

MEDICAL OPTIMIZATION NETWORK FOR SPACE TELEMEDICINE RESOURCES

R.V. Shah¹, R. Mulcahy¹, D. Rubin², E.L. Antonsen³, E.L. Kerstman¹, D. Reyes¹

¹University of Texas Medical Branch, Galveston TX, ²KBRwyle, ³Baylor College of Medicine

INTRODUCTION

Long-duration missions beyond low Earth orbit introduce new constraints to the space medical system such as the inability to evacuate to Earth, communication delays, and limitations in clinical skillsets. NASA recognizes the need to improve capabilities for autonomous care on such missions. As the medical system is developed, it is important to have an ability to evaluate the trade space of what resources will be most important. The Medical Optimization Network for Space Telemedicine Resources was developed for this reason, and is now a system to gauge the relative importance of medical resources in addressing medical conditions.

METHODS

A list of medical conditions of potential concern for an exploration mission was referenced from the Integrated Medical Model, a probabilistic model designed to quantify in-flight medical risk. The diagnostic and treatment modalities required to address best and worst-case scenarios of each medical condition, at the terrestrial standard of care, were entered into a database. This list included tangible assets (e.g. medications) and intangible assets (e.g. clinical skills to perform a procedure). A team of physicians working within the Exploration Medical Capability Element of NASA's Human Research Program ranked each of the items listed according to its criticality. Data was then obtained from the IMM for the probability of occurrence of the medical conditions, including a breakdown of best case and worst case, during a Mars reference mission. The probability of occurrence information and criticality for each resource were taken into account during analytics performed using Tableau software.

RESULTS

A database and weighting system to evaluate all the diagnostic and treatment modalities was created by combining the probability of condition occurrence data with the criticalities assigned by the physician team.

DISCUSSION

Exploration Medical Capabilities research at NASA is focused on providing a medical system to support crew medical needs in the context of a Mars mission. MONSTR is a novel approach to performing a quantitative risk analysis that will assess the relative value of individual resources needed for the diagnosis and treatment of various medical conditions. It will provide the operational and research communities at NASA with information to support informed decisions regarding areas of research investment, future crew training, and medical supplies manifested as part of the exploration medical system.