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Medical Care for Humans in Space (3)

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ANESTHESIA FOR HUMAN SPACEFLIGHT

Abstract

Recently plans for human spaceflight exploration missions beyond Lower Earth Orbit [LEO] to destinations as Moon and Mars, as well as Asteroids and Lagrange Points have regained strong interest by the spacefaring nations.

While in the last four decades human spaceflight missions have been limited to LEO, for example to the International or recently the Chinese Space Station as well as Space Shuttle missions, exploration missions beyond LEO require different and more extended medical care for astronauts and space flight participants.

With private spaceflight and space tourism evolving not only highly selected professional astronauts will travel to space but also an increasing number of non-professional astronauts and spaceflight participants. Those might be less rigorously selected and of higher age, with more comorbidities and risk for the development of acute medical situations during spaceflight.

The longer the missions last the higher the likelihood is that acute or chronic illness might evolve in astronauts. This might in consequence require surgical interventions, for example in the case of disease of inner organs or due to trauma. Not only the mission duration but also the distance of the spaceship from the safe haven of mother Earth are important: while from LEO an evacuation to the ground and definitive medical care should be possible within 24 hours this is impossible during exploration missions beyond LEO where return to Earth may take days, weeks or even months. In this case surgical interventions will have to be performed on board of the spaceship during spaceflight. Equal to surgical operations on Earth also in space it will be necessary to provide anesthesia for these operations on spaceflight patients. Anesthesia may be achieved by means of loco-regional or general anesthesia techniques.

The small, confined and limited space on board of a spaceship, as well as the limited medical training of the onboard Crew Medical Officers – who are not necessarily medical doctors – requires careful planning. In space also the microgravity environment poses extra challenges. This paper will review the current knowledge about anesthesia for spaceflight. It will also outline limitations and challenges for providing anesthesia in space. The use of Space Stations in LEO - like the International Space Station or the Chinese Space Station - as a test bed for medical care for exploration missions beyond Lower Earth Orbit will be highlighted.