Space medicine, telemedical ecology and telemedicine: prospects for cooperation and development.

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Man Enters Space

'So Close, Yet So Far,' Sighs Cape

U.S. Had Hoped For Own Launch

CAPE CANAVERAL, Fla. (AP) — The Redstone rocket which the United States had hoped would boost the first man into space stands on a launching pad here. The Soviet Union beat its firing date by at least two weeks.

"So close, yet so far," commented a technician who is helping prove the Redstone to send one of America's astronauts on a short sub-orbital flight, hopefully late this month or early in May.

"If we hadn't lost these three last fall and on the flight Little Joe shot six times this year we might have made it," said the technician. "But you have to give the Russian scientists credit. They've accomplished a remarkable breakthrough."

Hobbs Admits 1944 Slaying

MOSCOW (AP) — A Soviet astronaut has orbited the globe for more than an hour and returned safely to ravish the plaques of scientists and political leaders alike. Soviet announcement of the feat brought praise from President Kennedy and U.S. space experts left behind in the cockpit to get the first man into successful space flight.

By the Soviet account, Maj. Yuri Alekseyovich Gagarin, piloted a five-ton spaceship over the earth in an orbit lasting an hour and 42 minutes. He was in the air a total of 11 hours and 48 minutes.

The whole sequence of events and the accomplishments relating to it caused a number of questions. The Soviet announcement said the flight took place today between 9:07 and 10:51 a.m., but some persons in Moscow's Western embassy were skeptical that the feat actually came off. 

YOR BRAUN'S REACTION:

'To Keep Up, U.S.A. Must Run Like Hell'
Purpose of the first flight:
studying human tolerance of space flight,
monitoring of parameters characterizing the functional activity of the cosmonaut's body (pulse, respiration, electrocardiogram, electroencephalogram, and other physiological parameters)

Problem of the first cosmonaut: assessment of the condition, the study of vestibular stability, psychophysical human performance in flight.
Actually, the past experience of medical and physiological investigations in space clearly shows that the main challenges for the future of medicine in space as well as on Earth are prevention, individualization and telecare.
Intersection points

Space medicine

- the remote health assessment
- forecasting of possible health risks
- a lot of experience in individual health assessment of cosmonauts

Telemedicine

- Telecare
- preventive orientation, early detection of health deviations
- individualization
The point of divergence is the object

Space medicine

- healthy people
- extreme influences and artificial conditions

Telemedicine

- Patients (usually)
- non-extreme influences and natural conditions
• **Space medicine** is dealing with healthy people. In the rest position, without the action of loads, the functional conditions of cosmonauts don't go beyond the normal range. This fact make it difficult to assess their health status before its reducing, not after.

• The focus of **telemedicine** is on the early diagnosis and detection of disease at the very beginning.
Functional states in prenosological approach and Patient Pathway in telemedicine.
OUR TARGET

Nosological states, disease  Pre-nosological states

Post-nosological states  Health
Satellite medico-ecological investigations
Prenosological principles of diagnosis are successfully applied in space to assess the health of cosmonauts on the base of heart rate variability data.

- The main goal of Earth and space medicine is to keep everyone (patients or non-patients) on border between health and disease.
ADAPTATION RISKS

- Adaptation risk characterizes the reserve of adaptation abilities ("health reserve") unlike the concept of clinical risks, where a set of signs (symptoms and syndromes), sufficient (or insufficient) for production of clinical diagnosis is considered.
An impressive and very important results were obtained in the international satellite project MARS-500.

Distribution of people in satellite groups in Mars-500 project at different categories of risk.
Prenosological states tend to arise in healthy people relating to adaptation to the changed environment or increased loads.

- Ecological stress in satellite groups (Mars-500 project).
Reactions of Martian crew to increased loads

- Adaptation RISK Martian crew
- Adaptation RISK Satellite 1

- Before June 2010
- Landing on Mars
- Oct 2011
Different ways of health assessment were examined in carrying out the longitudinal medical-environmental research in the satellite project Mars-500: group monthly surveys in Russia and some European countries (Czech Republic, Germany, Belarus) and weekly individual surveys at home conditions, in participants from the USA and Canada.
• The results demonstrated that weekly individual prenosological assessment can detect disturbances of the autonomic balance prior to appearance of any health problems.

• Health assessment with immediate demonstration of results when compared with the answers to a questionnaire about lifestyle factors and environmental influences have a greater impact on peoples mind in relation to lifestyle changes, correction of loads, nutrition, etc. to maintain health.
Individual profiles of RISK factors

- Worsening of well-being
- Lowering of physical activity
- Worsening of psychological state
- Nutrition
- Sleep problems
- Increased sensitivity to environmental factors
- Bad habits
- Stress-related problems

SUM Risk

SUM of correlations

Graph showing the sum of correlations for different factors.
This experience has allowed to start a developing of new system to meet the challenges of preventive medicine - telemedicine system for prenosological individual control.
The “Heart Wizard - Mars-500” instrument, which was created as a result of cooperation between the Institute of Biomedical Problems and the American company “Biocom Technologies” for use in long-term medical and environmental studies in Canadian and American participants, may be used as a prototype of these new systems.
New system will include:

- the current health assessment,
- valuable information about its long-term history
- recommendations on life optimization.
• Such cooperation of experts and specialists in the field of space medicine, telemedicine and telemedical ecology has already proved its usefulness while conducting scientific researches.

• The continuation of joint work can make a contribution to our main common problem – maintaining human health.
Thanks for your attention!