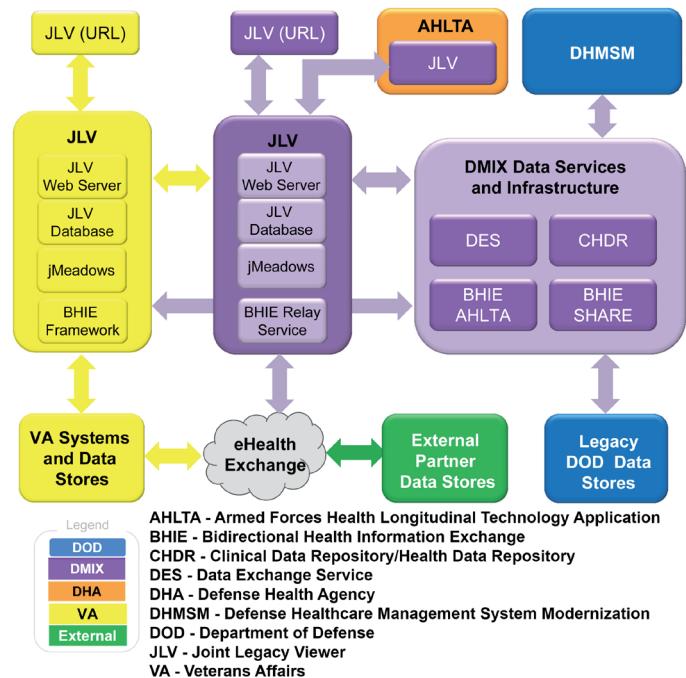


Defense Medical Information Exchange (DMIX)

Executive Summary

- In December 2014, USD(AT&L) separated the Defense Medical Information System (DMIX) into two components: Interoperability and Viewer. USD(AT&L) declared the Interoperability component to be under sustainment and designated the Viewer component as a tailored Automated Information System Acquisition Category III program.
- The United States Army Medical Department Board (USAMEDDBD) and the Army Test and Evaluation Command (ATEC) performed an operational assessment of DMIX Release 2 from April 20, 2015, through May 1, 2015, to support a Milestone C decision for the Viewer component of the DMIX program. The USAMEDDBD conducted an operational assessment of DMIX Release 2 because the DMIX program manager will implement the Virtual Lifetime Electronic Record (VLER), a major capability of the system, in DMIX Release 3. The USAMEDDBD plans to conduct a Multi-Service Operational Test and Evaluation (MOT&E) of DMIX Release 3 with the VLER capability and operational commercial health care partners.
 - Based on the operational assessment, DOT&E determined that the system was operationally suitable, but not operationally effective because of high-severity defects that included (1) inconsistent query results for which the system did not always display all records available in a date range, (2) medical record notes not displaying due to the format of the original note, and (3) inconsistencies in data displays and navigation buttons between different display schemes within the DMIX viewer.
 - Although the high-severity defects affected data completeness, all data displayed in the Joint Legacy Viewer (JLV) were accurate and patient records downloaded in a timely manner.
- The Program Management Office (PMO) took immediate steps to correct these problems. The PMO scheduled a Verification of Correction of Deficiencies (VCD) in December 2015 to verify DMIX Release 2 fixes.
- After the deployment of Release 3 in September, users discovered two new system defects and an external system data accessibility problem. The DMIX program manager stated that she has developed a plan to resolve the DMIX Release 3 system defects and data accessibility problem.
- Space and Naval Warfare Systems Command (SPAWAR) conducted a cybersecurity Cooperative Vulnerability and Penetration Assessment (CVPA) of DMIX Release 2 in the developmental test environment that concluded in June 2015. The CVPA identified vulnerabilities that could result in the loss of confidentiality, integrity, or availability of personal health information and personally identifiable information.
- SPAWAR conducted a cybersecurity CVPA of Integrated Electronic Health Record (iEHR) Increment 1 from



October 27, 2014, through December 10, 2014, and an adversarial assessment from January 12 – 16, 2015. The CVPA of iEHR Increment 1 identified vulnerabilities that could compromise medical information if not quickly and adequately addressed.

System

- The DMIX program supports integrated sharing of standardized health data among DOD's Defense Healthcare Management System Modernization program, DOD legacy systems, Veterans' Affairs (VA), other Federal agencies, and private-sector healthcare providers.
- Together, the Defense Healthcare Management System Modernization and DMIX are intended to modernize the Military Health System to enhance sustainability, flexibility, and interoperability for improved continuity of care.
- The DOD is developing DMIX incrementally, delivering upgrades to capabilities that have already been fielded:
 - JLV provides an integrated read-only, chronological view of health data from DOD and VA Electronic Health Record (EHR) systems, eliminating the need for VA or DOD clinicians to access separate viewers to obtain real-time patient information. DOD and VA users logon to their respective JLV Web Servers using a Uniform Resource Locator (URL) address in their web browser. Armed Forces Health Longitudinal Technology Application users can connect to the JLV Web Server through their system menu.

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- The Data Exchange Service (DES) receives user queries entered through JLV and queries hundreds of DOD and VA data stores, returning the results to jMeadows. jMeadows maps local VA and DOD clinical terms to standard medical terminology and aggregates the data for presentation by the JLV Web Server.
- The Bidirectional Health Information Exchange (BHIE) enables the VA to access clinical data from multiple DOD and VA systems using the Data Exchange Service, BHIE Share, and Clinical Data Repository/Health Data Repository. The Clinical Data Repository/Health Data Repository enables bidirectional exchange of outpatient pharmacy and medication allergy data for checking drug-to-drug and drug-to-allergy interactions.
- The VLER capability provides views of a patient's medical history and outpatient clinical visits within DOD medical facilities. The VLER provides the ability to both retrieve and share medical documentation with external partners, such as the VA and other Federal or commercial health care partners. The DOD and external partners pass VLER data through the eHealth Exchange service. The DMIX program manager implemented VLER viewer functionality into JLV, replacing the legacy VLER viewer.
- iEHR, not shown in the system diagram, is a program deployed to a single site, the James A. Lovell Federal Healthcare Center in North Chicago, Illinois, where it is now in sustainment. iEHR provides single sign-on and

context management capabilities to enable a user to logon to all published applications via a Common Access Card. It allows users to enter a patient once and the same patient will automatically populate in other applications. iEHR also provides a roaming capability to allow users to access their information from multiple devices.

Mission

The DOD, VA, Federal agencies, and private-sector health providers will use the DMIX infrastructure and services to:

- Share standardized health data using standard terminology
- Securely and reliably exchange standardized electronic health data with all partners
- Access a patient's medical history from a single platform, eliminating the need to access separate systems to obtain patient information
- Maintain continuity of care
- Exchange outpatient pharmacy and medication allergy data and check for drug-to-drug and drug-to-allergy interaction

Major Contractors

- Data Federation/JLV: Hawaii Resource Group – Honolulu, Hawaii
- Test Support: Deloitte – Falls Church, Virginia
- Program Manager support: Technatome – Fairfax, Virginia

Activity

- During FY15, the USAMEDDBD and ATEC conducted operational tests of DMIX Release 2 and iEHR Increment 1 in separate events. The USAMEDDBD conducted an operational assessment of DMIX Release 2 because the DMIX program manager will implement VLER, a major capability of the system, in DMIX Release 3. USAMEDDBD plans to conduct an MOT&E of DMIX Release 3 with the VLER capability and operational commercial health care partners.

DMIX Release 2

- From April 20, 2015, through May 1, 2015, the USAMEDDBD and ATEC conducted an operational assessment of DMIX Release 2 in accordance with a DOT&E-approved test plan to support a Milestone C decision for the JLV Viewer component of the DMIX program.
- SPAWAR conducted a cybersecurity CVPA of the system in the developmental test environment. The assessment concluded in June 2015.
- The PMO coordinated with USAMEDDBD and the San Antonio Military Medical Center to schedule a VCD of DMIX in December 2015 to verify corrective actions for Release 2 high-severity defects.

DMIX Release 3

- After successful developmental testing, the Program Executive Office DHMS deployed DMIX Release 3 on September 18, 2015, to implement fixes to system defects discovered during DMIX Release 2 operational testing and to prepare for the Release 3 MOT&E.
- Following deployment, users discovered two problems associated with theater inpatient data and progress notes not displaying properly in JLV. Users also identified an Essentris site that had made local changes, which prevented the site's users from accessing patient data from DMIX. The DMIX program manager stated that she has developed a plan to resolve the DMIX Release 3 system defects and data accessibility problem.

iEHR Increment 1

- SPAWAR conducted a cybersecurity CVPA of iEHR Increment 1 from October 27, 2014, through December 10, 2014, and an Adversarial Assessment from January 12 – 16, 2015.

Terminology Mapping

- Both the DOD and VA had planned to provide health data mapped to a medical terminology standard through the JLV to help users read and analyze patient data more

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- easily. There are 20 Clinical Domains, which have national standards for terms within the domain. In December 2013, the DOD and VA delivered terminology maps for seven Clinical Domains to support DMIX Release 0. In 2014, the DMIX program manager implemented terminology maps for 14 Clinical Domains; in FY15, completed delivery of the remaining Clinical Domain maps and provided maintenance of active terms for another 11 Clinical Domains. The VA implemented terminology maps for one additional domain in December 2014.
- DOT&E is working with the DMIX PMO, the Interagency Program Office, and the operational test community to develop an operational test methodology to determine the accuracy and completeness of Clinical Domain terminology maps.

Assessment

DMIX Release 2

- DMIX Release 2 was not operationally effective because of high-severity defects that included (1) inconsistent query results for which the system did not always display all records available in a date range, (2) medical record notes not displaying due to the format of the original note, and (3) inconsistencies in data displays and navigation buttons between different schemes within the DMIX viewer. DOT&E sent a memorandum to the Program Executive Office DHMS on May 8, 2015, which detailed the Severity 1 defect causing inconsistent query results in a date range. Although the high-severity defects affected data completeness, all data displayed in JLV were accurate and user queries of patient records were timely. The Program Office took immediate steps to correct the problems and operational testers plan to verify the fixes in December 2015. The VCD results will be included in the 2016 Annual Report.
- The PMO improved DMIX developmental testing to evaluate the system's response to invalid inputs. DOT&E recommended such testing to discover failure modes caused by non-typical use cases, such as those observed in DMIX Release 2 operational testing, earlier in the test cycle.

- DMIX Release 2 is operationally suitable. Users liked the functionality and indicated that it improved their business processes. Additionally, users rated the system highly for usability and liked the data display, record selection and customization capabilities, and supporting documentation.
- The cybersecurity assessment identified significant vulnerabilities that could result in the loss of confidentiality, integrity, or availability of personal health information and personally identifiable information.

DMIX Release 3

- The DOD and VA deployed DMIX Release 3 in September 2015 to all JLV users. The user base has significantly expanded from 3,000 users earlier this year to an estimated 17,000 users. Program risk, and potential risk to patient safety, increased following the deployment of Release 3 when users discovered problems with theater inpatient data, progress notes not displaying properly, and with local data access.
- The DMIX program manager has scheduled an MOT&E of DMIX Release 3 in March 2016, creating a gap of six months between deployment and operational testing. The long gap between deployment and operational testing further increases the risk of DMIX users experiencing system problems prior to the MOT&E.

iEHR Increment 1

- The cybersecurity assessment of iEHR Increment 1 identified vulnerabilities that could compromise medical information if not quickly and adequately addressed.

Recommendations

- Status of Previous Recommendations. The DOD and DMIX PMO have addressed the FY14 recommendations; however, the VA was not able to accelerate clinical terminology mapping efforts. The VA implemented terminology maps for one additional domain in December 2014.
- FY15 Recommendation.
 1. The DMIX PMO should conduct further cybersecurity testing on the operational DMIX system to verify fixes and mitigations of the vulnerabilities found during testing of DMIX Release 2.

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