

VIREC Insights is intended to provide VA researchers with a starting point for understanding concepts in data management and basic information about health related databases.

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Veterans Health Information Systems and Technology Architecture (VISTA) as a Research Tool

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The current decentralized Department of Veterans Affairs (VA) clinical databases, collectively known as **VISTA** (Veterans Health Information Systems and Technology Architecture), were introduced in 1982. Since that time, it has evolved into one of the richest health care information systems in the world. In this issue of *VIREC Insights*, we will provide an overview of the potential research uses and limitations of **VISTA**.

Veterans Health Information Systems and Technology Architecture (VISTA)

Previously

Decentralized Hospital Computing Program (DHCP)

Period Covered

Varies from site to site.

Information Sources

- Manuel entry, bar codes, and automated instrumentation.
- Some data are derived from central financial and personnel systems and are distributed to local facilities.

Unique Features

- Includes information on all persons treated at VA Medical Centers (VAMCs).
- Written in Massachusetts General Hospital Utility Multi-Programming System (MUMPS or "M"); also developed using Borland's Delphi.
- Includes a variety of software and integrated data systems at different levels.
- Currently provides the most clinical detail at the patient level of any VA database or information system.
- Most clinical data reside only in the local **VISTA** but may be extracted on special request for research purposes
- Limited set of core data elements are extracted from all VA facilities and nationally available datasets such as the National Patient Care Database (NPCD) and VHA Decision Support System (dSs) at the Austin Automation Center.

Responsible Offices

- National: VHA Office of Information (OI).
- VISN: VISN Chief Information Officer (CIO).
- Local Hospital: Information Resource Management (IRM) Chief.

Overview

VISTA is a rich, automated environment that supports day-to-day operations at local VA health care facilities, with the primary focus on supporting the activities of direct patient care. *VISTA* provides the source data for many other administrative, financial, and workload databases including the National Patient Care Database and its associated SAS®¹ extracts, as well as the Decision Support System (dSs) and its associated SAS® extracts. It is important to note that there are Clinical, Administrative / Financial, and Infrastructure-related data within *VISTA* that may be useful in research but are not available in other systems.

Background

VISTA is built on a client-server architecture, which ties together workstations and personal computers with graphical user interfaces at Veterans Health Administration (VHA) facilities. Augmenting the national *VISTA* software suit many facilities have developed local software to meet unique facility needs. *VISTA* also includes the links that allow commercial off-the-shelf software and products to be used with existing and future technologies (this is predominantly standards-based messaging such as that defined by Health Level Seven (HL7)).

Strengths and Limitations

As a research tool, *VISTA* provides the most comprehensive patient-level clinical data and hospital organization information, such as staffing, specialty units, etc. *VISTA* provides one source of information across the spectrum of care provided at the local facility. There are exporting functions within *VISTA* through use of VA FileMan and the Health Summary. MUMPS code can also be written to extract subsets of data for use on approved platforms. Individual identifiers used in the *VISTA* are compatible with those in other VA health information systems, and compensation and pension information systems.

Limitations of the *VISTA* are primarily due to scope (*ad hoc* queries are challenging because of the size and complexity of the *VISTA* database. *VISTA* has over 1940 files and over 44,960 data fields. *Ad hoc* queries typically access less than 20 data elements), and the detailed steps necessary for extracting the data. Since each local *VISTA* only includes information about services provided at that facility, multi-site studies require data extraction from all facilities involved. Data extraction using VA FileMan or MUMPS from remote locations must be authorized by the local IRM Chief and other local authorities as required to enable download to a central location for multi-site studies.

Researchers should also be aware that some clinical data might be outside the *VISTA* system and therefore not extractable using *VISTA* -based tools. Some examples include radiology imaging data, cardiac catheterization images, and results. Some data that reside in *VISTA* as text, such as radiology, patient history and physical information, or discharge notes, are extractable only as narrative text, and will require subsequent formatting/coding to enable analysis. Also, some data may not be coded consistently across all sites, though this situation is improving. For example, often laboratory tests may be coded differently (single versus panels), and reported in different units (mg/dl versus positive or negative or %). Knowledge about the specific standards used and possible data values is required for the researcher to be able to interpret the data. Finally, researchers need to keep in mind that while the data from the *VISTA* may be useful to address specific research questions, once extracted, the data will require multiple levels of review and reformatting to enable analysis with currently available qualitative or quantitative analysis software.

¹ SAS/STAT and all other SAS Institute, Inc., product or service names are registered trademarks or trademarks of SAS Institute, Inc., in the USA and other countries. ® indicates USA registration.

VISTA Strengths

- Scope and uniformity of clinical and administrative data for each VAMC and their outpatient clinics and services.
- One source for detailed clinical data across the spectrum of care provided at a facility.
- Linkage across software packages facilitated with a unique, enterprise-wide patient identifier (called the Integration Control Number (ICN)).

VISTA Limitations

- Includes only services and information provided at the treating facility.
- Data must be extracted or written out to another media for any analysis.
- For a multi-site study, requires extracting data from multiple local sites.
- Patient data from different VISTA software packages (e.g., pharmacy, lab, radiology) may require separate extracts but can be linked using data management software on another platform.
- Data extraction beyond the needs of VA FileMan or Health Summary requires knowledge of MUMPS.
- Some clinical software is not managed via the VISTA system (e.g., some commercial clinical systems such as cardiac cath lab).
- Some software may be implemented differently at sites as VISTA supports many site parameters supporting local variability.
- Text-based data not easily extracted, especially where the data are incorporated as part of a patient note such as a consult or progress note (e.g., EKG, radiology interpretation, H&P).
- Some clinical data are not included in any VISTA software package (e.g., smoking hx, alcohol use).

Sample Data Elements included in VISTA Databases Not Currently Available in National VA Databases

DATA CATEGORY & ELEMENTS	TYPE OF INFORMATION NEEDED	VISTA SOURCE PACKAGE
Homocystene B-6	RESULT	Lab
Micro / creat ratio	FACT & RESULT	Lab
Potassium Chloride	RESULT	Lab
Blood Pressure	RESULT	Vitals / Measures
Height	FACT & RESULT	Vitals / Measures
Pulse	FACT & RESULT	Vitals / Measures
Weight	FACT & RESULT	Vitals / Measures

Sample Data Elements in VISTA Retrievable as Text Data

DATA CATEGORY & ELEMENTS	TYPE OF INFORMATION	VISTA SOURCE PACKAGE
Cardiac Imaging	RESULT	Medicine - but will be replaced by Clinical Procedures
Pathology Reports	Interpretive diagnostic information	Pathology
Surgery Reports	Interpretive diagnostic information	Surgery

Table of VISTA Software Packages

The following table is taken from VISTA Monographs website, http://www.va.gov/vista_monograph/. There are three types of VISTA packages: the Clinical Package, the Administration / Financial Package, and the Infrastructure Package, as listed below. More information on these packages can be found on the aforementioned VISTA Monographs source or the electronic version of this *VIReC Insights*.

CLINICAL PACKAGE	ADMINISTRATION / FINANCIAL PACKAGE	INFRASTRUCTURE PACKAGE
Admission, Discharge, Transfer (ADT) / Registration	Accounts Receivable (AR)	Duplicate Record Merge: Patient Merge
Computerized Patient Record System (CPRS)	Automated Information Collection System (AICS)	Health Level Seven (HL7)
Dentistry	Automated Medical Information Exchange (AMIE)	Kernel
Dietetics	Automated Safety Incident Surveillance Tracking System (ASISTS)	Kernel ToolKit
Home Based Primary Care (HBPC)	Clinical Monitoring System	List Manager
Immunology Case Registry (ICR) Overview	Current Procedural Terminology (CPT)	MailMan
Intake and Output	Decision Support System (DSS) Extracts	Master Patient Index (MPI)
Laboratory	Diagnostic Related Group (DRG) Grouper	Master Patient Index / Patient Demographics (MPI / PD)
Lexicon Utility	Engineering	Minimal Patient Dataset (MPD)
Medicine	Equal Employment Opportunity (EEO)	National On-Line Information Sharing (NOIS)
Mental Health	Equipment / Turn-In Request	National Patch Module
Nursing	Event Capture	Network Health Exchange (NHE)
Oncology	Fee Basis	Patient Data Exchange (PDX)
Patient Care Encounter (PCE)	Generic Code Sheet	Remote Procedure Call (RPC) Broker
Pharmacy	Hospital Inquiry (HINQ)	Survey Generator
Primary Care Management Module (PCMM)	Incident Reporting	VA FileMan
Prosthetics	Income Verification Match (IVM)	
Quality: Audiology And Speech Analysis And Reporting (QUASAR)	Integrated Funds Distribution, Control Point Activity, Accounting and Procurement (IFCAP)	
Radiology / Nuclear Medicine	Integrated Patient Funds	
Remote Order Entry System (ROES)	Integrated Billing (IB)	
Resident Assessment Instrument Minimum Data Set (RAI / MDS)	Library	
Scheduling	Missing Patient Registry	
Social Work	Occurrence Screen	
Spinal Cord Dysfunction	Patient Representative	
Surgery	Personnel and Accounting Integrated Data (PAID)	
Veteran Identification Card (VIC)	Police and Security	
VISTA Imaging System	Record Tracking	
Visual Impairment Service Team (VIST)	Voluntary Timekeeping	
Vitals / Measurements		
Women's Health		

Data Extraction Methods from *VISTA*

While many data elements reside within the local *VISTA*, there are no analytic functions within the system (it is important to remember that *VISTA* is first and foremost a patient care system). For the most part, data must be exported from *VISTA* to another media to enable research use. MUMPS programming and VA FileMan templates can be used to extract data. A review of these extraction techniques by Beattie and colleagues (1995) is still current for most of the basic functions of the VA FileMan software, although many new software and *VISTA* functions have been added. Highlights about Custom MUMPS Programming and VA FileMan are listed below.

Custom MUMPS Programming

- MUMPS Programmer with IRM programming access.
- IRM approval to extract data for each site.
- Cooperation of package ADPAC / CAC (Automated Data Processing Applications Coordinators / Clinical Applications Coordinators) for each site (e.g., Lab ADPAC for specific lab data and lab menus, profiles, and pointers.
- ASCII files that can be generated can be converted to SAS® to work in conjunction with SAS® Medical Datasets or Pharmacy Benefits Management (PBM), Version 3.0.

VA FileMan

VA FileMan is *VISTA*'s database management system. The majority of VHA clinical data is stored in VA FileMan files and is retrieved and accessed through VA FileMan user interfaces.

Fileman User Features:

- Stand-alone user interface for adding, editing, printing, and searching data.
- Form-based editing (ScreenMan).
- Easy terminal-based editing of word processing database fields (Screen Editor).
- Flexible, extensive report module.
- Scrollable onscreen output of any report (Browser device).
- Data interchange with outside applications such as PC spreadsheets and databases (Import and Export Tools).
- SQL Interface (SQLI) allows access to data (read-only) from PC-based tools supporting SQL (e.g., Microsoft SQL, MS ACCESS), though this method may require use of 3rd party software to facilitate the “bridge” between the PC tool and *VISTA*, such as the KB SQL tool.

For any data extraction methods, review of research requests by local institutional review boards (IRB) is also required, as well as patient consent for some research projects. Researchers are strongly encouraged to discuss their data needs with local IRM, software ADPACs, and IRB office. For multi-site studies, each local facility may have local procedures with which researchers interested in using *VISTA* data must comply.

Highlights of Recent Research Using *VISTA*

Several health services research studies and clinical trials have utilized data from the *VISTA*. An example of a single site study is the work of Goldstein and colleagues (2002). An example of a multi-site observational study is that of Owen, et al. (2002), which focused on prescribing patterns of antipsychotic medications and required *VISTA* data extractions from 13 VA facilities. An example of a multi-site randomized clinical trial that utilized data extractions from nine VA hospitals is that of Wienberger and colleagues (1996 & 1998). This study combined the work of a MUMPS routine for patches with a VA FileMan remote data extraction to a central location. A list of citations compiled from online bibliographic systems and VA-funded research, and provided to us on request by HSR&D researchers is included at the end of this issue for interested readers.

Future VISTA Plans

- **Increased use of standard coding systems.**
- **Longer retention times.**
- **Plans for new data entry (e.g., images, results from clinical procedures such as ECG, etc.).**
- **Improved numeric identifier that serves as an enterprise-wide identifier for patients.**
- **Providers will also be uniquely identified.**
- **Plans for a Health Data Repository (HDR), a clinical repository that will support extracting of data for both corporate reporting and research by 2005.**

VISTA uses standard coding for much of its data, including ICD-9, CPT, DSM-III, LOINC, and other universal and standards-based coding methodologies. VISTA will be continuing to establish more rigorous coding support over the next years to improve the ability of all users to readily analyze VISTA data. All VA sites are required to map local data to these standard coding schemes.

Most data in VISTA is retained according to the data retention requirements of the application area responsible for initial capture of the data; for example, pharmacy data for outpatient prescriptions must be maintained by the Pharmacy to meet JCAHO requirements. VA legal requirements to retain data for 75 years are not imposed on the VISTA system. At this time, most VA sites do retain data online for many years. See the Health Data Repository note below for more detail on future plans for data retention.

The VISTA Imaging application provides the ability for VISTA users to view, from any qualified workstation, images captured via digital means. This includes radiological images, pathology, cine films, ECG, and scanned documents. Many complex medical diagnostic systems (e.g., Pulmonary Function Testing, Gastroenterology, etc.) now provide the means for clinicians to capture images and create complex clinical reports using such commercial products - VISTA Imaging combined with the Clinical Procedures application will be used to transfer the completed reports to VISTA so they can be viewed via CPRS and VISTA Imaging. Clinical Procedures will also establish complex interfaces with these products to capture, where feasible, the discreet data of many studies (e.g., capture of the ejection fraction measured during cardiac catheterization).

VISTA already has enumerated over 8.9 million unique patients across VA. These patients reflect those actively seen for care over the past 5 years. VA will be exploring how best to enumerate the "historical" patients not recently seen so that data related to their health can also be used for analysis.

VHA is evaluating the best method to use to uniquely enumerate its providers (e.g., physicians, nurses, pharmacists, social workers, etc.). Identification of each unique provider serves not only VISTA's needs, but also needs of dSs and billing.

The HDR will provide the support for a full electronic patient medical record. VHA will use a combination of the existing VISTA system and a commercial clinical repository product to record all patient data to create a longitudinal record covering all care received from the VA. In addition, the HDR will provide the means to electronically receive data from other health care entities such as the Department of Defense (DoD), private health care, and any reference facility (such as specialty laboratories). All data in the HDR will be fully encoded. Data warehouse and datamarts will be created using data extracted from the HDR. The VIReC is working closely with the VHA Office of Information to help ensure that the HDR will be able to facilitate medical research. The HDR is currently being built as a prototype to help VHA assess the best method for national implementation. The current projection for the HDR activation is for fiscal year 2005.

Published and Ongoing Research Using VISTA

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Intranet addresses have been removed from this document. Intranet links are available on the Intranet version of this publication. For more information, please go to VIREC's Redaction Information web page: <http://www.virec.research.va.gov/References/Redactions.htm>

Veterans Affairs Information Researchers' Guide To VA Data

VIREC Mission Statement:

To serve as a database and informatics resource and referral center for researchers using VA databases and information systems.

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Veterans Health Information Systems and Technology Architecture (VISTA)

Contact Information

- *VISTA*
http://www.va.gov/vista_monograph
- Health Data Repository - Analysis
[Redacted]

Training Opportunities

- Camp CPRS held annually
- Austin Information Technology Conference (ITC) held annually in August

Websites

- Descriptions of *VISTA* Software Packages
http://www.va.gov/vista_monograph
- Technical Information about *VISTA* Applications (Intranet)
[Redacted]
- HSR&D Current Studies (To conduct a search of ongoing studies using *VISTA*)
<http://www.hsr.d.research.va.gov/research/studies/>