OFFICE OF
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AND TECHNOLOGY

Electronic Health Record (EHR) Data Interoperability

White Paper

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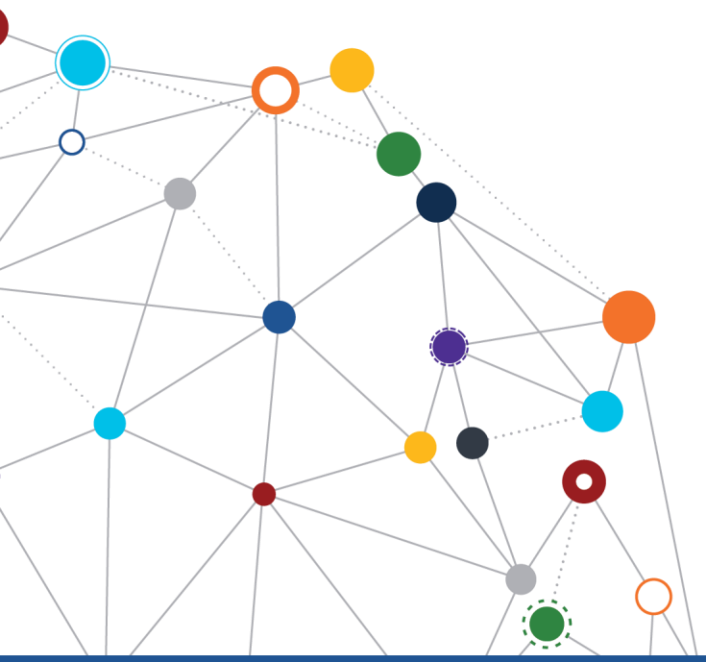

VA | U.S. Department of Veterans Affairs
Office of Information and Technology

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1 Introduction

For healthcare, interoperability describes the extent to which different information technology (IT) systems and applications communicate, exchange data, and *use* the information processed from that data.[1] At the Department of Veterans Affairs (VA), electronic health record (EHR) initiation interoperability is highlighted through Electronic Health Record Modernization (EHRM); it is the transition from a legacy patient data system to one where there is greater coordination to access, exchange, and cooperatively use data with the goal of optimizing the health of Veterans, within and across VA divisions. Simply put, interoperability at VA requires delivering the right data, at the right time, to the right healthcare professional, to provide the quality of care that Veterans expect and deserve.

In the interim, interoperability between the Department of Defense (DoD) and VA will be addressed through common EHRs and the Joint Legacy Viewer (JLV). The JLV is a clinical application that provides an integrated, read-only display of health data from the DoD, VA, and private sector partners in a common data viewer.

Currently, the DoD and the VA Interagency Program Office (IPO) are helping to establish joint DoD and VA EHRM governance bodies to oversee joint decision-making. The governance will improve interagency communication through VA's Cerner EHR Integration Implementation Project. VA's new EHR system will use open application programming interface (API) and fast healthcare interoperability resource (FHIR) standards to enable interoperability with the private sector, which potentially positions VA as a leading force to drive interoperability forward in the healthcare industry.[2]

The Office of Architecture and Engineering Service (AES), within VA's Office of Information and Technology (OIT) Enterprise Program Management Office (EPMO), has developed this high-level white paper to address the initiatives of EHR data interoperability across healthcare modernization efforts at VA. This document describes the benefits and constraints of data interoperability; thought leadership on data interoperability at VA and its impact on healthcare; and plans to enhance customer service and improve product satisfaction for the benefit of our nation's Veterans.

[1] Refer to the Healthcare Information and Management Systems Society at https://www.himss.org/library/interoperability-standards/what-is-interoperability.

[2] VA, Cerner Leaders Detail Progress on EHR Implementation, Interoperability Efforts, https://www.hcinnovationgroup.com/interoperability-hie/article/13030888/va-cerner-leaders-detail-progress-on-ehr-implementation-interoperability-efforts

2 Overview of Data Interoperability in Healthcare

There are several definitions of interoperability; the VA IPO uses the Institute of Electrical and Electronics Engineers (IEEE) definition: *the ability of two or more systems or components to exchange information and to use the information that has been exchanged*. This requires that data conform to technology, content structure, and exchange methods. An interoperable health information technology system (HITS) makes data available to health care providers in a timely manner, across products and organizations, and in a way that they can be effectively used by customers to empower individuals to use electronic health information fully; enable providers and communities to deliver smarter, safer, and more efficient care; and promote innovation at all levels.

Currently, electronic health information is not sufficiently standardized to allow seamless interoperability; it is still inconsistently expressed in terms of vocabulary, structure, and format, thereby limiting the potential uses of the information to improve healthcare. We can learn from the important lessons and local successes of previous and current health information exchange (HIE) infrastructures to improve interoperability, supporting the nationwide exchange and use of health information across the public and private sectors.

Levels of Health IT Interoperability

Health information systems must work together uniformly to advance the effective delivery of care for patients and communities. There are four interoperability components and three levels of health IT interoperability. [3]

The four levels of interoperability components include:

- **Vocabulary/Code Sets/Terminology**: Context-specific terminologies, such as LOINC, SNOMED, and ICD-10. Non-domain specific vocabulary, such as state codes, gender codes, and religion codes, exist as well.
- **Content/Structure** (i.e., "syntax"): Standards that include the message formats, such as HL7 messages and documents. They specify the data to transmit and its format.
- **Transport**: Vendor-neutral interoperability techniques and protocols for exchanging secure information between health system participants.
- **Privacy and Security**: Mechanisms to ensure a secure network infrastructure is widely available and privacy and identity management is protected.

[3] DoD/VA IPO Healthcare Information Interoperability Technical Package at https://vaww.vashare.oit.va.gov/sites/OneVaEa/comm/Implementation%20Support/White%20Paper%20Resources/DoDVA%20IPO%20Healthcare%20Information%20Interoperability%20Technical%20Package.pdf

The three levels of health IT interoperability[4] include:

- **Process Interoperability** - People (assisted by computers) must be able to make use of shared information in their local workflows and processes for providing and receiving care and benefits.
- **Semantic Interoperability** – Information exchanged between systems must have shared meaning for people (assisted by computers) to use it for making care and benefits decisions.
- **Technical Interoperability** – Information must be reliably exchanged between multiple systems so people in different places and organizations can see it, use it, and add to it.

Industry Standards

Adopting industry standards helps achieve interoperability objectives. Health Level Seven International (HL7) is a non-profit organization that was founded in 1987 to develop international healthcare standards, formats, and definitions (informatics) for exchanging and developing EHRs. The HL7 membership represents over 50 countries and over 500 corporate members, including healthcare providers, government stakeholders, vendors, and suppliers; HL7 standards are the default standards in IT healthcare.

Another standard describes data formats and elements, known as "resources." The Fast Healthcare Interoperability Resources (FHIR) is an application programming interface (API) for exchanging EHRs. The standard is built on a base set of resources to satisfy the most common use cases, the sets of possible sequences of interactions between systems and users in an environment. FHIR resources aim to define the information contents and structure for the core information set that is shared by most implementations. Creating stronger legal interoperability standards for the healthcare IT industry will help VA realize its interoperability benefits.

3 Usage at VA

VA became recognized as the pioneer of EHR in the early 1980s with the development of the Veterans Health Information Systems and Technology Architecture (VistA), VA's legacy system. Now, almost forty years later, innovation and development make VistA too costly to maintain and lacking in the interoperability that is necessary to provide the best care possible to Veterans.

[4] Refer to the Health Language Blog, *Understand the Three Levels of Interoperability,* posted on November 12, 2014, at http://blog.healthlanguage.com/understand-the-three-levels-of-interoperability.

The VDIF

Therefore, VA has implemented a Veteran Data Integration and Interoperability Federation/Framework (VDIF) that includes data exchange schemas, business process management, master data management, interoperability standards, and authoritative data sources (ADSs). VA has defined the VDIF architecture as providing secure, high performance, governed access to joint EHR (JEHR) data and VistA legacy data, allowing multiple instances and the entire enterprise access to federated data. Federated data allows interoperability and information sharing between organizations, with the ability to aggregate data from disparate sources in a virtual database so it can be used for business intelligence (BI) or other analysis. VDIF will support the integration of VistA data and JEHR data with commercial off-the-shelf (COTS) and non-COTS products.[5]

Data exchange schemas and standards are components that permit data to be shared across clinicians, labs, hospitals, pharmacies, and patients, regardless of the application or application vendor. The establishment of this framework improves VA's ability to exchange data internally, and externally with business partners, fostering innovation in an agile manner.

The list of key drivers for EHR interoperability includes the:

- *Veterans Access, Choice, and Accountability Act of 2014,*[6] requiring hospital care and medical services to be furnished to Veterans through agreements with external facilities under certain conditions; and provides for easier access to electronic health information.
- *Delivering Government Solutions in the 21st Century: Reform Plan and Reorganization Recommendations,*[7] a document that describes a plan for the reorganization of the Executive Branch, including transitioning VA to a new EHR system that allows for interoperability between the DoD, VA, and other community providers.
- *National Defense Authorization Act (NDAA) for Fiscal Year 2014,*[8] providing authorization of appropriations, specifying the budget and expenditures of the DoD; and includes charging the IPO to promote interoperability by working with the Office of the National Coordinator (ONC) for Health Information Technology (HIT). (See below).

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[5] Refer to the Request for Information (RFI) for the VDIF Enterprise Platform Sustainment and Application Integration, December 14, 2018, at https://www.fedhealthit.com/2018/12/rfi-veterans-data-integration-and-federation-vdif-enterprise-platform-sustainment-and-application-integration/.

[6] Refer to the Veterans Access, Choice, and Accountability Act of 2014, Title I: *Choice Program and Health Care Collaboration*, Fact Sheet, Office of Public Affairs Media Relations, at https://www.va.gov/opa/choiceact/documents/Choice-Program-Fact-Sheet-Final.pdf.

[7] Refer to *Delivering Government Solutions in the 21st Century, Reform Plan and Reorganization Recommendations*, Executive Office of the President of the United States, *at https://www.performance.gov/GovReform/Reform-and-Reorg-Plan-Final.pdf.*

[8] Refer to the National Defense Authorization Act for Fiscal Year 2014, Public Law 113–66—DEC. 26, 2013*, at https://www.congress.gov/113/plaws/publ66/PLAW-113publ66.pdf.*

- *Health Information Technology for Economic and Clinical Health Act (HITECH) of 2009,*[9] promoting the adoption and meaningful use of health IT.
- *Joint Executive Committee (JEC) Joint Strategic Plan (JSP*),[10] which includes the JEC, made up of representatives of the DoD and VA to oversee development and implementation of the JSP, including health and benefits executive councils. The JEC identifies opportunities to enhance mutually beneficial services and resources; and submits the Annual Report to Secretaries and Congress.
- *Health and Human Services (HHS), Office of the National Coordinator (ONC) for Health Information Technology (HIT) interoperability initiatives,*[11] responsible for advancing connectivity and interoperability of health IT, providing access to individuals and health care providers.

In 2018, the IPO released three foundational technical guidance documents:

- DoD/VA Joint Interoperability Strategic Plan (JISP)
- Health Information Interoperability Technical Package (I2TP)
- Health Data Interoperability Management Plan (HDIMP)

The JISP focuses on VA's emerging modernization strategies. The plan identifies agreed-upon interoperability use cases, as well as a technical vision, near-term deliverables, and a long-term overview of the DoD and VA EHRM plans.

The I2TP classifies the domain and messaging standards that the Departments will put into action to boost interoperability. The package also delivers a list of the required standards to facilitate uniformity in vocabulary and terminology.

Finally, the HDIMP addresses the IPO's organization and role to support health data exchange and terminology standardization and DoD and VA's interoperability management efforts.

4 VA's Future State

In the 21st Century Cures Act (Cures Act), Congress identified the importance of interoperability and set out a path for the interoperable exchange of electronic health information. Specifically,

[9] For more information on the HITECH of 2009, refer to https://www.hhs.gov/hipaa/for-professionals/special-topics/hitech-act-enforcement-interim-final-rule/index.html.
[10] For more information on the JEC, refer to https://prhome.defense.gov/Portals/52/Documents/RFM/Readiness/DoDVA%20Docs/JEC%20101.pdf?ver=2018-08-07-093609-690
[11] Refer to the official website of The Office of the ONC at https://www.healthit.gov/topic/interoperability.

Congress directed the ONC to "develop or support a trusted exchange framework, including a common agreement among health information networks nationally."[12]

EHR Interoperability for VA is characterized by the following initiatives:

- An easy and routine use of data from community providers and patient-centric workflows that span institutions
- A migration to shared industry interoperability platforms and services
- A "universal" health language
- A standardized and sharable health mobile technology and applications to enable unified care coordination and seamless Veteran experience
- A fully established environment for consumption and reuse of APIs across the IT infrastructure to significantly reduce development efforts and costs

VA's approach to the future state is predicated upon leveraging the VDIF. The core of the VDIF is the HealthShare Enterprise Platform (HSEP). The system enables interoperability and will allow VA to transition from legacy systems to a single integrated platform.

HSEP will support implementation of a longitudinal patient record and improve patient health record interoperability with DoD, external partners, and community care providers. The HSEP will provide the ability to federate patient record data at a national level. The HSEP enables interoperability by transforming existing data to standard formats, such as:

- Fast Healthcare Interoperability Resources (FHIR)
- Health Level Seven (HL7) messaging
- Clinical Document Architecture (CDA) documents
- HealthShare Standard Document Architecture (SDA)

5 Thought Leadership

The DoD/VA IPO's mission is to lead and coordinate the adoption of and contribution to national health data standards to ensure interoperability among DoD, VA, and private sector healthcare worldwide. This office jointly oversees and monitors the efforts of DoD and VA to implement national health data standards for interoperability and acts as the single point of accountability for identifying, monitoring, and approving clinical and technical data standards and profiles.[13] The DoD/VA IPO ensures seamless integration of health data between the two

[12] Refer to Section 3001 (c) of the Public Health Service Act (42 U.S.C. 300 jj-11 amendment (9), *Support for Interoperable Network Exchange*, at https://www.congress.gov/bill/114th-congress/house-bill/34/text?q=%7B%22search%22%3A%5B%2221st+century+cures%22%5D%7D&r=1.
[13] Refer to a presentation of the ONC, DoD/VA Interagency Program Office,
Achieving Seamless Care Through Health Data Interoperability,
Lauren C. Thompson, PhD, Director, DoD/VA IPO, and

departments and private clinicians. This office closely collaborates with the ONC Standards Development Organization (SDO) and other public and private partners to support national interoperability efforts.

Dr. Helga Rippen, a clinician and deputy director of the DoD/VA IPO, states that it is vital to understand the information we are sharing in healthcare. To receive the most value from information, we need to understand the meaning of the data element, the context in which it was collected, and the way it is useful (i.e., supports a process). She stresses the importance of understanding the data infrastructure (how data is collected and shared) and the context of the data, as critical to improving healthcare systems.

One of the major roles of the DoD/VA IPO is to work closely with the DoD and VA to identify, develop, prioritize, and implement standards to meet their needs in a timely manner. The gaps in standards can be helped by the ability to quickly identify a need for seamless data exchange (e.g., community care) and reach out to standards development organizations to align the approach to benefit others. However, there are challenges, including the timeframe from when a standards gap is identified to when the standard is developed and approved. These are significant considerations to improving interoperability.

Dr. Rippen believes that one of the biggest challenges with health interoperability is that gaps exist in data models and data standards. These gaps are acutely felt when there is a need to migrate data between different systems and when there are challenges associated with data normalization.

6 Benefits

Technology is increasing at a rapid rate and is changing the way we think, organize, and operate in the healthcare environment. New software applications, cloud-storage solutions, and technology systems are changing the way hospitals manage patient care and store medical records, while legacy systems place patient information at risk.

The benefits of interoperability[14] include:

- Increased information sharing
- Integrated planning and enhanced government service delivery
- Reduced costs of information collection and management

Ms. Yvonne Cole, Co-Lead, Interagency Coordination Division, DoD/VA IPO at https://www.healthit.gov/sites/default/files/2019-01/DoDVAIPOUpdate.pdf.

[14] Refer to *Information Sharing Environment (ISE) Information Interoperability Framework (I2F),* Office of the Program Manager, Information Sharing Environment (PM-ISE) at https://www.dni.gov/files/ISE/documents/DocumentLibrary/FINAL---ISE_I2F_v0-5.pdf.

- Improved decision making
- Improved timelines, consistency, and quality of government responses
- Improved accountability and transparency of information for citizens
- Reusable, collaborative methods
- Improved security
- Improved readiness of partners to exchange and share information

It is certain that interoperability is a must for the healthcare sector. What was once mountains of printed materials for health records and patient information is now terabytes of data. The constant challenge for healthcare today is managing, sharing, and synthesizing this in a way that provides the best possible care for patients, while protecting their privacy.

7 Challenges to Healthcare Interoperability

Improved healthcare interoperability is a top priority for healthcare providers, policymakers, and patients in 2019. Many years of healthcare interoperability initiatives, health data exchange frameworks, and health IT standards have produced considerable advancements in dispersing efficient information exchange. However, there are still challenges that prevent stakeholders from accomplishing true interoperability for the delivery of optimal care and improved patient health outcomes.

The following are five of the top challenges for interoperability:

1. **Developing a standardized way of identifying patients**: Assigning a unique patient identifier to every patient in the nation is one way to guarantee hospitals can exchange medical data and patient health records accurately and proficiently. Mismatched patient EHRs can lead to errors in patient care and increase the likelihood of patient harm.
2. **Enforcing health IT interoperability standards across care settings and facilities:** Even though stakeholders agree on the significance of health IT standardization, healthcare enterprises often read and enforce these standards differently. Lack of interoperability standards or poorly enforced standards can hinder seamless health data exchange by complicating transactions and threatening the flow of information. The expansion of healthcare organization-led coalitions that are designed to enable exchange and promote standardization could provide support in overcoming the lack of standardization between care settings.
3. **Enforcing industry-wide interoperability measurement standards**: New interoperability improvement efforts frequently emerge across industries. Federal agencies need a method to measure the development of the state of IT interoperability in the healthcare industry in a consistent way. Refining measurement standards will assist in tracking growth on a national scale. By encouraging consistent standards for measurement

nationwide, ONC can prevent health IT developers, healthcare organizations, and health information exchanges (HIEs) from applying standards differently.

4. **Coordinating stakeholders across the industry:** One of the primary objectives of the ONC roadmap was to coordinate stakeholders to develop dependable policies across the industry and discuss policies blocking interoperability.
5. **Ending information blocking and data sharing impediments:** Information blocking generally occurs when a healthcare provider, IT developer, or EHR vendor knowingly and unreasonably interfere with the exchange and use of electronic health information. Regardless of whether Congress deems information exchange a right protected by the Health Insurance Portability and Accountability Act (HIPAA) of 1996, information blocking is still a prevalent problem in health data exchange. Examples of information blocking include issuing fees that make data exchange cost prohibitive, organizational policies or contract terms that prevent sharing information with patients or health care providers and using technology that is designed or implemented in non-standard ways that inhibit the exchange of information. Impeding the exchange of electronic health information to protect patient safety or privacy does not constitute information blocking.

Developing a national patient identifier, improving standardization and collaboration across the industry, and ending information blocking are all remaining hurdles standing in the way of true interoperability. With initiatives to overcome these challenges already gaining visibility, interoperability advancements will likely continue, despite these obstacles.

8 Conclusion

Configuring two systems between two of the largest Federal agencies, DoD and VA, takes time and patience; transitioning into a single EHR system between DoD and VA will take approximately five to ten years to complete. Tension between the EHR vendor community and the Government is often observed when implementing interoperability. The ONC sees the private sector to be potentially "information blocking." However, the joint statement between the two legacies represents concrete evidence of commitment to transform delivering Veteran-focused, provider-friendly care. The new EHR system will highlight the full picture of a patient's medical history to clinicians, driving positive clinical outcomes.

The contemporary healthcare environment is clearly a dynamic one as it meets the challenges and opportunities associated with combining enduring patterns of practice with evolving technology. The business of VA is not EHR development; rather, it is to "serve and honor the men and women who are America's Veterans." Now that VA is implementing a new EHR as a tool to be used to meet its mission, it is important for data to be interoperable to help facilitate the best care for Veterans; and to help DoD to optimize the care of Servicemembers as they transition to Veteran status.

Appendix A. Acronyms

The following table provides a list of acronyms that are applicable to and used within this document.

Acronyms	Description
ADS	Authoritative Data Sources
AES	Architecture and Engineering Service
API	Application Programming Interface
BI	Business Intelligence
CDA	Clinical Document Architecture
COTS	Commercial off-the-shelf
DoD	Department of Defense
EHR	Electronic Health Record
EHRM	Electronic Health Record Modernization
EPMO	Enterprise Program Management Office
FHIR	Fast Healthcare Interoperability Resources
HDIMP	Health Data Interoperability Management Plan
HHS	Health and Human Services
HIE	Health Information Exchanges
HIPAA	Health Insurance Portability and Accountability Act
HITECH	Health Information Technology for Economic and Clinical Health Act
HIT	Health Information Technology
HITS	Health IT System
HL7	Health Level Seven International
HSEP	HealthShare Enterprise Platform
I2TP	Health Information Interoperability Technical Package
IPO	VA Interagency Program Office
IT	Information Technology
JEC	Joint Executive Committee
JEHR	Joint Electronic Health Record
JISP	Joint Interoperability Strategic Plan
JSP	Joint Strategic Plan
NDAA	National Defense Authorization Act
OIT	Office of Information and Technology
ONC	Office of the National Coordinator for Health IT
SDA	HealthShare Standard Document Architecture
SDO	Standard Development Organization
VA	Department of Veterans Affairs
VDIF	Veteran Data Integration and Interoperability Federation/Framework
VistA	Veterans Health Information Systems and Technology Architecture

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