

MEDICAL SIMULATION SCENARIOS FOR EXPLORATION MEDICINE

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Introduction

Medical simulation is a useful tool that can be used to train personnel, develop medical processes, and assist cross-disciplinary communication. Medical simulations have been used in the past at NASA for these purposes, however they are usually created ad hoc. A stepwise approach to scenario development has not previously been used. The NASA Exploration Medical Capability (ExMC) created a medical scenario development tool to test medical procedures, technologies, concepts of operation and for use in systems engineering (SE) processes.

Methods

UTMB Aerospace Medicine Residents were tasked with developing an algorithm for medical scenario development, under the guidance of NASA flight surgeons, ExMC system engineers, and other interested parties. A robust scenario tool was developed that captures the physician thought process used during medical encounters. This tool was then used to take 11 scenarios from the Mars Transit Medical Concept of Operations (ConOps) that demonstrate various system functions, and flesh them out for training and testing purposes.

Results

A robust scenario development tool was created and then used to make a book of medical scenarios showing how a physician would approach treatment of the medical scenarios used in the ConOps. This work was then used to inform human factors and SE activities for the definition of initial system medical requirements for Gateway and Mars Transit vehicle systems.

Discussion

Medical scenarios are often used for training of medical personnel, but have broader utility. The medical scenarios algorithm and scenario book created an excellent communication tool that bridged the worlds of medicine and engineering. The stepwise algorithm helped engineers understand the medical thought process, and gave team physicians some insight into the needs of engineers. This tool will be used to test different aspects and assumptions of the Mars Medical ConOps within spaceflight analog environments, such as the Human Exploration Research Analog (HERA), the Integrated Power, Avionics and Software Platform (IPAS), and hopefully aboard the International Space Station.