Fiscal Year:	FY 2013	**Task Last Updated:**	FY 02/06/2014
PI Name:	Bailey, Michael R. Ph.D.		
Project Title:	Prevention of Renal Stone Complications in Space Exploration		
Division Name:	Human Research		
Program/Discipline:			
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**:Risk of Adverse Health Outcomes & Decrements in Performance due to Inflight Medical Conditions (IRP Rev I) (2) **Renal**:Risk of Renal Stone Formation		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Seattle	**State:**	WA
Zip Code:	98105-6698	**Congressional District:**	7
Comments:			
Project Type:	GROUND	**Solicitation:**	2012 Crew Health NNJ12ZSA002N
Start Date:	06/01/2013	**End Date:**	05/31/2016
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Crum, Lawrence (University of Washington) Cunitz, Bryan (University of Washington) Dunmire, Barbrina (University of Washington) Harper, Jonathan (University of Washington) Khokhlova, Vera (University of Washington) Kreider, Wayne (University of Washington) Maxwell, Adam (University of Washington) Paun, Marla (University of Washington) Sapozhnikov, Oleg (University of Washington) Sorensen, Matthew (University of Washington) Starr, Frank (University of Washington)		
Grant/Contract No.:	NCC 9-58-SMST03402		
Performance Goal No.:			

Performance Goal Text:	
Task Description:	The objective of this proposal is to refine and validate ultrasound to reposition kidney stones to prevent medical complications on space exploration missions. The objective will be met by adding a probe and software to the Flexible Ultrasound System. The probe will send ultrasound through the skin to create real time images of the stone and kidney and also to move or fragment the stone within the kidney. In Aim 1, the probe(s) will be refined. The capability to image and reposition stones will be added to 1) the kidney imaging probe of the FUS manufacturer and 2) a clinical 3D probe. A third plug-and-play probe will also be developed to fragment kidney stones as a last resort. In Aim 2, the first probe will be validated as a countermeasure for the contingency of stone formation. The five tasks in Aim 2 are to refine and validate the capability 1) to displace a large blocking stone from occluding the exit of the kidney to delay treatment and complications, 2&3) to detect and displace a medium-sized stone in the ureter to alleviate complications, 4) to expel a small stone from the kidney to avoid complications, and 5) to measure the size of kidney stones to inform decision making. Repositioning experiments will be conducted in animals where stones will be surgically implanted by retrograde percutaneous nephrostolithotomy in a porcine model. Stone detachment will be tested in a second porcine model in which a diet high in hydroxyproline produces small, attached kidney stones. Imaging and stone sizing will be conducted first in animals and then in human subjects. This proposal is in response to the emphasis point of the solicitation: “Refine and validate plug-and-play sensor and effector probes that integrate seamlessly with the proposed NASA Flexible Ultrasound System and address or mitigate medical conditions likely to be encountered during exploration missions.” It specifically addresses “ExMC Gap Report 4.13 Limited capability to diagnose and treat a renal stone.” The work is significant because if a stone forms in space, there are limited options to minimize or reduce complications – primarily analgesics, anti-inflammatories, and muscle relaxants – and potentially life threatening consequences. With the substitution of a probe and new software, the proposed work provides the crew and flight surgeons options to pass the stone, to prevent the stone from passing, to accelerate a stone that is passing, and if needed to break the stone. And it works without restricting any other possible options.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	0
Task Progress:	New project for FY2013.
Bibliography Type:	Description: (Last Updated: 10/09/2019)