CLINICAL DECISION SUPPORT PROJECT

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ABSTRACT
As NASA plans for exploration missions into deep space, significant challenges are realized due to the distance from Earth. Beside the effects of microgravity and radiation exposure, the astronauts face the additional constraints of isolation, lack of resupply, increasingly difficult evacuation, and delayed and disrupted communication with ground-based medical care providers. These constraints require a paradigm shift from current medical care where crews rely on the real-time communications with ground-based medical care providers toward Earth-independent medical operations for astronaut medical care. Medical expertise and decision-making are ground-based for current International Space Station and planned Lunar missions. However, a deep space exploration crew will need to autonomously perform the detection, diagnosis, treatment, and prevention of medical conditions. One approach to provide Earth-independent medical operations is to augment the requisite knowledge, skills, and abilities (KSAs) of a time-constrained crew—operating under stressful conditions, combatting fatigue, and facing a potential medical crisis—with a robust clinical decision support system (CDSS).

The CDSS is envisioned as an integrated, software-based tool deployed on a laptop computer or handheld device. The CDSS will assist the crew and ground support when interacting with knowledge/data bases (e.g. records, pharmacy, schedule), instrumentation (e.g. imaging, physiological monitoring devices), and habitat (e.g. wellness system, task performance system) and vehicle systems (e.g. environmental system, communication system). In addition, the human interface will employ a context-based approach that accounts for the crew's situation. Thus, extraneous and clinically/operationally non-relevant information are reduced to avoid an increase in cognitive load. The framework of an ideal spaceflight CDSS is to include core and advanced analytical features that maintain a flexible platform for integrating new technology in the future.

The Exploration Medical Capability (ExMC) Element of the Human Research Program (HRP) is expanding the boundaries of space medical systems to advance the care of astronauts on future exploration missions beyond low Earth orbit by actively identifying and testing next-generation medical care and crew health maintenance technologies. The Clinical Decision Support (CDS) project addressed ap Medical-701 within the Inflight Medical Conditions risk: "We need to increase inflight medical capabilities and identify new capabilities that (a) maximize benefit and/or (b) reduce "costs" on human system/mission/vehicle resources." Though mass, volume, and power will face increasing constraints, the projected computational capabilities of spacecraft systems will increase exponentially as information technology advances in this decade and beyond. Hence, data, software, and computational resources will play an essential and synergistic role in maintaining crew health, wellness, and performance in deep space missions.

The focus of the CDS project was to develop recommended requirements for an in-vehicle CDSS that acts as a 'virtual assistant' for delivering optimal health, performance, and medical care during exploration missions. In fiscal year 2022 (FY22), the CDS project was chartered to baseline and/or revise all CDS project related documentation and update the CDS project model to include the revised CDSS Concept of Operations, revised systems-based modeling language (SysML) activity diagrams, and baseline requirements. The focus of this presentation will be an overview of the CDS products and CDS model content.