

On-Orbit Prospective Echocardiography on International Space Station Crew

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Introduction

A prospective trial of echocardiography was conducted on of six crewmembers onboard the International Space Station. The main objective was to determine the efficacy of remotely guided tele-echocardiography, including just-in-time e-training methods and determine what “space normal” echocardiographic data is.

Methods

Each crewmember operator (n=6) had 2-hour preflight training. Baseline echocardiographic data were collected 55 to 167days preflight. Similar equipment was used in each 60-minute in-flight session (mean microgravity exposure - 114 days (34 – 190)). On Orbit ultrasound operators used an e-learning system within 24h of these sessions. Expert assistance was provided using ultrasound video downlink and two-way voice. Testing was repeated 5 to 16 days after landing. Separate ANOVA was used on each echocardiographic variable (n=33). Within each ANOVA, three tests were made: a) effect of mission phase (preflight, in-flight, post flight); b) effect of echo technician (two technicians independently analyzed the data); c) interaction between mission phase and technician.

Results

Nine rejections of the null hypothesis (mission phase or technician or both had no effect) were discovered and considered for follow up. Of these, six rejections were for significant technician

effects, not as a result of space flight. Three rejections of the null hypothesis (Aortic Valve time velocity integral, Mitral E wave Velocity and heart rate) were attributable to space flight, however determined not to be clinically significant. No rejections were due to the interaction between technician and space flight.

Conclusion

No consistent clinically significant effects of long-duration space flight were seen in echocardiographic variables of the given group of subjects.