Challenges of Life Support/Medical Support for Human Missions (8)
Challenges of Life Support/Medical Support for Human Missions (3) (3)

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KYMIRA: ASTRONAUT PHYSIOLOGICAL HEALTH MONITORING USING SMART UNDERLAYER GARMENT.

Abstract

The SGAC have instigated a Digital Mars Analog Simulation to be developed and implemented. Using KYMIRA's non-invasive, continuous, biomonitoring smart garments as a potential scenario within a Mars Habitat or during excursions. This telemedicine solution can help to activity monitor and track astronaut health trends over the duration of the mission as well as accelerate clinical decision making when rapid decline or an acute event takes place. The smart garment is worn under loose fitting outfits or EVA suits, similar to compression clothing. Garment sensors enable non-invasive, continuous and simultaneous physiological measurements.

The smart garment is worn under loose fitting outfits or EVA suits, similar in principle to compression clothing. Garment sensors enable non-invasive, continuous simultaneous measurement. A key aspect of KYMIRA's proposed technology is the use of multiple physiological biomarker recordings to enable accurate medical assessment. When doctors, such as Cardiologists and Emergency Medicine physicians, make treatment decisions for patients with ECG abnormalities they do not only rely on the ECG results but must assess other aspects of the patient's physiology. An illustrative example of this is with Ventricular Tachycardia (VT), which is one of the most dangerous heart rhythm abnormalities that can be recorded by a cardiac monitor. When VT is associated with haemodynamic instability (i.e. a considerable drop in blood pressure), patients must be offered an implantable defibrillator to rapidly terminate the rhythm when it occurs. On the contrary, when VT is tolerated haemodynamically (i.e. with preservation of blood pressure), medications or ablation procedures to eliminate the cause are the best treatment. These two different kinds of VT simply cannot be distinguished using an ECG alone. In fact, any heart rhythm abnormality that results in haemodynamic instability requires a different treatment when compared to the exact same abnormality with preserved haemodynamic function. Even the most expert human analysts cannot reliably determine more precise diagnoses over broad categorisations.

Being able to measure multiple parameters drastically improves accuracy and speed of diagnosis which would be crucial, given the environment, light-delay, and lack of full medical assessment facilities and staff available.

Besides diagnosing serious and acute deteriorating health conditions, this same system would be used to objectively measure long-term physiological trends in Astronauts and help evaluate corrective measures. For example, individual muscle conditioning as well as an adherence to appropriate exercise and training regimes, tailored for a specific astronaut's needs could be better enabled via this smart garment system.