Stress Management of Patients on Earth and Astronauts Working in Space
Paul L. Schraeder 1 and Claire M. Lathers 2

1 Albert Einstein Medical Center, Philadelphia, PA schraedp@einstein.edu and 2 Office of the Director, Center for Veterinary Medicine, U.S. Food and Drug Administration, Rockville, MD 20855 CLathers@cvm.fda.gov

INTRODUCTION. In many cases of patient management, it is very obvious that an individual is under excess stress due to work or family challenges but there are also many circumstances in which stress may be present but is not as obviously apparent. (1) One such type of stress may be related to training for an flight into outer space and/or the actual experience of working in space. Stress itself can modify sleep patterns. In addition, this effect may be compounded by the known disruption of natural circadian rhythms that occur during space flight; these changes may influence the development and exacerbation of space motion sickness, lead to significant sleep disturbances in and of themselves, and contribute to a decrement in performance. (2-5) All such changes may interfere with normal shuttle and space station operations and thus interfere with getting the assigned tasks done during space flight. Stress is also a factor in the occurrence of many cases of sudden unexplained death (SUD).

PURPOSE. This paper explores the concepts of stress as it relates to changes in autonomic neural function, cardiac function and morphology and as a risk factor for SUD. The lessons learned are valuable for treating patients and for planning training and the actual tasks to be conducted while working on space station or during space flight in the Shuttle.

DISCUSSION. Stress is a theorized risk factor in SUD but clinical evidence is sparse. The acute stress of a strong emotion such as fear may initiate sudden death if there is coronary artery disease. Chronic stress linked with heart disease suggests a role for stress management interventions. (6,7) Risk for sudden death in psychiatric patients is confounded by substance misuse or depression. (8,9) Myocardial infarction patients with depression are 3.5 times more likely to die. While pathologists are faced with the complexity of cardiac diseases that cause sudden death in the absence of coronary artery disease, (10) many sudden deaths are due to familial heart muscle (cardiomyopathy). However, both hypertrophic cardiomyopathy and arrhythmogenic right ventricular dysplasia are difficult to detect, requiring detailed myocardial histology. Rossi (11) suggest pathological microscopic methodology for the brain stem and upper thoracic spinal cord to identify an anatomical substrate for arrhythmogenic QT-interval prolongation and bulbo-spinal sympathovagal abnormalities associated with sudden cardiac death with no evidence of cardiovascular respiratory disease. The most common cause of death in exercise related sudden cardiac is fatal arrhythmia. Collective review of these studies suggests assessment of medical histories and cardiovascular and EEG evaluation of surviving family members may help to clarify risks for SUD.

CONCLUSION. It is best for each individual, whether a patient or an astronaut, to address the effects of stress in order to minimize interference with normal shuttle and space station operations and allow them to do their assigned tasks with the best possible performance during space flight. If the stress level experienced by the space traveler is greater than appropriate for the circumstances, individulized interventions such as counseling by the assigned flight surgeon would be indicated. If the excessive stress level persists, consultation with a clinical psychologist with expertise in stress reduction would then be indicated. While an appropriate level of stress can enhance performance and alertness, excessive stress must be recognized as being detrimental to overall performance and needs to be addressed.