Meeting: 75th AsMA Annual Scientific Meeting: Frontiers in Aerospace Medicine

Tracking Id: 97911

Abstract Type: Panel
Status: Accepted

Author: Andrew Kirkpatrick
University of Calgary
Critical Care Medicine
Foothills Medical Centre
Calgary, Alberta Canada
Entered By, Primary Author, Presenting Author

David Dawson
University of California, Davis
Division of Vascular Surgery
2221 Stockton Blvd, 2nd Floor
Sacramento, CA United States 95817
Co-author

Mark Campbell
Wyle Life Sciences
Paris, TX United States
Co-author

Jeff Jones
NASA-Johnson Space Center
Houston, TX United States 77058
Co-author

Chad G. Ball
University of Calgary
Surgery
132 Silvergrove Rd N.W.
Calgary, Alberta Canada T3B 4K1
Co-author

Douglas R. Hamilton
Wyle Life Sciences
1290 Hercues Drive 77058
Suite 120
Houston, TX United States 77058
Co-author
Scott Dulchavsky
Henry Ford Hospital
Surgery
2799 W Grand Blvd
Detroit, MI United States
Co-author

Paul McBeth
University of Calgary
Foothills Medical Centre
Calgary, Alberta Canada
Co-author

John Holcomb
U.S. Army Institute of Surgical Research
Fort Sam Houston, TX United States
Co-author
Introduction: Managing injury and illness during long duration space flight limits efforts to explore beyond low earths orbit. Traumatic injury may be expected to occur in space and is a frequent cause of preventable deaths, often related to uncontrolled or ongoing hemorrhage (H). Such bleeding causes 40% of terrestrial injury mortality. Current guidelines emphasize early control of H compared to intravenous infusions. Recent advances in surgical and critical care may be applicable to trauma care in space, with appropriate considerations of the extreme logistical and personnel limitations. Methods: Recent developments in technique, resuscitation fluids, hemoglobin (Hb) substitutes, hemostatic agents, interventional angiography, damage control principles, and concepts related to suspended animation were reviewed. Results: H associated with instability frequently requires definitive intervention. Direct pressure should be applied to all compressible bleeding, but novel approaches are required for intracavitary noncompressible bleeding. Intravenous hemostatic agents such as recombinant Factor VII may facilitate hemostasis especially when combined with a controlled hypotension approach. Both open and laparoscopic techniques could be used in weightlessness, but require technical expertise not likely to be available. Specific rehearsed invasive techniques such as laparotomy with packing, or arterial catheterization with with robotic intravascular embolization might be considered. Hemodynamic support, thermal manipulation, or pharmacologic induction of a state of metabolic down regulation for whole body preservation may be appropriate. Hypertonic saline, with or without dextran, may temporize vascular support and decrease reperfusion injury, with less mass than other solutions. Hb substitutes have other theoretical advantages. Conclusions: Terrestrial developments suggest potential novel strategies to control H in space, but will required a coordinated program of evaluation and training to evaluate.