

Prioritizing Medical Resources for Exploration Missions

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Introduction:

Long duration missions beyond low Earth orbit introduce new constraints to the medical system. Factors such as the inability to evacuate to Earth in a timely manner, communication delay, limitations in available medical equipment, and the clinical background of the crew will all have an impact on the assessment and treatment of medical conditions. The Exploration Medical Capability (ExMC) Element of NASA's Human Research Program seeks to improve the way the element derives its mitigation strategies for the risk of "Unacceptable Health and Mission Outcomes Due to Limitation of In-flight Medical Capabilities."

Methods:

The Integrated Medical Model (IMM) is a probabilistic model designed to quantify in-flight medical risk to astronauts as well as associated medical impacts to space missions to aid in mission planning and design. For each of the medical conditions encompassed by the IMM project, a suite of medical capabilities best suited to address each condition will be defined with respect to the current terrestrial standard of care and draw upon the preventive medicine paradigm of primary, secondary, and tertiary prevention to address the following categories: safety/prevention, screening, diagnosis, and treatment. IMM simulations for each Design Reference Mission (DRM) allow for identification of those conditions that are major contributors of risk for each forecasted outcome of loss of crew life, probability of evacuation, number and type of predicted in-flight medical events, and quality adjusted mission time lost. The ExMC Element will draw upon output metrics from the IMM and aim to prioritize portions of the outlined suite of medical capabilities in its assessment.

Results/Conclusion:

This effort outlines a repeatable, evidence-based process with the goal of helping the Exploration Medical Capability Element attain an acceptable risk posture for exploration missions.