Fiscal Year:	FY 2012	**Task Last Updated:**	FY 07/12/2012
PI Name:	Levine, Benjamin D M.D.		
Project Title:	Cardiovascular Imaging and Strategies to Mitigate the Risk for Cardiac Events in Astronauts During Prolonged Spaceflight		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Cardiovascular Alterations Team		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Cardiovascular**:Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes (2) **Medical Conditions**:Risk of Adverse Health Outcomes and Decrements in Performance Due to Medical Conditions that occur in Mission, as well as Long Term Health Outcomes Due to Mission Exposures		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	214-345-4619
Organization Name:	The University of Texas Southwestern Medical Center at Dallas		
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City:	Dallas	**State:**	TX
Zip Code:	75231-5129	**Congressional District:**	5
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2009 Crew Health NNJ09ZSA002N
Start Date:	06/01/2010	**End Date:**	05/31/2014
No. of Post Docs:	1	**No. of PhD Degrees:**	0
No. of PhD Candidates:	0	**No. of Master' Degrees:**	0
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	0
No. of Bachelor's Candidates:	2	**Monitoring Center:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Radford, Nina (Cooper Institute) Khera, Amit (The University of Texas Southwestern Medical Center at Dallas)		
Grant/Contract No.:	NCC 9-58-CA02201		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	This proposal to the Cardiovascular Alterations Team will enhance current NASA cardiovascular disease risk reduction strategies by partnering with investigators for the Aerobics Center Longitudinal Study (ACLS) and the Dallas Heart Study (DHS) to determine how to minimize the risk of a catastrophic cardiovascular event in asymptomatic astronauts. During an exploration class space mission, such as a mission to Mars, astronauts will not have access to comprehensive health care services for periods of 2 years, and possibly longer. Since the majority of experienced astronauts are middle aged (average age 46, range 33-58 years), they are at risk for developing serious cardiovascular events which are life-threatening for the astronaut, and mission threatening for NASA. The ability to identify 'at risk' individuals who are currently asymptomatic is a topic of intense research within the cardiovascular community that is relevant both for NASA and public health. The primary objective of this application is to determine the risk of coronary events associated with changes in coronary artery calcium (CAC) scores over time, and to determine whether this risk can be mitigated by increases in physical fitness, or use of lipid lowering therapy. Hypothesis 1: A change in coronary calcium score over time from <10 to >10, is associated with an increase in risk for coronary events; this risk is most prominent when the CAC score increases above a threshold level of 100. Hypothesis 2: The increased risk associated with increasing CAC scores is mitigated by increasing levels of physical fitness and/or the use of lipid lowering therapy (statins). To test these hypotheses, we will accomplish the following specific aims: Specific Aim 1: To identify ALL clinical events in the ACLS data base. We will identify and verify all myocardial infarctions, new onset angina, and revascularization procedures in ACLS patients who fit the astronaut demographics and who have had more than one CAC measurement. Specific Aim 2: To update the ACLS data base to include information about timing and dose of statin medications. This information will be linked with treadmill time and the clinical events from aim 1 to developed robust risk prediction models. After completion of these specific aims we will acquire information that is essential to inform decisions regarding astronaut selection for space exploration and will allow the flight surgeons to minimize the risk for catastrophic cardiovascular events. The project will have wide spread implications for public health and cardiovascular risk reduction in the population at large, especially for the asymptomatic individual.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	After completion of these specific aims we will acquire information that is essential to inform decisions regarding astronaut selection for space exploration and will allow the flight surgeons to minimize the risk for catastrophic cardiovascular events. The project will have wide spread implications for public health and cardiovascular risk reduction in the population at large, especially for the asymptomatic individual. The novel risk assessment algorithm being developed by NSBRI investigators, NASA flight surgeons, and national CVD prevention experts will have wide ranging influence and may replace the Framingham risk score as the definitive assessment of CV risk.
Task Progress:	We have had great success obtaining complete responses in more than 80% of our multiple scan patients, a response rate that rivals other large prospective trials, using our approach of survey letters, internet mailings, telephone calls, search of electronic medical record, and Medicare data base. We have verified virtually all of 656 events in patients with multiple scans, and >50% of the 1,054 with single scans. This is a very high event rate and will DEFINITELY allow us to accomplish our aims.
Bibliography Type:	Description: (Last Updated: 12/13/2023)
Articles in Peer-reviewed Journals	Hastings JL, Krainski F, Snell PG, Pacini EL, Jain M, Bhella PS, Shibata S, Fu Q, Palmer MD, Levine BD. "Effect of rowing ergometry and oral volume loading on cardiovascular structure and function during bed rest." J Appl Physiol. 2012 May;112(10):1735-43. Epub 2012 Feb 16. PubMed PMID: 22345434 ; http://dx.doi.org/10.1152/japplphysiol.00019.2012 , May-2012
Articles in Peer-reviewed Journals	Shibata S, Hastings JL, Prasad A, Fu Q, Bhella PS, Pacini E, Krainski F, Palmer MD, Zhang R, Levine BD. "Congestive heart failure with preserved ejection fraction is associated with severely impaired dynamic Starling mechanism." J Appl Physiol. 2011 Apr;110(4):964-71. Epub 2011 Feb 10. PubMed PMID: 21310890 ; http://dx.doi.org/10.1152/japplphysiol.00826.2010 , Apr-2011
Articles in Peer-reviewed Journals	Shibata S, Levine BD. "Biological aortic age derived from the arterial pressure waveform." J Appl Physiol. 2011 Apr;110(4):981-7. Epub 2011 Feb 3. PubMed PMID: 21292839 ; http://dx.doi.org/10.1152/japplphysiol.01261.2010 , Apr-2011
Articles in Peer-reviewed Journals	Shibata S, Levine BD. "Effect of exercise training on biologic vascular age in healthy seniors." Am J Physiol Heart Circ Physiol. 2012 Mar 15;302(6):H1340-6. Epub 2012 Jan 20. PubMed PMID: 22268113 ; http://dx.doi.org/10.1152/ajpheart.00511.2011 , Mar-2012