

Fiscal Year:	FY 2011	Task Last Updated:	FY 10/12/2011
PI Name:	Dulchavsky, Scott A. M.D., Ph.D.		
Project Title:	Intuitive Ultrasound Catalog for Autonomous Medical Care		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Smart Medical Systems and Technology Team		
Joint Agency Name:	TechPort:	Yes	
Human Research Program Elements:	(1) ExMC: Exploration Medical Capabilities		
Human Research Program Risks:	(1) 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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City:	Detroit	State:	MI
Zip Code:	48202-2608	Congressional District:	13
Comments:			
Project Type:	GROUND	Solicitation / Funding Source:	Directed Research
Start Date:	01/01/2007	End Date:	06/30/2011
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	1	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	4	Monitoring Center:	NSBRI
Contact Monitor:	Contact Phone:		
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: End date is now 6/30/2011 (previously 12/31/2010) per NSBRI (Ed., 10/10/2011) NOTE: Title change in October 2009 (previous title, "Ultrasound Catalog for Autonomous Medical Care").		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Hamilton, Doug (NASA Johnson Space Center) Melton, Shannon (Wyle Laboratories) Sargsyan, Ashot (Wyle Laboratories) Peck, Donald (Henry Ford Health System) Soltanian-Zadeh, Hamid (Henry Ford Health System)		
Grant/Contract No.:	NCC 9-58-SMS00002		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>The diagnosis and management of acute health problems in space is problematic; there is no radiological capability aboard the International Space Station (ISS); however, an ultrasound system is operational. Terrestrial investigations suggest expanded clinical applications of ultrasound, which could be used to diagnose over 75% of space medical conditions. This proposal will use an outcomes oriented approach to develop an intuitive ultrasound image catalog, coupled with just-in-time training methods, to allow non-experts to acquire and interpret advanced ultrasound examinations.</p> <p>Specific Aim 1: Develop an intuitive ultrasound image cataloging system which incorporates ground acquired ultrasound whole body images. The catalog will acquire ground based crew-member images to use for medical diagnosis in space.</p> <p>Specific Aim 2: A mathematical coupling model will be developed based on existing ground/in-flight ultrasound data which will allow microgravity associated morphometric and topographic changes to be predicted.</p> <p>Specific Aim 3: Assess the ability of non-physician crew medical officers (CMO) analogs to acquire and interpret complex ultrasound examinations autonomously or with remote guidance.</p> <p>The constraints of spaceflight require the development of novel strategies for crew member health problems including ultrasound. Evidence based trials have demonstrated the accuracy of ultrasound in aerospace relevant clinical conditions when performed and interpreted by experts. ISS experiments have shown that just-in-time trained astronaut crew-members, augmented by on-board proficiency enhancement, can acquire complex, diagnostic quality ultrasound images. Expanding just-in-time ultrasound training to autonomous ultrasound operation, coupled with enhanced on-site interpretative capabilities, significantly expands diagnostic capabilities during exploratory class space missions. The majority of the training algorithms in this proposal are readily transferable to terrestrial medicine and provide a significant, clinically relevant advance in space medical capabilities with profound Earth-based ramifications.</p>
Rationale for HRP Directed Research:	<p>The educational methods that were developed for the Intuitive Ultrasound Catalog are directly beneficial to medical care on Earth. These methods have been successfully transitioned to the following organizations:</p> <p>United States Olympic Committee: We supported the 2010 Winter Olympic Games in Vancouver</p> <p>National Football League: We are currently working with the Detroit Lions, Atlanta Falcons, and Chicago Bears</p> <p>National Hockey League: Detroit Red Wings</p> <p>American League Baseball: Detroit Tigers</p> <p>National Basketball Association: Detroit Pistons</p> <p>United Nations: Millenium Development Project, Team Leader Infopoverty Section</p> <p>WINFOCUS: World Conference on Ultrasound, Critical Care Medicine Symposium</p> <p>University of Michigan Center for Entrepreneurship: Technology Development</p> <p>Wayne State University School of Medicine: used for medical student ultrasound education</p> <p>American College of Surgeons: the Basic Ultrasound Course for Surgeons uses this technology.</p> <p>Our ocular ultrasound technique to measure intra-cranial pressure is being tested in human trials in the ICU and was presented to the Armed forces. A number of spinoff companies, Medical Imagineering and Ultrasound Education Technologies, were formed to produce phantom ultrasound models, and ultrasound training videos, respectively. Major ultrasound manufacturers (GE, Sonosite) and simulation centers now use these products.</p>
Task Progress:	We are concluding data analysis.
Bibliography Type:	Description: (Last Updated: 02/23/2023)
Articles in Peer-reviewed Journals	Afonso N, Amponsah D, Yang J, Mendez J, Bridge P, Hays G, Baliga S, Crist K, Brennan S, Jackson M, Dulchavsky S. "Adding new tools to the black bag--introduction of ultrasound into the physical diagnosis course." J Gen Intern Med. 2010 Nov;25(11):1248-52. Epub 2010 Aug 10. http://dx.doi.org/10.1007/s11606-010-1451-5 ; PMID: 20697974 , Nov-2010
Articles in Peer-reviewed Journals	Benninger MS, McFarlin K, Hamilton DR, Rubinfeld I, Sargsyan AE, Melton SL, Moyhi M, McLaren PJ, Dulchavsky SA. "Ultrasonic evaluation of sinusitis during microgravity in a novel animal model." Arch Otolaryngol Head Neck Surg. 2010 Nov;136(11):1094-8. http://dx.doi.org/10.1001/archoto.2010.196 ; PMID: 21079162 , Nov-2010
Articles in Peer-reviewed Journals	Hamilton DR, Sargsyan AE, Martin DS, Garcia KM, Melton SL, Feiveson A, Dulchavsky SA. "On-orbit prospective echocardiography on International Space Station crew." Echocardiography. 2011 May;28(5):491-501. Epub 2011 Apr 29. http://dx.doi.org/10.1111/j.1540-8175.2011.01385.x ; PMID: 21535119 , May-2011
Articles in Peer-reviewed Journals	Hamilton DR, Sargsyan AE, Melton SL, Garcia KM, Oddo B, Kwon DS, Feiveson AH, Dulchavsky SA. "Sonography for determining the optic nerve sheath diameter with increasing intracranial pressure in a porcine model." J Ultrasound Med. 2011 May;30(5):651-9. PMID: 21527613 , May-2011
Articles in Peer-reviewed Journals	Otto C, Comtois JM, Sargsyan A, Dulchavsky A, Rubinfeld I, Dulchavsky S. "The Martian Chronicles; remotely guided diagnosis and treatment in the Arctic Circle." Surg Endosc. 2010 Sep;24(9):2170-7. Epub 2010 Mar 13. http://dx.doi.org/10.1007/s00464-010-0917-1 ; PMID: 20229213 , Sep-2010