaging Project Team.

Software

Routine software "patch" updating is vital to VistA Imaging application maintenance. The IHS VistA Imaging Program Office will provide a mechanism for the prompt distribution of notices regarding VistA Imaging patch/version enhancements received from the VHA VistA Imaging Project Office. It will be the responsibility of individual Indian health VistA Imaging sites to prepare for, receive, and install released patches of VistA Imaging. Documentation of these patch installations must be sent to the IHS VistA Imaging Program Office for file updating.

Documentation Requirements

A number of documents are required for the planning, implementation, and use of VistA Imaging. These documents, outlined in the *VistA Imaging in Indian Health Implementation Manual*, are vital to the operational success of VistA Imaging in diverse Indian health clinical settings. A partial list, noted here, includes:

- Site Implementation Proposal and Agreement, with attachments below:
  - o VistA Imaging Software Site Contact Listing
  - o Site System Information
  - o Image Acquisition Technical Datasheet for Devices Using DICOM
  - o Image Acquisition Technical Datasheet for Devices Using Clinical Capture
  - o Image Quality Certification
- Technical Site Profile
- Site Readiness Report and Checklist
- Acceptance Testing Plan
- Certificate of Training

Additional documents, such as a Scanning Prioritization Policy and a Contingency Planning Policy, may be of benefit for facilities implementing VistA Imaging. Samples of these and related operational policies will be available via the IHS-VHA Collaboration server.
(http://vhacollaboration.ihs.gov/VistAImaging/default.aspx)

Proper documentation helps assure that adequate technical and personnel resources are available to accomplish the functional requirements outlined by the site/IHS Area's **VistA Imaging Project Team**. Timely documentation is also important for quality control requirements specified by the Veterans Health Administration, pursuant to FDA Medical Device regulations.

Resource Requirements

Budgetary planning must occur early in VistA Imaging Site Implementation planning. Proper resource planning - for computer server configurations, network improvements, workstations, image capture stations, personnel, etc. – can significantly enhance a site's planning and operational success.

Regionalized solutions to VistA Imaging computer server configurations may represent a cost-effective means for multiple sites to share a single, validated VistA Imaging hardware installation. Such regional solutions, in turn, will depend on wide area network systems to assure that performance goals for information access and system reliability are met. In the long-term, the most cost-effective installations of expensive computer servers/hardware may be regional. Each site or IHS Area, however, will have to determine the balance between software performance and reliable telecommunication availability for their specific needs and budget.

VHA Service Support

A Project Agreement has been established between the IHS and VHA to provide a framework and support for the FY 2006 IHS implementation of VistA Imaging. This project agreement indicates ongoing VHA assistance with the implementation of VistA Imaging in Indian health in the following areas:

- Shared use of VHA-developed VistA Imaging training materials;
- Implementation manger support for IHS VistA Imaging installations;
- Support from the VHA VI Project Office specific to FDA requirements and documentation, remote assistance with IHS VistA Imaging installations, and requirements to optimally indicate VistA Imaging into the IHS RPMS/Electronic Health Record environment;
- Enterprise VistA support.