Challenges of Life Support/Medical Support for Human Missions (8)
Challenges of Life Support/Medical Support for Human Missions (2) (2)

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CPR AND RESCUER'S POSITION IN MICROGRAVITY

Abstract

Background Long-term and remote space missions pose hazards to astronauts that may consequently require medical attention. Advanced medical equipment, extensive medical knowledge and communication systems may be insufficient in emergencies. Astronauts' safety depends on how procedures, especially techniques, are adapted to microgravity and hypogravity.

Aim The study aims to exploit the potential of an innovative patient symulator/rescuer position in a simulated, underwater environment of microgravity to maximise the effectiveness of CPR.

Material and Methods The study used a Mobile Medical Module (MMM) which is an innovative patient and rescuer's stabilising device in microgravity and hypogravity. The study was conducted in a pool at a depth of 3.8 meters and involved three two-person teams. The simulator was adapted to underwater conditions and rescuers and the simulator were weighted to achieve neutral buoyancy of every element. The study consisted of three phases including a simulator that was free-floating, stabilised by MMM undocked and docked at the bottom. The scenario of the study listed medical procedures which were subsequently assessed according to a defined criterion. Techniques of procedures and their fluency over a measured time segment were in focus.

Results Effects of resuscitation varied depending on the stabilisation of particular elements: a patient simulator, MMM, rescuers. The most efficient resuscitation employed the stabilisation of MMM at the bottom and the least lacked any stabilisation. Satisfactory results were achieved with a fixed patient simulator/MMM/rescuer stabilisation and any unbalance disturbed the effectiveness. The stabilisation of MMM at the bottom simulated Earth-like conditions, however, positioning rescuers in relation to a patient proved differently. The application of MMM in both free-floating conditions and stabilisation at the bottom succeeded in new positioning of rescuers in relation to a patient. CPR became more effective when lower limb levers and additional muscle groups were used. A developed model of rescuers/patient positioning was used when a patient simulator/MMM was either free-floating or stabilised at the bottom.

Conclusions The use of devices stabilising a patient's position on solid surfaces is primary for effective CPR, whereas stabilising a rescuer's position in relation to a patient is crucial in microgravity. Appropriate body positioning allows the use of levers and skeletal muscles. A stable patient simulator/MMM/rescuer position enhanced the efficiency of underwater tests. The concept requires further tests in simulated microgravity free from a negative impact of physical properties of water on.