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THE IMPROVEMENT OF THE CARDIOPULMONARY RESUSCITATION METHOD IN MICROGRAVITY BASED ON AN INNOVATIVE CONSTRUCTION CMRS - MOBILE MEDICAL MODULE (MMM) - AND THE SIMULATION IN NEUTRAL BUOYANCY.

Abstract

Background: Any future manned space mission to the Moon or Mars will require appropriate medical protection. In such long-distance missions, the risk of an accident necessitating medical aid, including cardiopulmonary resuscitation, increases. Adequate preparation of astronauts to provide medical care requires the development of appropriate rescue equipment and training methods tailored to the reality of microgravity.

Aim: To respond to this challenge, a team of scientists has developed an innovative version of the Crew Medical Restraint System (CMRS) named the Mobile Medical Module (MMM), and a training method in neutral buoyancy.

Material and Method: The first stage of the research was to determine the needs based on the analysis of the previously used equipment and resuscitation techniques in microgravity. The second stage was to develop a resuscitation technique based on the recommendations of the European Resuscitation Council (ERC) and the American Heart Association (AHA) for microgravity conditions, taking into account the specificity of the space station's interior and equipment needs. The third stage was the development of a new CMRS model that allows for quick and reliable stabilization of rescuers with the patient using a lever mechanism. The fourth stage was to test the developed methods and equipment in the ground and underwater conditions. The fifth and final stage was the creation of a medical assistance management system and appropriate training methods in neutral buoyancy. Results: The research, design and construction work carried out made it possible to achieve the intended goals. An innovative construction of the CMRS/MMM was developed, enabling the stabilization of rescuers with the patient, based on a special structure and a lever mechanism. The developed astronaut stabilization system enables long-term CPR and other medical activities in microgravity. Furthermore, ground-based CPR methods were adapted for the CMRS/MMM. A system for managing a medical team in the confined space of the space station has also been produced, as well as a simulation training project for astronauts was developed. Tests of medical procedures and new CPR methods were performed in a pool at a depth of 4 meters by scuba divers who are specialists in emergency medicine and disaster medicine. Conclusions: The MMM Project

allowed the development of new resuscitation techniques and training methods for astronauts in neutral buoyancy conditions.