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MEDICAL AUTONOMY AS PREREQUISITE FOR DEEP SPACE TRAVEL WILL BENEFIT FROM
TERRESTRIAL HEALTHCARE INNOVATION

Abstract

In order to make long-duration human spaceflight possible, significant progress is needed in keeping astronauts healthy. In deep-space, communication delays and the absence of specific medical equipment or skills will pose a threat on the physical and mental well-being of astronauts. With near future plans for manned missions to the Moon and Mars, medical autonomy is of importance now. Utilisation of working technologies and concepts on Earth can be readily adapted. The terrestrial healthcare innovation space has much to contribute to this field and in this review a scope of the possibilities will be presented.

Emerging technologies like Virtual and Augmented Reality (VR and AR), Artificial Intelligence (AI) and others are the result of components becoming smaller, cheaper and smarter, and have led to a range of healthcare applications. Fundamentally different from previous developments, many of these technologies are digital and underpinned by software that can be scaled exponentially.

VR and AR are increasingly deployed for medical training and can also be used for guidance through complex medical procedures. When seen through glasses or a head-mounted display, the inside of a spacecraft can be blended with artificial layers adding relevant data like vitals or guidance while using complex medical equipment. In terrestrial healthcare, new surgery solutions use 3D technologies to overlay imaging data on real-life subjects.

Astronauts can only be trained so much for potential medical events. Artificial Intelligences in medical decision support systems, help human doctors on Earth making decisions, but will be critical to deep-space astronauts that require immediate assistance. AI can also play a role in psychological counselling as psychological stresses might arise from isolation from the rest of humanity, working in extreme environments, and being confined to small spaces. Conversational AIs are actually tested worldwide to apply 'traditional' Cognitive Behavioural Therapy methods in psychological coaching for patients. Skipping a 20 minutes communication delay from Earth to Mars, AI will be able to offer on-demand counseling with a skilled, but artificial psychologist.

Still, the absence of gravity and presence of radiation are challenges to be dealt with, but the space sector has lots to gain from the developments in modern healthcare here on earth, especially in 'digital health'. Digital solutions ensure on-demand availability of care, focused on empowered patients. In space, these tools can help empower the astronaut on-the-go to prevent, diagnose and treat illnesses without the assistance they have at their disposal in Low Earth Orbit.