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EYE MONITORING IN SPACE AND EXTREME ENVIRONMENTS: ADDRESSING THE SPACEFLIGHT ASSOCIATED NEURO-OCULAR SYNDROME (SANS) RED RISK THROUGH MOBILE BIOMEDICAL DIAGNOSTICS DURING THE COSMIC KISS MISSION ABOARD THE INTERNATIONAL SPACE STATION (ISS)

Abstract

A high priority *Red Risk* associated with long duration human spaceflight (e.g., missions to Mars) is Spaceflight Associated Neuro-ocular Syndrome (SANS). SANS, which can lead to optic disc edema, retinal nerve fiber layer thickening and globe flattening, is present in over two-thirds of astronauts and is thought to be associated with long duration exposure to microgravity (i.e., 30 days or longer). Currently, any visual distortions which may manifest from SANS are mitigated by providing glasses in space. However, multi-year missions to Mars may worsen these symptoms and, therefore, flight surgeons are seeking to develop new mobile device monitoring and diagnostic systems. To address this need, a mobile device for retinal image diagnostics is applied during the *Cosmic Kiss* mission for astronauts aboard the International Space Station (ISS). This mobile technology, developed for space, also has healthcare applications on Earth in emergency and remote medicine, as fundus diagnostics provide valuable analysis of altered microcirculation and pressure conditions within the head (e.g., for craniocerebral trauma). This mobile biomedical technology approach provides a qualified digital health diagnostic for space and extreme environments at a cost and mass savings to existing non-mobile diagnostics. These savings, alongside unmet demand for health-improving, personalized healthcare services, have catalyzed the rapid evolution of medical diagnostic technology and have improved value propositions within healthcare. Altogether, it is anticipated that mobile biomedical diagnostics like these will emerge as both an enabler of human deep space exploration within the Artemis Program, and a sustainable model in healthcare on Earth.