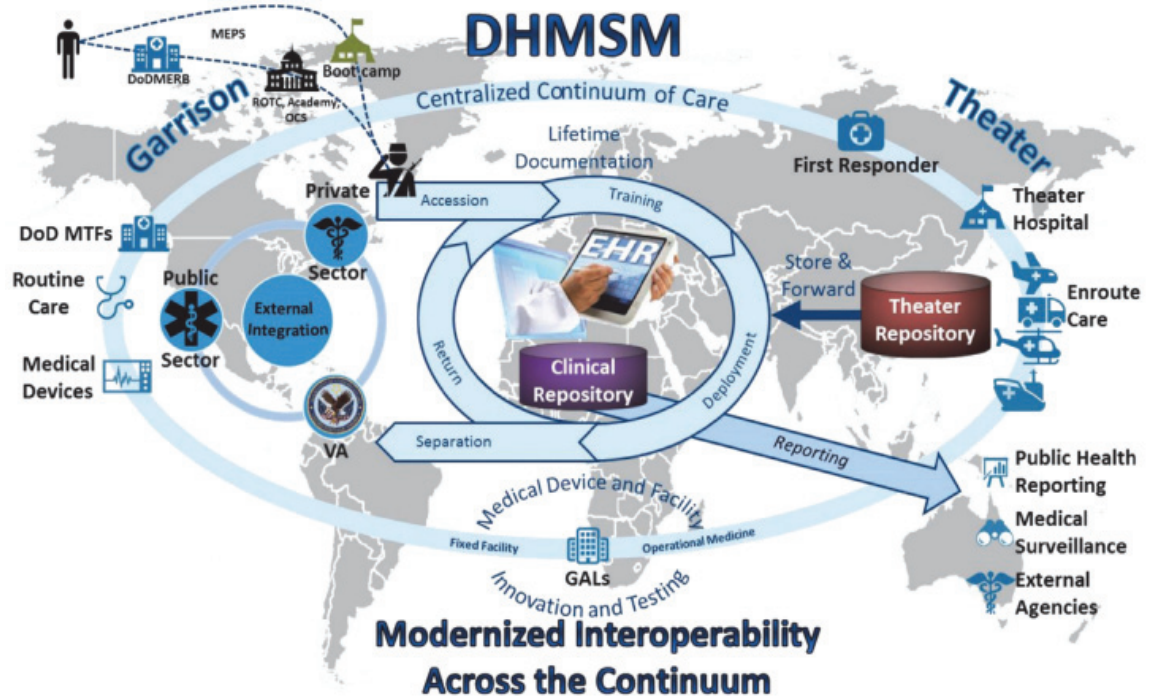


# DOD Healthcare Management System Modernization (DHMSM)

## Executive Summary

- Military Health System (MHS) GENESIS is intended to transform the way the DOD and the Department of Veterans Affairs provide military and veteran healthcare missions by creating a single health care record for each patient, used by both agencies. Currently, health care records reside in multiple legacy systems, making it difficult for health care providers to understand a patient's complete medical history. MHS GENESIS provides an integrated health record and delivers new capabilities to increase patient safety, such as barcode medication administration and decision support tools.



LEGEND:			
DHMSM	DoD Healthcare Management Systems Modernization	MERB	Medical Examination Review Board
DoD	Department of Defense	MTF	Military Treatment Facility
EHR	Electronic Health Record	OCS	Officer Candidate School
GAL	Government Authorized Laboratory	ROTC	Reserve Officers' Training Corps
MEPS	Military Entrance Processing Station	VA	Veterans Affairs

- MHS GENESIS will be deployed to DOD hospitals and clinics worldwide. MHS facilities encompass 54 hospitals, 377 medical clinics, and 270 dental clinics. Over 205,000 medical staff members will use the system to deliver and document healthcare for 9.4 million beneficiaries.
- The DOD Healthcare Management System Modernization (DHMSM) Program Office deployed MHS GENESIS at four Initial Operational Capability (IOC) sites in Washington State between February and October 2017.
- The Joint Interoperability Test Command (JITC) conducted IOT&E, with Service Operational Test Agency (OTA) assistance, from September through December 2017, at three of the IOC sites.
  - MHS GENESIS was not operationally effective because it did not demonstrate enough workable functionality to effectively manage and document patient care. Users satisfactorily performed 56 percent of the 197 medical and administrative tasks used as measures of performance, and generated 207 incident reports, 156 of which were high priority.

- MHS GENESIS was not operationally suitable because of poor system usability, insufficient training, and inadequate help desk support. Users gave MHS GENESIS usability an average score of only 37 out of 100 on the System Usability Scale (SUS), well below the threshold of 70 that indicates acceptable usability.
- The Program Office postponed the IOT&E at the fourth IOC site to improve system effectiveness and suitability in select clinical areas from January to March 2018. The Program Office closed over half (118 of 209) of the incident reports generated at the first three IOC sites. Of the 118 incident reports closed, 98 of these were high priority.
- The contractor implemented an upgrade to the core Millennium software within MHS GENESIS in April 2018.
- JITC completed the IOT&E at the fourth IOC site, with Service OTA assistance, in July 2018. This site is a larger hospital than the previous IOC sites, providing specialty and subspecialty care, with more MHS GENESIS functionality.

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- Although key MHS GENESIS functions improved and the system worked well in 18 of 70 clinical areas, MHS GENESIS is not yet operationally effective. Users satisfactorily performed 45 percent of the medical and administrative tasks used as measures of performance. Users generated 298 incident reports, 254 were high priority.
- MHS GENESIS is not yet operationally suitable because of poor system usability and insufficient training and documentation. The Madigan Army Medical Center (MAMC) users gave MHS GENESIS usability an average score of 40 out of 100 on the SUS.
- JITC and Space and Naval Warfare Systems Command (SPAWAR) Red Team completed a cybersecurity Cooperative Vulnerability and Penetration Assessment (CVPA) from November 2017 through June 2018 and an Adversarial Assessment (AA) in September 2018.
  - MHS GENESIS is not survivable in a cyber-contested environment. JITC and the SPAWAR Red Team successfully executed three cybersecurity attacks against the system as an insider, near-sider, and outsider. The results of MHS GENESIS cybersecurity testing will be provided in a separate, classified report.
- Following the IOT&E, the Program Office and Defense Health Agency (DHA) have worked swiftly to resolve the open incident reports. As of December 14, 2018, DHA recommended 114 of 388 (34 percent) incident reports and 29 of 57 (51 percent) top priority incident reports for closure. DHA has recommended all top priority software defect incident reports for closure.
- The Program Office created a Cyber Integrated Work Group (CIWG) to improve the cybersecurity posture of MHS GENESIS. The working group identified 34 specific tasks assigned to the appropriate parties, focused upon incident response and intrusion detection as well as prioritization and mitigation of identified vulnerabilities.

## System

- The Program Office plans to field MHS GENESIS, a modernized Electronic Health Records (EHR) system, to 205,000 Military Health System personnel providing care for 9.4 million DOD beneficiaries worldwide. MHS facilities encompass 54 hospitals, 377 medical clinics, and 270 dental clinics worldwide.

## Activity

- The Program Office completed MHS GENESIS Go-Live at all four IOC sites in 2017:
  - Fairchild Air Force Base (FAFB), Washington, on February 7, 2017
  - Naval Health Clinic Oak Harbor (NHCOH), Washington, on July 15, 2017
  - Naval Hospital Bremerton (NHB), Washington, on September 23, 2017
- MHS GENESIS comprises three major elements:
  - The Millennium suite of applications, developed by Cerner, which provides medical capabilities
  - Dentrix Enterprise, developed by Henry Schein, Inc., which provides dental capabilities
  - Orion Rhapsody Integration Engine, developed by Orion Health, which enables the majority of the external information exchanges
- MHS GENESIS will replace legacy healthcare systems including the Armed Forces Health Longitudinal Technology Application (AHLTA), Composite Health Care System (CHCS), and Essentris inpatient system. MHS GENESIS will replace legacy Operational Medicine components of the Theater Medical Information Program (TMIP) – Joint software suite including AHLTA-Theater, TMIP CHCS Caché, and AHLTA-Mobile.
- The Program Office established two program segments to support deployment of the DHMSM EHR System to the DOD enterprise:
  - Fixed Facility (Segment 1) supports all medical and dental services delivered by permanent inpatient hospitals and medical centers, ambulatory care clinics, and dental clinics.
  - Operational Medicine (Segment 2) supports theater hospitals, hospital ships, forward resuscitative sites, naval surface ships, and submarines. The Program Office will provide MHS GENESIS to the Joint Operational Medicine Information System Program Office for implementation of Segment 2.

## Mission

DOD medical staff will use MHS GENESIS to manage delivery of enroute care, dentistry, emergency department, health, immunization, laboratory, radiology, operating room, pharmacy, vision, audiology, and inpatient/outpatient services. DOD medical staff will also use MHS GENESIS to perform administrative support, front desk operations, logistics, billing, and business intelligence.

## Major Contractors

- Leidos – Reston, Virginia
- Cerner – Kansas City, Missouri
- Accenture Federal Services – Arlington, Virginia
- Henry Schein, Inc. – Melville, New York

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and suitability of select clinical areas from January to March 2018.

- The contractor implemented an upgrade to the core Millennium software within MHS GENESIS in April 2018.
- JITC conducted IOT&E Phase 2, with Service OTA assistance, at MAMC from June 18 to July 12, 2018, in accordance with a DOT&E-approved test plan.
- JITC and SPAWAR Red Team completed a CVPA in three phases assessing the commercial data center at the Cerner Technology Center (CTC), Kansas City, Missouri, from November 4 – 15, 2017; assessing medical devices and peripherals connecting to MHS GENESIS at the Fixed Facility Government Approved Laboratory (FF GAL), Auburn, Washington, from April 14 – 25, 2018; and assessing the end-user environment at MAMC from June 18 – 29, 2018.
- JITC and SPAWAR Red Team conducted an AA in September 2018. The CVPA and AA were conducted in accordance with a DOT&E-approved test plan.

## Assessment

- IOT&E Phase 1 was adequate to determine that MHS GENESIS was neither operationally effective nor operationally suitable.
  - MHS GENESIS was not operationally effective because it did not demonstrate enough workable functionality to effectively manage and document patient care. Users satisfactorily performed 56 percent of the 197 medical and administrative tasks used as measures of performance. Users generated 209 incident reports, 156 of which were high priority. Because each hospital had its own process for completing work, which sometimes conflicted with the enterprise processes inherent to MHS GENESIS, poorly defined user roles and workflows within MHS GENESIS resulted in an increase in the time required for health care providers to complete daily tasks. Some providers reported that they needed to work overtime and were seeing fewer patients per day due to delays caused by problems with MHS GENESIS. Some users questioned the accuracy of the information exchange between external systems and MHS GENESIS.
  - MHS GENESIS was not operationally suitable because of poor system usability, insufficient training, and inadequate help desk support. A lack of documentation forced users to develop their own operational workarounds. Users gave MHS GENESIS usability an average score of 37 out of 100 on the SUS, below the threshold of 70 that indicates acceptable usability.
  - System outages indicated that the end-to-end system and supporting network did not have sufficient availability to support operations at the four IOC sites. Users reported increased lag times when other IOC sites went live, suggesting the current system and supporting network configuration may not support the hundreds of additional sites planned for MHS GENESIS.
- IOT&E Phase 2 was adequate to determine that MHS GENESIS is not yet operationally effective or operationally suitable.
  - MHS GENESIS worked well in 18 of 70 clinical areas, and the Program Office fixed over half of the incident reports (118 of 209) generated during Phase 1 IOT&E. Of the 118 incident reports closed, 98 of these were high priority. However, users satisfactorily performed only 45 percent of the medical and administrative tasks used as measures of performance. Users generated 298 new Incident Reports, 254 of which were high priority.
  - MHS GENESIS was not operationally suitable because of poor system usability, insufficient training and documentation, and inadequate dissemination of system change information. MAMC users gave MHS GENESIS usability an average score of 40 out of 100 on the SUS. New users indicated that they needed more training with the system. Users did not receive information about updates or changes to the MHS GENESIS system.
  - Users did not report major system outages during the Phase 2 IOT&E. However, the Program Office did not provide detailed reliability, availability, and maintainability information for independent review. DOT&E was not able to evaluate these aspects of MHS GENESIS.
- MHS GENESIS is not survivable in a cyber-contested environment. JITC and the SPAWAR Red Team successfully executed three cybersecurity attacks against the system as an insider, near-sider, and outsider. The results of MHS GENESIS cybersecurity testing will be provided in a separate, classified report.
- Following the IOT&E, the Program Office and DHA categorized the 388 open high-priority incident reports into the following areas: configuration (25 percent), software defect (10 percent), enhancement (20 percent), policy/process (4 percent), knowledge deficit (32 percent), and other (8 percent). DHA further designated 57 of the 388 incident reports as their top priority for resolution.
- The Program Office and DHA have worked swiftly to resolve the OT&E incident reports. As of December 14, 2018, DHA recommended 114 of 388 (34 percent) incident reports and 29 of 57 (51 percent) top priority incident reports for closure. DHA has recommended all top priority software defect incident reports for closure.
- The Program Office created a CIWG to improve the cybersecurity posture of MHS GENESIS. The working group includes the major cybersecurity players including the Program Office, Leidos, Cerner, SPAWAR, and the DHA. The working group identified 34 specific tasks assigned to the appropriate parties in the following areas: configuration management, medical devices, recovery, detect and response, and incident response.

## Recommendations

- The USD(A&S) should direct the Program Executive Office (PEO), Defense Healthcare Management Systems (DHMS) and DHA to provide a plan to resolve high-priority incident reports, and provide updates on the status of high-priority incident reports.
- The Surgeons General of each of the Services should provide their full support to DHA and the PEO DHMS to establish enterprise-wide workflows and training.
- The PEO DHMS and DHA:
  1. Develop a corrective action (burndown) plan for the Priority 1 and 2 incident reports.
  2. Provide the USD(A&S) and DOT&E updates on the status of high-priority incident reports, between now and the next fielding.
- The DHMSM Program Office, working with the military healthcare community, should continue their collaborative efforts to:
  1. Resolve Priority 1 and 2 Incident Reports prior to further fielding.
  2. In coordination with DOT&E, plan JITC-led assessments at current MHS GENESIS sites to verify high-priority incident report fixes.
- 3. Work with DHA to implement a consistent method of notifying users of changes to the system.
- 4. Improve training and documentation for both new site implementation and sustainment.
- 5. Continue to resolve known cybersecurity deficiencies.
- 6. Improve interoperability, focusing on database exchanges identified as problematic during IOT&E.
- 7. Monitor reliability and availability to ensure the system meets users' needs.
- 8. Continue to work with the DHA and the Defense Information Systems Agency to isolate network communications problems and reduce latency.
- 9. Conduct FOT&E at the next fielding to further evaluate corrective actions and revised training, to inform further fielding decisions.