Abdominal Injury

From HumanResearchWiki

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Introduction

Abdominal injuries encompass a wide range of possible mechanisms and potential outcomes. Terrestrially, mechanisms of injury may include blunt trauma from falls or collision with small moving objects, while motor vehicle accidents and injury inflicted by fire arms or sharp objects are common causes of penetrating trauma. Injuries may range from mild (manifesting with local hematoma and tenderness) to major injury to intra-abdominal structures (manifesting with massive bleeding).

Clinical Priority and Clinical Priority Rationale by Design Reference Mission

One of the inherent properties of space flight is a limitation in available mass, power, and volume within the space craft. These limitations mandate prioritization of what medical equipment and consumables are manifested for the flight, and which medical conditions would be addressed. Therefore, clinical priorities have been assigned to describe which medical conditions will be allocated resources for diagnosis and treatment. “Shall” conditions are those for which diagnostic and treatment capability must be provided, due to a high likelihood of their occurrence and severe consequence if the condition were to occur and no treatment was available. “Should” conditions are those for which diagnostic and treatment capability should be provided if mass/power/volume limitations allow. Conditions were designated as “Not Addressed” if no specific diagnostic and/or treatment capability are expected to be manifested, either due to a very low likelihood of occurrence or other limitations (for example, in medical training, hardware, or consumables) that would preclude treatment. Design Reference Missions (DRMs) are proposed future missions designated by a set of assumptions that encompass parameters such as destination, length of mission, number of crewmembers, number of Extravehicular Activities (EVAs), and anticipated level of care. The clinical priorities for all medical conditions on the Exploration Medical Condition List (EMCL) can be found here (https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All_DRM). The EMCL document may be accessed here (https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL_RevC_2013.pdf).
<table>
<thead>
<tr>
<th>Design Reference Mission</th>
<th>Clinical Priority</th>
<th>Clinical Priority Rationale</th>
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<tbody>
<tr>
<td>Lunar sortie mission</td>
<td>Not Addressed</td>
<td>Under nominal conditions, crewmembers in the low gravity environment of the space vehicle used to reach the moon, as well as on the lunar surface (either inside the lunar habitat or outside on an EVA), will be unlikely to sustain anything more than minor abdominal trauma or strain. The reduced gravity is thought to be protective in that impact forces will be minimized and the pressurized EVA suit is expected to offer some additional protection against abdominal injury. This type of minor injury would be managed with symptomatic treatment alone (analgesics) that would be available onboard the space vehicle and in the habitat, and accounted for under the condition “Sprains/strains/overuse injuries”. In the unlikely event that severe injury should occur, with intra-abdominal organ disruption or penetrating trauma, surgical intervention would be needed. [1]</td>
</tr>
<tr>
<td>Lunar outpost mission</td>
<td>Not Addressed</td>
<td>Under nominal conditions, crewmembers in the low gravity environment of the space vehicle used to reach the moon, as well as on the lunar surface (either inside the lunar habitat or outside on an EVA), will be unlikely to sustain anything more than minor abdominal trauma or strain. The reduced gravity is thought to be protective in that impact forces will be minimized and the pressurized EVA suit is expected to offer some additional protection against abdominal injury. This type of minor injury would be managed with symptomatic treatment alone (analgesics) that would be available onboard the space vehicle and in the habitat, and accounted for under the condition “Sprains/strains/overuse injuries”. In the unlikely event that severe injury should occur, with intra-abdominal organ disruption or penetrating trauma, surgical intervention would be needed. [1]</td>
</tr>
<tr>
<td>Near-Earth Asteroid (NEA) mission</td>
<td>Should</td>
<td>Under nominal conditions, crewmembers in the microgravity environment of the NEA mission will be unlikely to sustain anything more than minor abdominal trauma or strain. The reduced gravity is thought to be protective in that impact forces will be minimized and, during EVAs, the pressurized EVA suit is expected to offer some additional protection against abdominal injury. Minor abdominal injuries can be managed with observation and symptomatic treatment (analgesics).</td>
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Initial Treatment Steps During Space Flight

A link is provided to a prior version of the International Space Station (ISS) Medical Checklist, which outlines the initial diagnostic and treatment steps recommended during space flight for various conditions which may be encountered onboard the ISS. Further diagnostic and treatment procedures beyond the initial steps outlined in the Medical Checklist are then recommended by the ground-based Flight Surgeon, depending on the clinical scenario. Please note that this version does not represent current diagnostic or treatment capabilities available on the ISS. While more recent versions of this document are not accessible to the general public, the provided version of the checklist can still provide a general sense of how medical conditions are handled in the space flight environment. Medical Checklists will be developed for exploration missions at a later point in time.

Please note this file is over 20 megabytes (MB) in size, and may take a few minutes to fully download.

ISS Medical Checklist (http://www.nasa.gov/centers/johnson/pdf/163533main_ISS_Med_CL.pdf)

Capabilities Needed for Diagnosis

The following is a hypothetical list of capabilities that would be helpful in diagnosis. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.

- Vital signs measurement capability (blood pressure, pulse, respiratory rate, temperature, pulse oximetry)
- Auscultation device (such as a stethoscope)
- Non-sterile gloves
- Cardiac [Electrocardiograph (ECG)] monitor
- Imaging [such as ultrasound, computed tomography (CT), Magnetic Resonance Imaging (MRI)]
- Urine analysis
- Blood analysis

Capabilities Needed for Treatment

The following is a hypothetical list of capabilities that would be helpful in treatment. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.

- Bandaging
- Intravascular volume replacement [such as intravenous (IV) fluids]
- IV start & administration kit
- IV pump or pressure infuser
- IV antibiotics to cover gastrointestinal (GI) flora
- Analgesics (non narcotic, narcotic, oral, injectable)
- Blood products
- Vasopressors
- Suture or stapling kit
- Suction device
- Sterile gloves
- Skin cleanser [such as alcohol/Benzalkonium antiseptic (BZK)/iodine]
- Sharps container
- Nasal gastric tube

**Associated Gap Reports**

*The NASA Human Research Program (HRP) identifies gaps in knowledge about the health risks associated with human space travel and the ability to mitigate such risks. The overall objective is to identify gaps critical to human space missions and close them through research and development. The gap reports that are applicable to this medical condition are listed below. A link to all of the HRP gaps can be found here (http://humanresearchroadmap.nasa.gov/Gaps/).*

2.01 - We do not know the quantified health and mission outcomes due to medical events during exploration missions.
3.01 - We do not know the optimal training methods for in-flight medical conditions identified on the Exploration Medical Condition List taking into account the crew medical officer’s clinical background. (Closed)
4.01 - We do not have the capability to provide a guided medical procedure system that integrates with the medical system during exploration missions.
4.02 - We do not have the capability to provide non-invasive medical imaging during exploration missions.
4.04 - We do not have the capability to deliver supplemental oxygen to crew members while minimizing local and cabin oxygen build-up during exploration missions.
4.05 - We do not have the capability to measure laboratory analytes in a minimally invasive manner during exploration missions.
4.07 - Limited wound care capability to improve healing following wound closure (Closed)
4.09 - We do not have the capability to provide medical suction and fluid containment during exploration missions.
4.12 - We do not have the capability to generate and utilize sterile intravenous fluid from potable water during exploration missions.
4.14 - We do not have the capability to track medical inventory in a manner that integrates securely with the medical system during exploration missions.
4.15 - Lack of medication usage tracking system that includes automatic time stamping and crew identification
4.17 - We do not have the capability to package medications to preserve stability and shelf-life during exploration missions.
4.19 - We do not have the capability to monitor physiological parameters in a minimally invasive manner during exploration missions.
4.23 - We do not have the capability to auscultate, transmit, and record body sounds during exploration missions.
4.24 - Lack of knowledge regarding the treatment of conditions on the Space Medicine Exploration Medical Condition List in remote, resource poor environments (Closed)
5.01 - We do not have the capability to comprehensively manage medical data during exploration missions.

**Other Pertinent Documents**

**List of Acronyms**

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<thead>
<tr>
<th>B</th>
<th>BZK</th>
<th>Benzalkonium Antiseptic</th>
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<tr>
<td>C</td>
<td>CT</td>
<td>Computed Tomography</td>
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<tr>
<td>D</td>
<td>DRM</td>
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<td></td>
<td>E</td>
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<td></td>
<td>MRI</td>
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<tr>
<td>N</td>
<td>NEA</td>
<td>Near Earth Asteroid</td>
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<tr>
<td>T</td>
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References


Last Update

This topic was last updated on 8/12/2014 (Version 2).


Category: Medical Conditions