Evolution of HL7 in Veterans Health Administration

Looking to the Future

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Clinical AI Solutions Data Architect (VA National Artificial Intelligence Institute)
Lead Pharmacy Data Migration (electronic Health Record Modernization)
VA Process Asset Library (PAL)
Number of HL7 Protocols (VistA)

<table>
<thead>
<tr>
<th>Transaction Type</th>
<th>Count of HL7 Protocols</th>
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<tr>
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<td>Grand Total</td>
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</table>

Total Number of VA Subscriber Protocols (Transaction Type)
Current VistA Architecture

Applications
- Scheduling
- Pharmacy (Rx)
- Laboratory
- Radiology
- ADT
- 100+ other packages

Kernel/Tools
- Security
- Menu Management
- TaskMan, MailMan
- Package Manager, etc.

FileMan
- set of APIs
- search, inquire, edit, print
- utility functions
- data dictionary utilities
- transfer entries, etc.

“Database”
- M global namespaces
- data dictionary
- hierarchical files
  > Apps., Rx, Lab, Images
  > Common Data
  >100+ other files

ChooseVA

Joint DoD-VA HL7 Service Aware Interoperability Framework (SAIF) Implementation Guide (studylib.net)
Healthcare IT Delivery Models
“After careful consideration of all 437 charts, graphs, and metrics, I’ve decided to throw up my hands, hit the liquor store, and get snorkered. Who’s with me?!”
Private vs. Public vs. Hybrid Cloud

**HYBRID CLOUD**
The combination of Public and Private Cloud whereby specific resources (e.g. compute) are used in a Public Cloud while others (e.g. storage) are used in a Private Cloud.

**PUBLIC CLOUD**
- Publicly shared virtualized resources (multi-tenant)
- Supports multiple customers
- Supports connectivity over the Internet

**PRIVATE CLOUD**
- Privately shared virtualized resources (single-tenant)
- Cluster of dedicated customers
- Connectivity over the internet, fiber and private network
Patient data security at the VA

• Cloud-first strategy - seamless, global, secure, cost effective, and reliable
• FedRAMP-approved, DISA Impact Level 4, TIC2-compliant cloud environments (Azure, Amazon S3)
• VA Enterprise Services Cloud Broker (ESCB) program
• Encryption of data at rest, encryption of data in transit
• De-identified to reduce security risk to patients
Unify Data to Reduce Clinical Burden

- Opioid Safety and Abx Stewardship
- Inpatient Medication Management
- VA Innovations
- Regulatory, Quality & Financial
- PACT Huddle, Workflow & Population Mgmt.
Artificial Intelligence & Machine Learning
National Artificial Intelligence Institute Mission:

What We Aim to Do

The National Artificial Intelligence Institute seeks to establish the Department of Veterans Affairs as the preeminent organization for research, development, and training of Artificial Intelligence with impact on a global scale, ensuring the health and well-being of our Veterans.
AI-to-go Framework

• As VA’s capacity and portfolio of AI R&D increases, there will be a need to create a pipeline for AI research to transfer to validation, user acceptance, and VA-wide implementation. The NAII’s AI-ToGo framework will deliver a key capability of that process. This framework will enable models to be compared against one another for performance, while receiving input from clinicians on the value and impact of the information, prior to a model being transitioned to a pilot. The process includes checklists and Institutional Review Board modules for users, researchers, clinicians, and other practitioners.
VA Artificial Intelligence Strategy

1. Use existing AI to improve outcomes and experiences for our Veterans.
2. Increase VA AI capacity and capabilities.
3. Increase Veteran and Stakeholder trust in AI.
4. Build upon the VA’s existing partnerships across agencies and industry.

The AI Network seeks to build AI R&D capacity across the VA enterprise by establishing virtual centers with different foci of interest. Engagement with external partners, including using the Intergovernmental Personnel Act Mobility Program to bring in AI expertise, will help expand AI R&D capacity to ensure that AI use cases for today and the future are enabled.
Chaos to Efficiency

Population Surveillance: Old vs New

OLD
“Demolition Derby”

NEW
“Autonomous Driving”
## AI Concept to Research to Production Generic Lifecycle

<table>
<thead>
<tr>
<th>Business Understanding</th>
<th>Data Understanding</th>
<th>Data Preparation</th>
<th>Modeling</th>
<th>Evaluation</th>
<th>Deployment</th>
</tr>
</thead>
</table>

To be used as a tailorble general framework, as efforts:

- Could accomplish more than one step at a time
- May have a different number/type of pilots
- May employ live data during proof of concept
- May combine Demonstration and Proof of Concept

**UX Development**

**Proof of Concept**

**Single Site Pilot**

**Multi-Site Pilot**

**Production**

**Extant Data**

**Live Data**

**Feedback**

**Update**
AI-Driven System for Centralized Data and Analytics

1. **Centralization of Data and Analysis**
   Physical co-location of key individuals in a common location and a digital system that provides centralized data as well as predictive and prescriptive analytics

2. **Increased Operational Efficiency**
   Large impact on operational efficiency, bed space management, quality of care, patient experience, clinician satisfaction, transparency, coordination, and staffing

3. **AI-Powered**
   Leveraging AI-driven solutions and systems to enhance outcomes for Veterans
Data Integration & Near-Real Time Data

The Problem

Scalable real time and data warehouse data hybrid data models are not currently available to consumers, preventing the ability to bring cutting edge analytics and AI-ML capability at the point of care.

The Solution

NAII is partnering with all VA, Federal Agencies, Academia and Industry to design and develop proof-of-concept cloud-based data models between VistA, Cerner and VA Summit that can be leveraged for integrating AI and other tools to advance and streamline patient care workflows and operations.
eCART Clinical Deterioration Early Warning Score Pilot

• In a multi-center implementation study, use of eCART AI model was associated with a 36% decrease in mortality for patients with a discharge diagnosis of sepsis. \( N=60,261 \) patients

• eHRM Acute Care council, OEI and VHA sponsored single site project thru Kansas City VA has initiated.

• If Phase 2 DCC is approved, proposal to integrate eCART to NAII Digital Command Center in multicenter clinical trial.

The Impact of a Machine Learning Early Warning Score on Hosp... : Critical Care Medicine (lww.com)
AI Tech Sprint Results: Medication Adherence (CuraPatient)

- Leverages AI/machine vision to compare medication in image in hand versus in health record
- FDA Drug API to National Drug Code data source of medication and adverse events, and compound composition:
- VA Health API to access veterans’ data on medication, demographics, and immunization data sets:
- Census data to improve health equity challenges with social economics, housing, and underserved communities.
- Winner of “Future of Health” in national competition
- Estimated average practitioner’s office could save approximately 4900 hours a year of phone calls.
Appointment No-Show Prediction Model

- Long Beach VAMC, 2013-2022
- 50,000 random appointments
- Model trained on 37,500
- Model tested on 12,500
- Correct no-show predictions
  - Logistic Regression
    - Accuracy: 75.2%
  - Random Forest:
    - Accuracy: 68.0%
- Project is only 1 week old, will optimize model by refining features and working with SME.
Google DeepMind Acute Kidney Injury Prediction
A clinically applicable approach to continuous prediction of future acute kidney injury | Nature

Project Goal
• Prediction of imminent Acute Kidney Injury with sufficient lead time (48 hours) for effective intervention.

Current Project State
• Prior work published by Google Deep Mind based on six years of VA data.
• Prior model and data functional but siloed on standalone server.
• Ready for deployment to the Foundry COP platform for proof-of-concept testing.

Future Development
• Reproduction of original Google DeepMind results with current VA data.
• Conduct evidence-based research with new patient data to prove effectiveness and safety.
• Integrate near real-time data capability with proven AI-ML models at the point of care.
HealthSight Advisor: Indicator Management Dashboard
HealthSight Advisor: Indicator Management Detail View

View Current Alerts | Manage Alert Templates | Manage Custom Alerts

All Active Alerts in Location KC-LINWOOD-PACT PCP07
- Active Alerts ○ Resolved Alerts ○ Intervention Pending

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>Description</th>
<th>Date/Time</th>
<th>Location</th>
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Additional Clinician Burden Reduction Projects with AI

• Reduce “Alert” Fatigue
  • Computer Vision
  • Real Time Patient Centric Threshold Models
  • Improved Preventative Medicine and Operations Models

• Change Data Architecture of existing eHR systems (Kappa / Lake / Mesh / etc)
  • Agile workflow and/or application integration within the eHR
  • Reduce noise while maintaining clinician expertise in dynamic decision making

• Enhance and optimize patient empowerment and involvement in care
  • eScreening and mobile health application (SMART FHIR, etc)
  • Real Time HIE integration and real time surveillance models
How Do I Engage with the VA

Pathfinder
Together we can transform care for Veteran communities

Are you an individual or part of a business, organization, or institution that wants to improve Veteran care?
Pathfinder will demystify selling to and innovating with the Department of Veterans Affairs by giving you the tools you need to understand and navigate the process.

Industry and Entrepreneurs
For-profit businesses with ideas, technology and improvements that meet Veteran needs

VSO, Nonprofit, Community Group
Organizations with shared missions interested in developing an idea, program or initiative that would benefit Veterans and Caregivers

Other Government Agency
Government agencies who would like to engage VA in a shared initiative, or leverage VA innovation tools

Individual
Individuals who would like to engage in and support VA Innovation

See yourself innovating with VA | VA Pathfinder
Conclusion

- We believe that the best innovations are developed by the front line for the front line.

- Support and engagement at all levels of the organization have been critical for mission success.

- Incredible potential to improve the health and well-being of Veterans and the Workforce that care for them.
Thank You!

Email us at naii@va.gov
Website: National Artificial Intelligence Institute (NAII) (va.gov)

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- AI@VA Community on Teams: https://tinyurl.com/VA-AI-Community
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