The Space Medicine Exploration Medical Condition List

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ABSTRACT

Exploration Medical Capability (ExMC) is an element of NASA's Human Research Program (HRP). ExMC's goal is to address the risk of the "Inability to Adequately Recognize or Treat an Ill or Injured Crewmember." This paper discusses the approach ExMC has taken to address this risk.

The Space Medicine Exploration Medical Condition List (SMEMLC) was created to define the set of medical conditions that are most likely to occur during exploration space flight missions. The list was derived from the International Space Station Medical Checklist, the Shuttle Medical Checklist, in-flight occurrence data from the Lifetime Surveillance of Astronaut Health, and NASA subject matter experts. The list of conditions was further prioritized for eight specific design reference missions with the assistance of the ExMC Advisory Group.

The purpose of the SMEMLC is to serve as an evidence-based foundation for the conditions that could affect a crewmember during flight. This information is used to ensure that the appropriate medical capabilities are available for exploration missions.

THE HUMAN RESEARCH PROGRAM

NASA's Human Research Program (HRP) conducts research and develops technologies that allow humans to travel safely and productively in the environment of space.

The HRP is comprised of six Elements:

- International Space Station Medical Project
- Space Radiation
- Human Health Countermeasures
- Exploration Medical Capability
- Behavioral Health and Performance
- Space Human Factors and Habitability

The National Space Biomedical Research Institute (NSBRI) is a partner with the HRP in developing a successful human research program.

BACKGROUND AND PURPOSE

There are approximately eighty conditions on the condition list approved by the NASA's Space Medicine Division.

For each design reference mission, conditions on the list were prioritized by the ExMC Advisory Group, which includes flight surgeons, physiatrists, engineers, and scientists. The clinical priority of each condition is based on incidence, consequence, and mitigation capability.

The SMEMLC serves as "living document." New conditions can be added to the list, and the priority of conditions on the list can be adjusted as screening, diagnosis, or treatment capabilities change.

The purpose of the SMEMLC is to serve as an evidence-based foundation for the conditions that could affect a crewmember during flight. This information is used to ensure that the appropriate medical capabilities are available for exploration missions.

DEFINITIONS

The SMEMLC uses the following clinical priority scale describing which medical conditions will be given resources for diagnosis and treatment.

- Shall – Diagnostic and treatment capability must be provided
- Should – Diagnostic and treatment capability should be provided if mass/power/volume allow.
- Not Addressed – No specific diagnostic and/or treatment capability will be manifested, but diagnostic and treatment resources manifested for other medical conditions may be used if needed. A condition was listed as being of no medical concern if it is highly unlikely to occur, is expected to be engineered out, or the limitations in the medical training, hardware, or consumables precludes its treatment.

THE NEAR-EARTH ASTEROID (NEA)

EXPLORATION MEDICAL CAPABILITY (ExMC)

The Exploration Medical Capability (ExMC) Element is tasked with reducing the risk of the "Inability to Adequately Recognize or Treat an Ill or Injured Crewmember" during an exploration mission.

To address this risk, the Element must:

- Define requirements for crew health maintenance
- Develop treatment scenarios
- Extrapolate from the scenarios to health management modalities
- Evaluate the feasibility of these modalities
- Develop technology and informatics that will enable the availability of medical care and decision systems

APPROACH

To address the broad risk of the inability to adequately recognize or treat an ill or injured crewmember, the Element identified medical conditions of concern for exploration missions.

The conditions were gathered from several sources:

- Space flight medical incidents
- The Shuttle Medical Checklist
- The International Space Station Medical Checklist
- Subject matter expert opinion

THE NEAR-EARTH ASTEROID (NEA) DESIGN REFERENCE MISSION

Mission duration – 13 months
(6 months on the outbound journey, 1 month of surface or proximity operations, and 6 months on the return journey)
Crew size – 3 crewmembers (2 male, 1 female)
Extravehicular Activities (EVA)
No planned EVAs during the transit phase
Tethered EVAs during the surface/proximity operations

ADDITIONAL INFORMATION

Human Research Program: http://humanresearch.jsc.nasa.gov
HRP Roadmap: http://humanresearchroadmap.nasa.gov
For a copy of the SMEMLC, please contact us.