



2005 ABSTRACTS OF THE AsMA SCIENTIFIC SESSIONS

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The following are the peer-reviewed abstracts accepted for presentation—in slide, poster, or panel sessions—at the 2005 Annual Scientific Meeting of the Aerospace Medical Association. The numbered abstracts are keyed to both the daily schedule and the author index. [No abstract #45 or 87.]

Monday, May 9

8:30AM

Opening Ceremonies and 51st Louis H. Bauer Lecture

Monday, May 9

10:30AM

Panel: Aerospace Medicine Ground Rounds-1

[1] AEROSPACE MEDICINE GRAND ROUNDS

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Three separate ninety (90) minute "Grand Rounds" sessions will be held consisting of eighteen (18) different clinical aeromedical cases. These cases will be presented in a format that allows attendees to follow a case from initial clinical presentation to final aeromedical disposition. The presentations will be limited to ten (10) minutes with five (5) minutes left for a question and answer period. Each case will be selected to best represent the decision making process that is most appropriate in each clinical area in promoting flight safety and fairness to the aviator. Each case will include the patient's initial presentation, history and physical examination, the medical tests that were ordered, the differential and final diagnoses, the aeromedical concerns, and the final aeromedical disposition. This presentation will be an excellent review of clinical flight medicine practice and the decision making process required to provide consistent, fair, and reasonable aeromedical dispositions. Cases will be presented by Residents in Aerospace Medicine (RAM) from each of the four accredited residency programs in the United States: Naval Operational Medicine Institute, Pensacola Naval Air Station, FL; USAF School of Aerospace Medicine, Brooks City Base, TX; University of Texas Medical Branch, Galveston, TX; and Wright State University, Dayton, OH.

Learning Objectives: 1. This panel will discuss and review the processes involved in making appropriate aeromedical dispositions on aviators.

Monday, May 9

10:30AM

Slide: Aircrew Health Standards

[2] PERMANENT MEDICAL DISQUALIFICATIONS OF TUAF PILOTS AND NAVIGATORS DURING 1996-2003

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Introduction: In Turkey, all military flying personnel are examined annually by three Aeromedical Examination Centers according to the rules of Turkish Armed Forces Medical Standards (TSKSY). All diagnostic reasons for both disqualifications and waivers are mentioned in this document. This study presents the medical reasons for permanent disqualifications among TUAF pilots and navigators during an 8 years period (1996-2003). **Methods:** The TUAF medical disqualification records were reviewed to identify the causes and total number of pilots and navigators who have already been grounded permanently from flying duties between 1996 and 2003. We subdivided them into diagnostic and age categories. **Results:** There are totally 74 cases. The most common diagnostic categories for disqualification were cardiovascular (n=16), ophthalmology (n=16), musculoskeletal (n=9), infections (n=8), psychiatry (n=6), neurology (n=4), gastroenterology (n=4), oncology (n=3) and others (n=8). Annual average case number was 9.25. **Discussion:** Because of the different medical standards and populations, it is difficult to compare our data with the data of other countries. However our disqualification rate was similar to that of USAF which was published earlier.

Learning Objectives: 1. Understand the medical reasons for permanent disqualification from flying duties.

[3] PREGNANCY IN AIRCREW: FAA VS JAR F. KRISTOFELC

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Although pregnancy is a normal physiological process it can cause severe problems for a pregnant member of the aircrew, especially for the pilot. Due to major anatomical, hormonal and psychological changes the pregnancy can interfere with normal flight operation and can even cause sudden incapacitation. One in four pregnant women will experience some sort of cramping pains or other major abdominal discomfort and round thirty per cent can experience any sort of vaginal bleeding during first 22 weeks of pregnancy. One in ten pregnant women spontaneously abort, majority of these taking place within the first trimester – usually without prior symptoms. Under these circumstances it is no wonder, that the regulators are taking special precaution regarding flying fitness of the pregnant aircrew members. There is important difference in approach to flying ability during pregnancy between FAA and JAR flight crew licensing. According to FAA normal pregnancy is not disqualifying; it is recommended that applicant's obstetrician is made aware of all aviation activities so that the obstetrician can properly advice the applicant. The examiner may wish to counsel the applicant concerning piloting the aircraft in third semester. Proper use of lap belt and shoulder harness warrants discussion. According to JAR a confirmation of apparent normality of pregnancy is needed before the pilot continues flying. Monthly assessments are required to maintain certification up to 26 weeks of pregnancy. Beyond this point temporarily unfit assessment is appropriate. The AMS may approve certification of pregnant air crew for multi-pilot (class 1) and single pilot (class 2) operations during first 26 weeks of pregnancy following review of obstetric evaluation; but monthly obstetric reports are required.

[70]

METRONOME TO COORDINATE THE BREATHS AND CARDIAC COMPRESSIONS DELIVERED BY MINIMALLY-TRAINED CAREGIVERS DURING TWO-PERSON CPR

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Introduction: Astronaut crew medical officers (CMO) aboard the International Space Station (ISS) receive 40 hours of medical training over 18 months before each mission, including two-person cardiopulmonary resuscitation (2CPR) as recommended by the American Heart Association (AHA). Recent studies have concluded that the use of metronomic tones improves the coordination of 2CPR by trained clinicians. 2CPR performance data for minimally-trained caregivers has been limited. The goal of this study was to determine whether use of a metronome by minimally-trained caregivers (CMO analogues) would improve 2CPR performance. **Methods:** 20 pairs of minimally-trained caregivers certified in 2CPR via AHA guidelines performed 2CPR for 4 minutes on an instrumented manikin using 3 interventions: 1) Standard 2CPR without a metronome [NONE], 2) Standard 2CPR plus a metronome for coordinating compression rate only [MET], 3) Standard 2CPR plus a metronome for coordinating both the compression rate and ventilation rate [BOTH]. Caregivers were evaluated for their ability to meet the AHA guideline of 32 breaths-240 compressions in 4 minutes. **Results:** All (100%) caregivers using the BOTH intervention provided the required number of ventilation breaths as compared with the NONE caregivers (10%) and MET caregivers (0%). For compressions, 97.5% of the BOTH caregivers were not successful for meeting the AHA compression guideline, however, an average of 238 compressions of the desired 240 were completed. None of the caregivers were successful in meeting the compression guideline using the NONE and MET interventions.

Discussion: This study demonstrates that use of metronomic tones by minimally-trained caregivers for coordinating both compressions and breaths improves 2CPR performance. Meeting the breath guideline is important to minimize air entering the stomach, thus decreasing the likelihood of gastric aspiration. These results suggest that manifesting a metronome for the ISS may augment the performance of 2CPR on orbit and thus may increase the level of care.

Learning Objectives: 1. The audience will learn that use of a metronome to coordinate two-person CPR can augment the standard of care during space flight. 2. The audience will understand how the use of a metronome during two-person CPR may impact the likelihood of gastric aspiration.

[71]

TIME COURSE OF FACIAL PUFFYNESS DURING LONG SPACE FLIGHTS

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Introduction: The puffy face of astronauts in space was well known as an evidence of the headward fluid shift under weightlessness. However, the time course of the puffiness was not clear and its degree was not measured during a long space flight. **Method:** Four cosmonauts who stayed in space for four and six months in the ISS expedition #3 and #5 were assigned to two subjects and two cameramen respectively. A HDTV (High Definition TV) camera and a tape recorder were loaded on ISS in August 2001. Filming was done every two or three weeks, and all images were recorded on board. Tapes were delivered to the ground after the mission, and the images were examined by physicians as a medical visual inspection on a CRT monitor. Still images of the frontal face were extracted from tapes in each shot in each session for observations of the facial puffiness, and the area on the frontal face was measured and calculated with a PC. **Results:** Puffy faces were clearly observed in the visual inspection throughout both space flights, and the degree of puffiness seemed higher on the subject #3 than the subject #5. The puffiness seemed decreased on the subject #5 after one month, but it was not on the subject #3. However, calculated areas of the frontal face on both

subjects indicated that the puffiness did not vary much during the flights. The areas of the frontal face in space were larger than the areas on the ground by 8-10%. **Conclusion:** The puffy face due to the fluid shift was observed at the initial stage of flight and it remained almost same throughout the flight. Therefore, the fluid-volume overloaded in upper body seemed unchanged for months.

Learning Objectives: 1. The change of the facial puffiness on astronauts in space was described with images of High Definition TV.

[72]

THE CONDITIONING OF BONE STRENGTH ON POSTURE

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The Bones For Life program (BFL) for stimulating bone strength through natural movement and weight bearing posture (www.bonesforlife.com) is a 60 hour course of biomechanical procedures designed to regenerating bone mass for pre and post flight astronauts, as well as for general population. Organizing the skeleton for consistent transmission of force is essential for avoiding damage of sheering stress while performing weight bearing challenges. Counter measures are leaning onto a wall while lifting weights, wrapping a 7 meters cloth harness, which integrates the body into a reliable antigravity axis, while bouncing on the heels or jumping. The harness allows even people with functional limitations a safe building bone impact, as well as the biological optimism inherent in the facilitated performance. The success to transform mechanical effort into bone mass is gained through neuromotor strategies derived from Dr. Moshe Feldenkrais, Israeli. Physicist / engineer 1904-1984, who created a method for reprogramming counter productive patterns of self-organization. Following principles of infant learning, exploring unused options in the perspective of proportional distribution of load between all body parts, works to awaken the resourcefulness of the organism to arrive at more optimal solutions. The presentation includes a short demo of strategies: * Bouncing on the heels - pulsations strengthen bone * Aligning the neck- self feedback * Aligning the lumbar - bridging ribcage to pelvis * Hip joint, aligning the wheels * The antigravity lever of the knees- spontaneous springiness * Shortcut to upright posture- using a wall for resistance 2 pilot studies Tel Aviv, 2002, 2004 of women (age of 35-67) show after 4 months increase of bone density for 50% of participants as well as in safe withstanding of higher levels of springy pressure. The well-coordinated upright posture, projecting the body language of leadership, is beneficial to every human being.

Learning Objectives: 1. Neuro motor strategies for aligning the skeleton into a domino effect trajectory of force for strengthening bone. 2. experiencing optional movement coordination. 3. direct personal feedback from the suggested applications.

[73]

HYPERGRAVITY: GLUTAMATE AND GABA UPTAKE, EXOCYTOSIS AND EFFLUX MEDIATED BY HIGH-AFFINITY, SODIUM-DEPENDENT TRANSPORTERS

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Excitatory and inhibitory neurotransmitters, glutamate and GABA, mediate essentially all rapid communication in the CNS. They involve in the main aspects of normal brain function. Imbalances between excitatory and inhibitory responses can have diverse inevitable consequences. Comparative analysis of uptake and release of the neurotransmitters from rat brain synaptosomes has demonstrated that hypergravity loading (centrifugation of rats at 10G for 1 hour) evokes oppositely directed alterations of inhibitory and excitatory signal transmission. We have studied the maximal velocities of [3H]GABA reuptake and revealed more than twofold enhancement of GABA transporter activity (V_{max} rises from 1.4 \pm 0.3 nmol/min/mg of protein in the control group to 3.3 \pm 0.59 nmol/min/mg of protein for animals exposed to hypergravity). Recently we have also demonstrated the significant lowering of glutamate transporter activity (V_{max} of glutamate reuptake decreased from 12.5 \pm 3.2 nmol/min/mg of protein in the control group to 5.6 \pm 0.9 nmol/min/mg of protein in the group of animals, exposed to the hypergravity stress). Significant changes occurred in release of the