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Is Space R&D Truly Fostering A Better World For Our Future? (2)

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LEARNING FROM ASYNCHRONOUS, SPACE-BASED TELEMEDICINE SYSTEMS TO SUPPORT SPINOFFS FOR EARTH-BASED HEALTHCARE

Abstract

Telemedicine provides a unique mode of healthcare delivery that is helping to address barriers to healthcare access on Earth. Connecting patients and providers through space-enabled telecommunications has been used to combat issues including medical care shortages, geographical barriers, financial limitations, and transportation burdens for clinicians and patients. In the space domain, astronauts are the patients, and telemedicine is essential to monitoring and supporting crew physiological and behavioral health. Research and development of spaceflight medical capabilities has been and continues to be essential for space entities that seek to send humans on long-duration spaceflights to the International Space Station (ISS), Mars, and beyond. This work will specifically focus on the development of asynchronous telemedicine systems (ATS) by NASA to support human missions to Mars where astronauts will have to manage their health largely autonomously due to communications delays. To adequately manage risks of adverse cognitive, behavioral, or psychiatric conditions, NASA's Human Research Program (HRP) has identified a key gap (Gap BMed-103) in characterizing the quality and efficacy of care delivered by deep-space ATS versus real-time telemedicine (e.g. telemedicine for the ISS) or face-to-face care methods. Through addressing this gap, ATS designers in space-based (SB) and Earth-based (EB) domains have an opportunity to collaborate and translate potential lessons during the development stage for increasing patient autonomy and care efficacy while operating in resource-constrained environments. Traditional technology transfer from space to Earth often happens after the space innovation is complete, and this work proposes that a two-way transfer process during the development phase could lead to smoother and more effective transfer. The present project characterizes the existing infrastructure and operations of SB and EB Asynchronous Telemedicine Systems, with a focus on behavioral healthcare. Descriptive data collection will be performed through surveys of telemedicine system stakeholders in the respective SB and EB domains to elicit key information such as competencies required, information flow, technology infrastructure, system operations and interfaces, and resource constraints. After data collection, a Systems Architecture (SA) analysis will be performed to examine how stakeholders, resources, and information interact. The SA analysis will provide a consistent framework to highlight similarities, differences, and potential modifications in infrastructure, care practices, operational processes, or technologies between SB and EB systems. This work seeks to examine and demonstrate that valuable lessons in the development of deep-space telemedicine capabilities can be transferred to improve telemedicine methods on Earth and address barriers to healthcare access in under-resourced communities.