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THE CASE FOR SPACE: SURGICAL READINESS FOR DEEP SPACE MISSIONS

Abstract

INTRODUCTION

Surgical disease poses profound risk to individuals on long-duration missions in austere environments, to include deep space. Crew Medical Officer (CMO) proficiency in basic surgical procedures is critical for astronaut safety in spaceflight beyond low-Earth orbit; crews on Mars will experience communication delays exceeding 20 minutes, prohibiting interaction with terrestrial resources during surgical emergencies. Careful selection of a series of procedures for performance in microgravity is necessary in ensuring mission readiness.

METHODS

An in-depth PubMed literature review encompassed over sixty papers (1996-2018) pertaining to surgery in remote and resource-limited environments, identifying the procedures most critical for ensuring crew health and safety. Principles of laparoscopic and endoscopic training published by SAGES and ultrasound guidance outlined by the AIUM were incorporated into the protocol.

RESULTS

NASA's Integrated Medical Model outlines the 100 conditions most likely to develop inflight, 26 of which may require surgical intervention; the likelihood that a surgical event will occur among a 4-member crew during a 3-year Mars mission approaches 18

CONCLUSIONS

Medical readiness for austere missions involves CMO preparedness and spacecraft capabilities that facilitate timely procedural intervention. An effective training module should incorporate critical invasive procedures to permit treatment of high-risk conditions as they arise. Such a program may be useful in a multitude of austere environments with limited access to formal surgical training.