The National Space Biomedical Research Institute

Surgical Capabilities for Exploration and Colonization Space Flight – An Exploratory Symposium

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NSBRI Headquarters: BRC Room 280
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Co-Chairs:	**George Pantalos, PhD**	University of Louisville/Cardiovascular Innovation Institute
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Symposium Goal: Identify realistic and achievable pathways for surgical capabilities during exploration and colonization space operations and develop a list of recommendations to the NASA Human Research Program to address challenges to developing surgical capabilities.

Symposium Objectives:

1) Review current planning for healthcare delivery for Lunar colonization and Martian expeditions
2) Review previous and current efforts to develop surgical capabilities and related technologies for human space flight.
3) Given current capabilities and mission planning, propose reasonable scenarios and methods for delivery of surgical treatment.
4) Identify short term and long-term basic and applied science research initiatives as well as engineering and medical product development needed to answer existing challenges for surgical capabilities in space flight.

Symposium Schedule, Day 1

AM:
• Breakfast and Registration
• Welcome to NSBRI
• Introduction of Participants
• Symposium Background
• Current Medical Capabilities on the ISS and other capabilities that have been or are being considered
• Current Speculation and Planning for Lunar Colonization and Martian Expeditions including crew systems, healthcare delivery, and crew management and training
• Capabilities for surgical treatment in extreme environments (submarine, Antarctica , forward medical unit)
• Probabilities of medical conditions to be experienced in exploration colonization space flight

PM:
• Review of past and current efforts to define and develop surgical capabilities for space flight (parabolic flight, orbital flight, NEEMO, etc.)

• Review of emerging minimally invasive or non-invasive surgical and imaging technologies and technologies for battlefield and forward medical unit treatment including the use of smart systems
• Current practice of the FDA to review medical technologies for extreme environments
• Current practice of NASA to flight-qualify hardware and materials for space flight
• Data Blitz: 3-6 minute extemporaneous slide presentations to enhance symposium discussion

Dinner for all symposium participants with a speaker on the topic relevant to the symposium

Day 2 (AM only)
• Identify key challenges for basic and applied sciences to advance surgical capabilities for space flight
• Identify key challenges for engineering and product development to advance surgical capabilities for space flight
• Identify key challenges for mission planning and spacecraft utilization to advance surgical capabilities for space flight
• Develop prioritized recommendations to NASA/HRP for next steps and follow-up to develop surgical capabilities for space flight

Topics for Consideration, Presentation and/or Discussion during Sessions:

1) What is the current knowledge base for surgical care in space?
2) What surgical procedures are anticipated in exploration and colonization space flight?
3) What is the current planning for exploration space missions including considerations for healthcare delivery
4) Are there unique surgical equipment and supplies needed for space flight?
5) How do we regulate and qualify surgical equipment and supplies for space flight?
6) How do you identify and establish the space where a surgical procedure can take place and what is that space the rest of the time?
7) How do you establish and maintain a sterile field in space flight environments?
8) How do you manage fluids and suction in space flight environments?
9) What techniques for hemostasis are appropriate for space flight environments?
10) What needs to be anticipated for adequate post-operative care, rehabilitation, and resumption of crewmember activity?
11) What considerations need to be made for palliative/hospice care?
12) What are the qualifications and training (prior to and during flight) of a crew member responsible for surgical services in a space flight environment?
13) What diagnostic capabilities are needed?
14) How do you manage anesthesia, ventilation, and analgesia in a space flight environment?
15) How do you contain and control a surgical or trauma site in a space flight environment?
16) What surgical supplies and instruments are disposable and which are re-useable? How do you decontaminate and re-sterilize re-useable instruments and materials and how do you dispose of the disposable materials without contaminating the space craft?
17) Is it possible to capture and re-claim fluids used in surgical procedures to minimize the amount of consumable fluids needed for a mission?
18) How can artificial intelligence and/or smart systems be integrated?
19) How can robotics be incorporated?
20) Are there special concerns for wound healing in reduced gravity?
21) At what point is communication transmission latency reduce or eliminate efficacy for guiding or consulting on medical/surgical procedures?