SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

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DEVELOPING OF SPACE TECHNOLOGIES FOR MEDICAL CONTROL APPLIED TO PROBLEMS OF "HOME MEDICINE".

Abstract

Introduction. Many years experience of cosmonauts health monitoring shows that in the study of healthy subjects clinical approach to the evaluation of various medical and physiological data is almost less effective than the evaluation of adaptive abilities of the organism. Therefore the idea of prenosological (pre-medical) diagnosis and the concept of adaptive risks develop in space medicine last years. These new space technologies are being actively tested in terrestrial studies in systems as "home medicine". Methods. The report presents three variants of systems, respectively, designed to work with a) home PC ("Ecosan-2007" and "Ecosan-TM" complexes), b) Internet connections ("Delta 2013" device), c) mobile communication channels ("Traffic Lights of Health" system). The main method of functional conditions evaluation in all these systems is the heart rate variability (HRV) analysis. HRV indices allow us to construct a mathematical model and to compute the stress degree of regulatory systems, their functional reserve and adaptive risk. Results. Hard-software complex "Ecosan-2007" was used for monthly monitoring the health status of 120 volunteers in different regions of the world during the longitude medical- environmental research in "Mars-500" project. We have obtained the extensive experimental data on the annual and seasonal dynamics of functional states. The instrument Heart Wizard Mars500 has been also used in this project which enabled, using an ear photopletismographic sensor and Internet, to receive the data of examinations and recommendations at home. These two types of devices became the basis for creation of new appliances - "Ecosan-TM" and "Delta 2013". It has been also developed a system "Traffic Lights of Health" as mobile application for "Android" smartphones for express assessment of health status at home. It allows to identify the patient group of health (green - normal, yellow - functional stress, red - failure of adaptation) and generate a personal preventive recommendations or, if necessary, to send to the doctor. Conclusion. All devices presented in this report are based on space technologies and generally are home telemedicine systems to ensure periodic and urgent, express and regular examinations of cardiovascular control at home for the purpose of prenosological (pre-medical) health monitoring. Development and implementation of similar systems for individual self-control may also be useful to develop personalized systems for medical care in space.