

The National Space Biomedical Research Institute

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

December 9-10, 2015

NSBRI Headquarters: BRC Room 280
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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?