

Defensive Medical Information Exchange (DMIX)

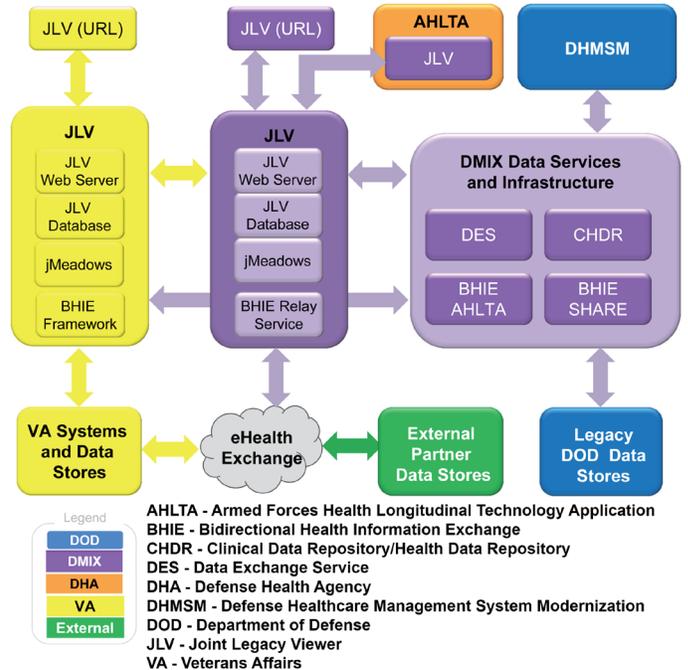
Executive Summary

Defense Medical Information Exchange Program

- The Program Executive Officer Defense Healthcare Management Systems (PEO DHMS) moved the Defense Medical Information Exchange (DMIX) program under the DOD Healthcare Management System Modernization (DHMSM) program in August 2016.
- PEO DHMS released a DMIX Full Deployment Decision Acquisition Decision Memorandum on October 12, 2016, officially transitioning DMIX into sustainment.

Defense Medical Information Exchange Release 3

- The U.S. Army Medical Department Board (USAMEDDBD) and Air Force Medical Information Systems Test Bed (AFMISTB) conducted the DMIX Release 3 (R3) Multi-Service Operational Test and Evaluation (MOT&E) at the Air Force Academy, Colorado Springs, Colorado; Fort Carson, Colorado Springs, Colorado; Joint Base Elmendorf-Richardson (JBER), Anchorage, Alaska; and Fort Drum, Watertown, New York, in April and May 2016. The DMIX R3 MOT&E was adequate to evaluate operational effectiveness and suitability. DOT&E did not assess survivability.
- DMIX R3 is operationally effective for queries of DOD and Department of Veterans Affairs (VA) data, but not for external healthcare partner data. Users were able to open all notes with the exception of two Community Health Summary (CHS) notes at JBER. All test patient data evaluated were accurate and timely. All DMIX R3 critical external interfaces met accuracy and timeliness threshold values. The majority of effectiveness failures that DOT&E observed during the test were attributable to two problems:
 - External partner data did not populate in the Immunizations widget.
 - The CHS widget did not consistently open for JBER users, preventing them from viewing external partner data.
- DMIX R3 is operationally suitable. Users rated DMIX R3 usability highly on the System Usability Scale (SUS) and indicated that the response time is adequate. Overall, DMIX R3 availability satisfied the threshold, with DMIX-owned components having higher availability than the required interfacing systems. Overall, 40 percent of the users felt they needed more training on the system.
- DOT&E did not assess DMIX R3 survivability. The cybersecurity Adversarial Assessment (AA) for DMIX R3 was delayed because of test limitations imposed by Defense Information Systems Agency (DISA) Defense Enterprise Computing Center (DECC) Montgomery that did not allow for an adequate test. Cyber testers are planning to conduct a Cooperative Vulnerability and Penetration Assessment (CVPA) and AA on DMIX Release 5 in 1Q – 2QFY17.



- The DOD offered to include VA DMIX components and interfacing VA systems in the full-scope cybersecurity testing planned for DMIX R3, but the VA declined to participate. Instead, the VA requested that the Department of Homeland Security (DHS) National Cybersecurity Assessment and Technical Services team conduct a limited-scope Risk and Vulnerability Assessment in April 2016. The scope of this assessment was not adequate to evaluate the full DMIX program, and did not include an AA, which is a critical part of DOT&E assessments of DOD systems. The DHS identified two critical vulnerabilities that could result in the loss of confidentiality, integrity, or availability of personal health information and personally identifiable information.

Defense Medical Information Exchange Releases 4 and 5

- The DMIX Program Manager developed and developmentally tested DMIX Releases 4 and 5 in 2016. PEO DHMS fielded DMIX Release 4 in July 2016 and DMIX Release 5 in October 2016.
- DOT&E agreed to allow PEO DHMS to include DMIX operational testing within the scope of the DHMSM IOT&E.

Terminology Mapping

- In late FY15 and FY16, the VA independently tested VA and DOD terminology maps to compare cross-organizational mapping and to inform efforts towards computable interoperability. The VA evaluated maps developed separately by the DOD and VA in five

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clinical domains. The testing evaluated the terminology within each map as well as the correlation between the two organizations' maps. The VA had not finalized results from this test in time to be included in this report.

System

- The DMIX program supports integrated sharing of standardized health data among DHMSM, DOD legacy systems, VA, other Federal agencies, and private-sector healthcare providers.
- Together, DHMSM 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 already fielded capabilities:
 - The Joint Legacy Viewer (JLV) provides an integrated, read-only, chronological view of health data from DOD and VA electronic health record 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 URL address in their web browser. Users of the Armed Forces Health Longitudinal Technology Application can connect to the JLV web server through the system menu.
 - The Data Exchange Service (DES) receives user queries entered through JLV and queries DOD, VA, and external partner 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 DES, 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.

Mission

The DOD, VA, Federal agencies, and private-sector health providers 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: Technatomy – Fairfax, Virginia

Activity

Defense Medical Information Exchange Program

- PEO DHMS moved the DMIX program under the DHMSM program in August 2016.
- PEO DHMS released a DMIX Full Deployment Decision Acquisition Decision Memorandum on October 12, 2016, officially transitioning DMIX into sustainment.

Defense Medical Information Exchange Release 3

- USAMEDDBD and AFMISTB conducted a DMIX R3 MOT&E in accordance with the DOT&E-approved test plan at the Air Force Academy, Colorado Springs, Colorado; Fort Carson, Colorado Springs, Colorado; Joint Base Elmendorf-Richardson, Anchorage, Alaska; and Fort Drum, Watertown, New York, in April and May 2016.
- The DHS conducted a Risk and Vulnerability Assessment of DMIX R3 components on VA networks in April 2016.

Defense Medical Information Exchange Release 4

- The DMIX Program Manager conducted developmental testing of DMIX Release 4 at Allegany Ballistics

Laboratory, Rocket Center, West Virginia, from April 25 through June 24, 2016.

- The PEO DHMS conducted the DMIX Fielding Decision Review on July 14, 2016, and subsequently fielded DMIX Release 4.

Defense Medical Information Exchange Release 5

- The DMIX Program Manager conducted developmental testing of DMIX Release 5 at Allegany Ballistics Laboratory, Rocket Center, West Virginia, from August 19 through September 30, 2016.
- The PEO DHMS conducted the DMIX Fielding Decision Review on October 14, 2016, and subsequently fielded DMIX Release 5.

Terminology Mapping

- In late FY15 and FY16, the VA independently tested VA and DOD terminology maps in five clinical domains to compare cross-organizational mapping and to inform efforts towards computable interoperability.

Assessment

- DMIX R3 is operationally effective for queries of DOD and VA data, but not for external healthcare partner data. All test patient records displayed in JLV were accurate as compared to the source data. Test patient data displayed in JLV were complete in 97 percent of the queries. Failures resulting from external healthcare partner data not displaying in the Immunizations widget accounted for 16 of the 20 completeness failures. Users opened all widgets successfully 92 percent of the time. The majority of failures to open all widgets (57 of 64) were failures to open the CHS widget at JBER. Widget sets downloaded within the 2 minute threshold 90 percent of the time. Users had a success rate of 99 percent when opening a note. Of the successful note downloads by DOD users, all notes displayed within 60 seconds. All but 2 of the CHS notes successfully downloaded by VA users at JBER displayed within 60 seconds.
- The Joint Interoperability Test Command evaluated four critical external interfaces using jMeadows server log files provided by the program manager. All four – namely the Patient Discovery Web Services, Master Veteran Index, DES, and Veterans Health Information Systems and Technology Architecture Data Service – met accuracy and timeliness threshold values.
- DMIX R3 is operationally suitable. Users rated DMIX R3 usability highly, with a mean score of 80 on the SUS. There were no significant differences in SUS ratings between sites, agencies, or user experience with JLV. Users liked the JLV data display and indicated that the response time was adequate. They liked the help features with the exception of error messages; users documented 107 test incidents regarding unclear error messages that did not adequately support them. Overall, 40 percent of the users (71 of 178) felt they needed more training on the system. Users who reported receiving only computer-based training, which is the primary medium, most often felt that they needed more training. The DMIX help desk was responsive and resolved help desk tickets in a timely manner. DMIX R3 availability – i.e., the ability of any user to query the system via JLV at a given time and potentially to view a patient’s entire record – was 92.5 percent. This measure included supporting systems but did not account for the availability of DOD or VA databases. DMIX system components showed availability of 99.7 percent for JLV/ jMeadows and 98.3 percent for DES.
- DOT&E did not assess DMIX R3 survivability. The cybersecurity AA for DMIX R3 was delayed because of test limitations imposed by DISA DECC Montgomery that did not allow for an adequate test. Cyber testers are planning to conduct a CVPA and AA on DMIX Release 5 in 1Q – 2QFY17, while also working with DISA to mitigate prior test limitations.
- The DOD offered to include DMIX components and interfacing systems on VA networks in the full-scope cybersecurity testing planned for DMIX R3, but the

VA declined to participate. Instead, the DHS National Cybersecurity Assessment and Technical Services team conducted a limited-scope Risk and Vulnerability Assessment at the request of the VA. Testing included vulnerability scanning as well as penetration testing of the VA JLV server stack. The scope of this assessment was not adequate to evaluate the full DMIX program because other DMIX components and interfacing systems were not included in the assessment. The VA did not conduct an AA, which is a critical part of DOT&E assessments of DOD systems. The DHS identified two critical vulnerabilities that could result in the loss of confidentiality, integrity, or availability of personal health information and personally identifiable information.

Defense Medical Information Exchange Releases 4 and 5

- The DMIX Program Manager developed and developmentally tested DMIX Releases 4 and 5 in 2016. PEO DHMS fielded DMIX Release 4 in July 2016 and DMIX Release 5 in October 2016.
- DOT&E agreed to allow PEO DHMS to include DMIX operational testing within the scope of the DHMSM IOT&E.

Terminology Mapping

- The VA independently evaluated the VA-DOD data maps for the Vital Signs, Medications, Payers, Documents, and Allergies clinical domains using a Structured Query Language analysis. This evaluation compared terminology within the maps individually as well as the correlation between the two organizations’ maps. The VA had not finalized results from this test in time to be included in this report.

Recommendations

- Status of Previous Recommendations. The DMIX PMO has addressed the FY15 recommendations.
- FY16 Recommendations.
 1. The DMIX Program Manager should:
 - Diagnose and correct CHS problems.
 - Alert users when data do not load or are not available.
 - Improve error messages to provide users with better feedback where feasible.
 - Conduct DMIX Release 5 operational testing in conjunction with cybersecurity testing (CVPA and AA).
 2. The PEO DHMS should expand VA testing of correlation between the DOD and VA terminology maps to more clinical domains in order to fully understand the interoperability of medical records between the two organizations.
 3. The VA should:
 - Correct JLV cybersecurity vulnerabilities discovered during the DHS Risk and Vulnerability Assessment.
 - Allow a DOD Red Team to perform cybersecurity testing (CVPA and AA) of DMIX components and interfacing systems on VA networks.

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