Medical Data Architecture Project Status

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Medical Data Architecture (MDA) Project

• Background
  – ExMC Risk and Gap
  – MDA Project Objective
  – Test Bed 1 Objectives

• MDA Accomplishments
  – Risk Reduction
  – System Requirements Review (SRR)
  – System Design Review

• Summary & FY17 Plans
Exploration Medical Capability (ExMC) Risk & Gap

**ExMC Element Risk:**
Risk of Adverse Health Outcomes & Decrements in Performance due to Inflight Medical Conditions

**MDA Need**
ExMC Gap Med07: We do not have the capability to comprehensively process medical-relevant information to support medical operations during exploration missions.

**MDA Goal**
The MDA will develop capabilities that support autonomous data collection, and necessary functionality and challenges in executing a self-contained medical system that approaches crew health care delivery without assistance from ground support.
MDA Project Objectives

The primary objectives of the Medical Data Architecture project are to establish a robust data architecture that:

- Provides a unified ability to capture, collect, store, access, integrate, and analyze a spectrum of health-related data to create actionable insight and medical process support leading to an Exploration Medical System.
- Provides the capability to manage and process medically relevant data from a variety of sources both medical and non-medical.
- Establishes interfaces for the integration of hardware and software components.
- Enables data retrieval as meaningful information that can inform diagnosis, treatment and health management.
- Automates data transfers.
- Expands the medical system to enable sophisticated data analytics and clinical decision support capability.
MDA Project Development

**Approach**
- Phased software lifecycle development process
- Multiple versions or test beds, where each successive version builds upon the previous test bed(s)
- Demonstration for each test bed in a laboratory and/or analog environment.

**Iterative Development Process**
- Meets ExMC request for quick system development
- Provides customer feedback opportunities
07 We do not have the capability to comprehensively process medically-relevant information to support medical operations during exploration missions.
Test Bed 1 Concept of Operations Scenario

- Subject dons wearable sensors to enable the capture of vital signs.
- Subject discloses shoulder pain, at which point, the Crew Medical Office (CMO) prescribes analgesics.
- Subject asked by the CMO to apply the Electrocardiogram (ECG) Glove to capture a 12-lead ECG.
- Subject requested to update personal medication usage via the Dose Tracker software.
- During this interaction, the CMO:
  - logs into the crewmember’s Electronic Health Record (EHR),
  - downloads that individual’s vital signs data from the biosensors,
  - and provides data entry into the Private Medical Conference template in the Objective and Subjective sections of the note.
# Levels of Care

## MEDICAL CARE CAPABILITIES

<table>
<thead>
<tr>
<th>Level of Care</th>
<th>Mission</th>
<th>Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>LEO &lt; 8 days</td>
<td>Space Motion Sickness, Basic Life Support, First Aid, Private Audio, Anaphylaxis Response</td>
</tr>
<tr>
<td>II</td>
<td>LEO &lt; 30 day</td>
<td>Level I + Clinical Diagnostics, Ambulatory Care, Private Video, Private Telemedicine</td>
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<tr>
<td>III</td>
<td>Beyond LEO &lt; 30 day</td>
<td>Level II + Limited Advanced Life Support, Trauma Care, Limited Dental Care</td>
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<tr>
<td>IV</td>
<td>Lunar &gt; 30 day</td>
<td>Level III + Medical Imaging, Sustainable Advanced Life Support, Limited Surgical, Dental Care</td>
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<tr>
<td>V</td>
<td>Mars Expedition</td>
<td>Level IV + Autonomous Advanced Life Support and Ambulatory Care, Basic Surgical Care</td>
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</tbody>
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NASA-STD-3001 Vol 1, Rev A
Test Bed 1 Overview

Test Bed 1 Objectives

- Demonstrate data flow autonomy
- Establish data architecture foundation
- Develop a scalable data management system
- Utilize modular design and standardized interfaces
Summary of FY16 Accomplishments

• MDA Project Risk Reduction Activity
  – Developed software compliance and project management documentation
  – Deployed software components and evaluate interfaces
  – Enabled development of the laboratory environment
  – Refined ‘sprint style’ planning and execution

• MDA Project Completed SRR and Design Review Milestones for Test Bed 1
  – System requirements focused on the first in a series of test beds, which will incrementally add capability as the medical system definition advances and matures
  – Class C Software Project, software quality assurance, verification and validation plans in place

• Initiated Test Bed 1 Build
  – System demonstrations provided to ExMC management
FY17 Plans

Milestones

– System Design Review held November 2017
– Test Bed 1 demonstration scheduled for April 2017
– Complete Test Bed 1
  • Release 1.0 – Astroskin, CARDIAx and OpenEMR integration
  • Patch release 1.1 – add Dose Tracker
  • Final patch release 1.2 – maintenance
– Develop milestones, deliverables and requirements for Test Bed 2
– Prepare for Test Bed 2 System Requirements Review