

# Exploration Medical Capability

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## ABSTRACT

Exploration Medical Capability (ExMC) is an element of NASA's Human Research Program (HRP). ExMC's goal is to address the risk of the "Inability to Adequately Recognize or Treat an Ill or Injured Crewmember." This poster highlights the approach ExMC has taken to address this goal and our current areas of interest.

The Space Medicine Exploration Medical Condition List (SMEMCL) was created to identify medical conditions of concern during exploration missions. The list was derived from space flight medical incidents, the shuttle medical checklist, the International Space Station medical checklist, and expert opinion. The conditions on the list were prioritized according to mission type by a panel comprised of flight surgeons, physician astronauts, engineers, and scientists. From the prioritized list, the ExMC element determined the capabilities needed to address the medical conditions of concern. Where such capabilities were not currently available, a gap was identified. The element's research plan outlines these gaps and the tasks identified to achieve the desired capabilities for exploration missions.

This poster is being presented to inform the audience of the gaps and tasks being investigated by ExMC and to encourage discussions of shared interests and possible future collaborations.

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## THE HUMAN RESEARCH PROGRAM

NASA's Human Research Program (HRP) conducts research and develops technologies that allow humans to travel safely and productively in the environment of space

- The HRP is comprised of six Elements
- International Space Station Medical Project
  - Space Radiation
  - Human Health Countermeasures
  - Exploration Medical Capability
  - Behavioral Health & Performance
  - Space Human Factors and Habitability

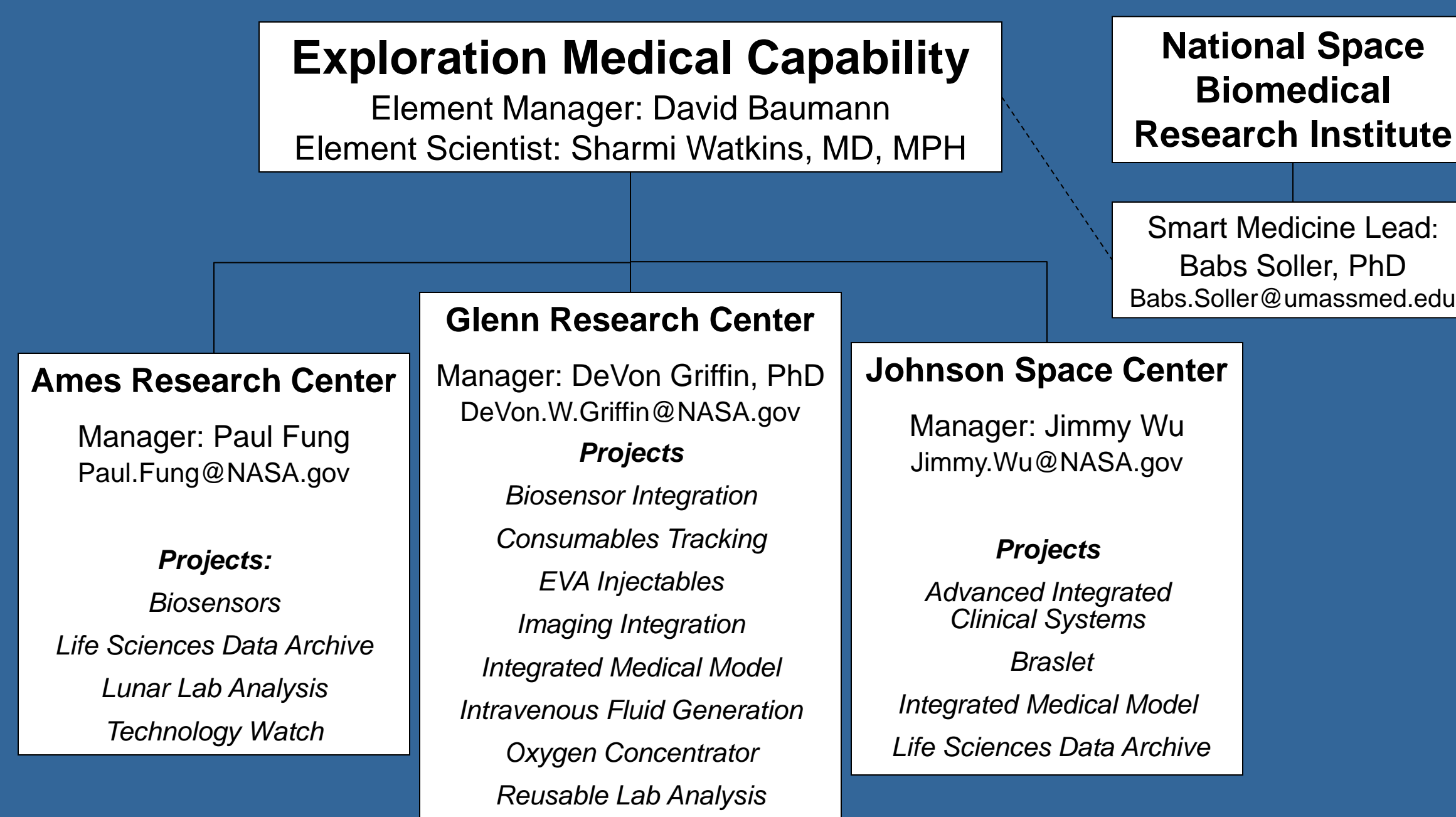
The National Space Biomedical Research Institute (NSBRI) is a partner with the HRP in developing a successful human research program.

## EXPLORATION MEDICAL CAPABILITY

The Exploration Medical Capability (ExMC) Element is charged with reducing the risk of the "inability to adequately recognize or treat an ill or injured crewmember" during an exploration mission

- To address this risk, the Element must
- Define requirements for crew health maintenance
  - Develop treatment scenarios
  - Extrapolate from the scenarios to health management modalities
  - Evaluate the feasibility of these modalities
  - Develop technology and informatics that will enable the availability of medical care and decision systems

## ORGANIZATIONAL STRUCTURE



## APPROACH

To address the broad risk of the inability to adequately recognize or treat an ill or injured crewmember, the Element identified medical conditions of concern for exploration missions.

- The conditions were gathered from several sources
- Spaceflight medical incidents
  - Conditions on the Shuttle medical checklist
  - Conditions on the International Space Station (ISS) medical checklist
  - Expert opinion

## THE CONDITION LIST

There are approximately eighty conditions on the condition list approved by the NASA's Space Medicine Division in July 2009

The conditions were prioritized by a panel of flight surgeons, physician astronauts, engineers, and scientists based on incidence, consequence, and mitigation capability

- The condition list is a "living document"
- New conditions can be added to the list
  - The priority of conditions on the list can be adjusted as screening, diagnosis, or treatment capabilities change



Artist's Concept of Manned Exploration Mission, NASA

## IDENTIFICATION OF GAPS

From the prioritized condition list, ExMC annually determines the capabilities needed to address the medical conditions of concern

Where such capabilities are not currently available, a gap is identified

- ExMC currently identifies gaps in the following areas
- Validation of Medical Standards
  - Risk Quantification
  - Risk Mitigation
  - Monitoring and Treatment of Conditions of Concern
  - Enabling Capabilities

For each gap, ExMC conducts a Technology Watch to identify emerging high-impact technologies that

- Augment ongoing efforts
- Accelerate the development of medical care and research capabilities

## AREAS OF INTEREST

- Novel medical screening technologies
- Delivery of medical training to non-clinicians
- Autonomous medical procedure systems
- Noninvasive diagnostic imaging
- Smart ventilators and oxygen concentrators
- Minimally invasive laboratory capabilities
- Stabilization and treatment of bone fractures
- Wound care and wound closure
- Rapid vascular access
- Advanced dental care
- Intravenous fluid generation
- Inventory tracking for medications and other consumables
- Medication stability and shelf-life preservation
- Biomedical monitoring capabilities
- Medical data management systems
- Prevention and treatment of radiation sickness

## LINKS

Human Research Program Site  
<http://humanresearch.jsc.nasa.gov/>

HRP Integrated Research Plan  
[http://humanresearch.jsc.nasa.gov/files/IRP\\_HRP-47065.pdf](http://humanresearch.jsc.nasa.gov/files/IRP_HRP-47065.pdf)

HRP Roadmap  
<http://humanresearchroadmap.nasa.gov/>