

**JUNE 2000**

*Space tourism physical standards (University of Manitoba, Winnipeg, Canada):* "Commercial space travel may soon be a reality. If so, microgravity, high acceleration, and radiation exposure, all known hazards, will be accessible to the general public. Therefore, space tourism has medical implications. ... However, there are problems using astronaut data to make inferences about the general public. ... Astronaut data can tell us very little about the potential hazards of microgravity in pediatric, obstetric and geriatric populations, all of whom are potential space tourists. Key issues in standard setting will be determining acceptable limits of pre-existing disease and inferring medical standards from mission profiles. It will not be a trivial task drafting minimal medical standards for commercial space travel. It will require the collaboration of space medicine physicians, making the best guesses possible, based on limited amounts of data, with limited applicability. ... It is time to begin preliminary discussions toward defining those standards ...

"A scenario – March 15, 2020: The Anders family has just won a trip for five, for 5 d and 5 nights, to celebrate the grand opening of 'Skyrider International,' the world's first space hotel, 1 mo from now. They have presented at your office for medical clearance to take the trip. Three generations are present. Eric Sr. and Crystal are in their 70's. Eric Jr. and Joanie are 41 and 40, while young Billy has just turned 10. You just saw Joanie last week and confirmed that she is 5 wk pregnant. Fortunately, the World Health Organization, using data from the International Space Station, has recently adopted a set of minimum medical standards for civilian space travel. You set about examining each patient separately, and within 3 h, all five are cleared to travel."<sup>1</sup>

**JUNE 1975**

*Eating metric pi (Crew Systems Department, Naval Air Development Center, Warminster, PA):* "The metric system offers, due to its simplicity and uniformity, substantial advantages for the entire scientific community. ... To further encourage those who may feel that the road to metrication is paved with agonizing frustrations, the author points out some lesser known advantages of the metric system pertaining to acceleration research. ...

"These advantages were very likely not known to the 'Founding Fathers' of the meter during the French Revolution; they are, rather, the result of the serendipitous coincidence that the Earth's Gravitational Acceleration Standard, when expressed in the metric system, nearly equals  $\pi^2$ ."<sup>2</sup>

*Anemic crew (United Airlines Medical Department, Chicago, IL):* "This investigation developed and provides guidelines for the determination and medical release of flight crew members for duty with hemoglobin values less than normal. This dilemma occurs commonly to the flight surgeon following bland donation, resolved hemorrhagic disorders, chronic idiopathic blood disorders, and pregnancy. Minimum safe values were computed and tabulated for otherwise healthy individuals at rest and exercise at the routine extremes of the flight environment of present pressurized jet airliners from known physiological parameters. These values were then correlated with the records of 62 pilots and stewardesses with subnormal hemoglobin values to assure the operational predictive validity. ...

"The flight surgeon is advised to be aware of the critical values but investigate thoroughly any variance from the lower limits of normal or an unfavorable trend in this potentially very real and serious incapacitative [sic] entity."<sup>3</sup>

**JUNE 1950**

*Ultrasound therapy (U.S. Naval Reserve & New York Poly-Clinic Hospital, New York, NY):* "For the past twelve months we have been testing clinically the potent new modality of ultrasonic therapy. The modern concepts in ultrasonics [sic] stem from work by Langevin in France, Wood and Loomis and Cady in the U.S.A., Hiedemann and Bergmann in Germany. ...

"The apparatus used in our work consists of an electronic circuit which activates a quartz crystal within a hollow metal hand applicator. On activation, the metal membrane vibrates powerfully at the rate of 800,000 times per second. Clinical application of this nodality involves the application of a liquid or ointment to the skin as a coupling agent for the maintenance of good contact between skin and ultrasonic head. The latter is not to be kept stationary at any time but must be kept constantly in motion. The coupling agent may be paraffin oil, cold cream, lanolin, water, medicated ointments, et cetera. If contact is poor, an uncomfortable sensation of heat may be imparted to the skin under treatment. Where applicable (when deeper penetration and a more homogeneous field is required), treatment in a water bath is preferable to oil or fat coupling. However, any liquid not harmful to the tissues can be used as contact medium. The substance is propelled (as, for example, novocaine) into the cutis and subcutis. It is thus possible to force slight amounts of a drug into the tissues. High polymeric combinations (insulin) cannot be used since these are decomposed in the ultrasonic field. The depolymerizing action of ultrasonics begins at atomic weights about 5000 and upwards. Thus sera which are not combined with lipoids, and vaccines are unsuitable. ...

"We have been able to demonstrate to our satisfaction the therapeutic effectiveness of this new modality in clinical medicine, in posttraumatic conditions, in painful afflictions of the muscles, nerves, and joints, and in the amelioration of localized congestive disturbances."<sup>4</sup>

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