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SPACE MEDICINE FOR AUSTERE I.C.E (ISOLATED, CONFINED, ENVIRONMENTS: TRAINING ANALOG ASTRONAUTS MARS MEDICS TEAMS IN HIGH-FIDELITY ANALOG MISSIONS IN NEPAL, HIMALAYAS - A CASE STUDY FOR FUTURE PLANETARY SURFACE EXPEDITIONS

Abstract

The development of novel medical technologies specifically design for exploration space missions can be solutions to address the myriad of medical challenges astronauts are currently faced with during long-duration missions and planetary surface exploratory expeditions. Innovative, pioneering approaches incorporating exponential technologies will enable Humanity to not only survive but "thrive" in dangerous extreme environments on Earth, in Space and future settlement on Mars. Additionally, new discoveries and potential to improve "state-of-the art" medical procedures and protocols for training astronauts can be extrapolated for terrestrial "spin-off" benefits where the challenges found in the extraordinary environment of space can be used to change current accepted paradigms on Earth. Our teams at Mars Academy USA have work in the development of the Mars Medics Training Program to train non-medical and medical professional in extreme, austere I.C.E as analog astronauts. MAU Mars Medics (MMM) Analog Astronaut Simulation Training missions focuses on space medicine, biomedical and biotechnology innovations. Mission crews enter fully "in-person" immersive simulations living and working together in a transdisciplinary, multicultural analog Mars environment in MAU's mobile, modular Mars Basecamps. The missions are specifically focused on innovations for explorations in space medicine, astro-wellness, space food production and nutrition. The crews will test, develop and innovate ways to support future human explorations and settlement on Mars and Moon. The crews will test design and integrate exponential technologies, such as, VRAR, 3D printing, telemedicine / telehealth technologies, robotics, autonomous and drones. The crews conducted the teleanesthesia telesurgery protocols using simulation-based learning platforms and real-time medical "tele-triage" operational procedures to train non-medical analog astronaut crews living in isolation and confinement in remote and extreme environments. Additionally, we tested feasibility for incorporating exponential technologies, such as, 3D printed medical tools and VRAR technologies as fully immersive virtual tools to support the training. This abstract will highlight previous and current studies to address the challenges in providing space surgery interventions and emergency medical management for non-medical or minimally-trained medical crews. The study utilized real-time communication between remote medical teams and on-site non-medical trained analog astronauts. We tested 3D printed medical tools, such as, surgical scalpels and "VapoJet", a novel 3D printed portable anesthesia device which can potentially replace the bulky anesthesia equipment currently used for surgical procedures.