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THE CONCEPT OF AN INTEGRATED INTELLIGENT HEALTH EVALUATION AND SUPPORT PLATFORM FOR DEEP SPACE EXPLORATION

Abstract

Due to the inability to abort missions, and the time delay between earth and Mars, long duration space missions to destinations such as Mars will require increased medical autonomy of crews to maintain health and safety. On such missions, crews undergo several adaptations to different gravity levels, and their physiological and mental states are affected. In addition, crew members will lose some of the knowledge and skills developed during training, as they will not use these skills regularly. The Medical Officer is particularly affected, as s/he will not only undergo adaptations, but have a limited number of patients to work on. Overall, there is a need to improve Medical autonomy and help medical officers assess their skills, retrain in specific areas and receive instructions for specific procedures they might not have encountered before on the surface of the planet. In this paper, we propose an integrated intelligent health evaluation and learning platform to help achieve these goals. This idea was proposed as part of the Young Professional side event of the International Space Exploration Forum 2 in Tokyo. The system concept consists of three elements: an automated self-assessment bay for patients, a medical officer decision and training support tool, and a computer software working in the background which integrates all medical information. Patients will use the automated self-assessment bay daily, to assess their health status, check their vitals and take any samples required by the system. In the background, the artificial intelligence system will aggregate information from all crew members and identify any trends observed to inform the medical officer, or change the training routine followed by the medical officer. Should a case be observed which cannot be directly managed by the patient through simple instructions, the automated self-assessment bay will send the patient to the medical officer. The medical officer will have access to the patient information and analytics from the AI to help make a more informed decision. In addition, in cases of emergency the decision support system includes a knowledge base with written, video-based, photo-based and auditory instructions that can instruct the medical officer in performing any procedures they might not be familiar with. Use of this integrated platform should reduce the need for invasive procedures in the long term. In addition, such an integrated platform not only has applications in space exploration, but could also be adapted for use in rural and isolated medicine on earth.