Clinical Finding Form (CliFF)

Branch: Baseline

ICL91_Space Adaptation - Back Pain

Back pain is frequently reported by astronauts during the early phase of spaceflight as they adapt to microgravity. The nature of the pain is localized, non-radiating pain involving the paravertebral muscles. Relief is often reported with spinal flexion in the fetal position. Non-steroidal anti-inflammatory agents have also proven to be effective. This syndrome usually subsides after the first several days inflight. Although space adaptation back pain (SABP) is common among astronauts, most cases are mild, self-limited, or responsive to available treatments. The precise mechanism and spinal structures responsible for SABP are uncertain, but evidence supports the hypothesis of spinal lengthening as a causative factor. It is not possible to predict with any degree of certainty those astronauts who will develop SABP. There are also no currently accepted preventive measures for SABP. Several effective in-flight treatments are available, such as body positioning (knees bent to chest) and analgesic medications (ibuprofen and acetaminophen). To date, there has been no documented evidence of direct operational mission impact related to SABP. However, there is the potential for mission impact due to impaired crew performance related to uncontrolled pain, sleep disturbance, or the adverse side effects of medications.

INCIDENCE DATA INCLUDED IN THE MODEL

The model imports the following incidence information from the MEDPRAT Evidence Library Database: incidence data category, space adaption status, EVA status, incidence data type, incidence and occurrence distribution data and incidence data characteristics. Data category defines the type of data available for incidence calculations (i.e. raw data vs. adjusted data). Space adaptation identifies medical events that where onset occurs in the first 5-7 days of flight and does not reoccur. EVA-related incidence values identify medical events that occur only during an EVA. Incidence values types vary by data category and define the number of medical events per person-year (rates) or medical events per person at-risk (proportion) for each medical condition. Incidence values can be modified by crew characteristics such as gender sex and certain crew medical history characteristics. Modifying characteristics are noted below and incidence values are listed individually for each characteristic. Distributions are assigned to medical events incidence values and occurrences in the model. For each crewmember in a given trial, the incidence and number of occurrences of each medical condition are randomly selected from these probability distributions. Detailed descriptions of the distributions are included in the MEDPRAT Technical Description Document.

INCIDENCE DATA

SPACEFLIGHT LITERATURE

An early retrospective study by Wing et al. (1991) conducted a highly cited chart review of n=58 Johnson Space Center astronauts, 68% of whom reported space adaptation back pain (SABP) at some point during the mission. Kerstman et al (2012) expanded this data through a medical record review of Mercury, Apollo, Apollo-Soyuz Test Project (ASTP), Skylab, Mir, International Space Station (ISS), and Shuttle programs and reported SABP incidence as 52% (382/728). Incidence data also included from Pool-Goudzwaard (2015), which may be more accurate with daily surveys but has a smaller sample size.

ANALOG LITERATURE

The highest quality analog incidence data comes from "head-down tilt bed rest" (Hirayanagi, 2009; Belavy, 2011) and "dry immersion" (Treffel, 2017) studies which mimic microgravity and report 80-92% incidence of low back pain. Other analog incidence data was found in pilots - 64.02% of fighter pilots, 89.38% of utility and 74.55% of attack helicopter pilots (Grossman, 2012).

TERRESTRIAL LITERATURE

No terrestrial literature search completed due to this being a space adaptation condition.

OVERALL INCIDENCE SUMMARY

INCIDENCE

mean 0.4899 and SD 0.01687

INCIDENCE SUMMARY

The Bayesian posterior distribution for the incidence proportion given the spaceflight evidence (438 events over 894 person-missions) under an uninformative prior is Beta(shape1=429.68, shape2=447.397) with mean 0.4899 and SD 0.01687. Evidence • HSRB Space Adaptation Back Pain risk update (3-26-2020) Reviewed the LSAH data used for the HSRB update and found 13 extra events over 23 additional person-missions after

ISS Exp 39/40. • LSAH data requests to IMM had 425 total events over 871 person-missions. IP: 0.4879 (95%CI: 0.4543, 0.5217). The LSAH data requests cover through Expedition 39/40, and all STS. Total updated events 438 (425+13) over 894 person-missions (23+871). IP: 0.4899 (95%CI: 0.4567, 0.5232)

TABLE 1. INCIDENCE MODEL

Incidence Details

Incidence Type
SAS

Segment
Space Adaptation

Env. Exposure
NA

Sex
Any

Crowns
Any

Contacts
Any

Pregnancy
Any

Incidence Distribution

Occurrence Dist
Binomial

Incidence Dist.
Beta

Mean
0.4899

SD
0.01687

Beta
(Alpha): 429.68
(Beta): 447.397

Onset Timing (Hours)
(Min): 1
(Max): 120
(Most Likely): 12

TABLE 2. INCIDENCE LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
(NASA HSRB, 2020)	Spaceflight	4

NASA Human System Risk Board presentation on March 26, 2020 (CR SA-02435). LOC = 4 (confident) due to large sample size of inflight astronauts.

CREWMEMBER SELECTION/PREVENTION

DISQUALIFYING CONDITIONS

Refer to Medical Evaluation Documents (MED) Volume A, Medical Standards for ISS Crewmembers, International Space Station Program, Rev 3.4 (2016).

PREFLIGHT PREVENTATIVE MEASURES

There are no currently accepted preventive measures for SABP.

BEST CASE SCENARIO DEFINITION

Back awareness to mild back discomfort.

WORSE CASE SCENARIO DEFINITION

Moderate to severe back pain.

CONDITIONS INCLUDED, BUT NOT EXPLICITLY STATED (CNES)

None

BEST CASE/WORST CASE PROBABILITY COMMENTS

Most of the affected astronauts reported mild pain (86%). Moderate pain was reported by 11% of the affected astronauts and severe pain was reported by 3% of the affected astronauts. Therefore, the best case percentage = 86% and the worst case percentage = 14%.

TABLE 3.BEST/WORST CASE PROBABILITY LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Kerstman, et al. 2012	Spaceflight	4

LOC = 4 (confident) based on this large retrospective study of inflight astronauts.

TABLE 4. CLIFF TREATMENT & OUTCOME TABLE BY CLINICAL PHASE

Case Scenario	Composite Incidence	Condition Probability %	CP1: Diagnosis		CP2: Treatment			CP3: Condition End State				
			TI%	Duration	TI%	Duration		TI%	RTDC		LOCL	
			Preset	Preset	Preset	Min	Max	Preset	Min%	Max%	Min%	Max%
Treated Best Case (TBC)	mean 0.4899 and SD 0.01687	86 - 86	100	0.17	0	0	72	0	0	0	0	0
Treated Worst Case (TWC)		14 - 14	100	0.87	30.6139	0	288	0	0	0	0	0
Untreated Best Case (UTBC)	N/A	N/A	N/A	0.17	30.6139	0	72	0	0	0	0	0
Untreated Worst Case (UTWC)	N/A	N/A	N/A	0.87	70.6883	0	288	0	0	0	0	0

TABLE 4 KEY

Composite Incidence: The same composite incidence will be used for both TBC and TWC. For EVA conditions: events per EVA (events/EVA). For space adaptation conditions: events per person (events/person). For non-spaceflight conditions: events per person year (events/py).

Condition Probability: The probability that CLiFF condition progresses to a worst case scenario. Best case scenario: 100%-Worst Case.

Clinical Phase General Comments:

- TI% = Task Impairment %. Task Impairment is the % of tasks that the crewmember is incapable of performing without impairment secondary to the medical condition.
- Durations are defined in hours.
- Removal to Definitive Care (RTDC): The probability the entire crew aborts the mission and returns to earth. This is considered as a condition end state result if any of the following criteria are met: 1) the potential for LOCL, 2) potential for significant permanent task impairment, or 3) potential for intractable pain.
- Loss of Crew Life (LOCL): The probability of death of affected crewmember due to medical condition.

Clinical Phase 1: Initial Assessment and Diagnosis:

- Covers only the initial assessment and diagnosis of the affected crewmember to define his or her medical condition. While the affected crewmember is being assessed, he or she is not able to perform any assigned tasks, thus Task Impairment (TI) during this phase is considered 100%. In the untreated case, there is no diagnosis performed, therefore Task Impairment and Duration will always be " not applicable."

Clinical Phase 2: Stabilization, Treatment, and Convalescence:

- The affected crewmember is receiving any appropriate initial or follow-on treatment for his or her medical condition to allow the crewmember to recover as much as he or she is able to recover in the spaceflight environment. Clinical phase 2 also encompasses relapses or recurrences of the same original medical condition in Clinical Phase 1. The duration of Clinical Phase 2 is expressed as minimum and maximum hours.

Clinical Phase 3: Condition End State:

- Reached once the affected crewmember has recovered from the medical condition as much as he or she is able to recover in the spaceflight environment amongst treated and untreated best and worst case scenarios. This may or may not be recovery from the given medical condition to the full extent possible. If this “recovered” state results in Removal to Definitive Care (RTDC) or Loss of Crew Life (LOCL) this will be noted in the condition end state results.

SCENARIO OVERVIEW COMMENTS

The definitions of space adaptation back pain--best and worst case scenario--are difficult to define. The highest quality studies are able to use a likert scale to group into mild, moderate-severe cases, however more often than not these data are only reported as "SABP present" or "SABP not present." Overall, the prior CLiFF and included studies demonstrate a high likelihood of spontaneous recovery from space adaptation back pain. RTDC = 0.

TREATED BEST CASE (TBC) SCENARIO COMMENTS

Minimum duration for space adaptation back pain (SABP) was collected from Wing 1991 who reported two Johnson Space Center astronauts with a duration of 1 day SABP. Kerstman's expanded retrospective chart review including all U.S. astronauts provided a maximum duration of SABP (up to day 12). No results reported these data as stratified best or worse case scenarios, also no studies reported treated vs untreated SABP. The prior CLiFF, derived from LSAH chart review, likely contains the most pertinent and omprehensive data. A repeat chart review of NASA-proprietary astronaut data would be needed to gain updated information about SABP.

TREATED WORST CASE SCENARIO (TWC) COMMENTS

Minimum duration for space adaptation back pain (SABP) was collected from Wing 1991 who reported two Johnson Space Center astronauts with a duration of 1 day SABP. Kerstman's expanded retrospective chart review including all U.S. astronauts provided a maximum duration of SABP (up to day 12). No results reported these data as stratified best or worse case scenarios, also no studies reported treated vs untreated SABP. The prior CLiFF, derived from LSAH chart review, likely contains the most pertinent and omprehensive data. A repeat chart review of NASA-proprietary astronaut data would be needed to gain updated information about SABP.

UNTREATED BEST CASE (UTBC) SCENARIO COMMENTS

There is no data regarding untreated SABP. However, even without treatment SABP should be self-limited and resolve with time as astronauts adopt to the microgravity environment.

UNTREATED WORST CASE (UTWC) SCENARIO COMMENTS

There is no data regarding untreated SABP. However, even without treatment SABP should be self-limited and resolve with time as astronauts adopt to the microgravity environment.

TABLE 5. CLINICAL PHASE II DURATION LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Pool-Goudzwaard, 2015	Spaceflight	3
Kerstman, et al. 2012	Spaceflight	
Barratt, 2019	Spaceflight	

LOE = 3 (somewhat confident) based on spaceflight data. Not given an LOE of 4 (confident) since the studies are not detailed enough to provide the precise durations of symptoms and impairment, and since there is no data for the untreated case scenarios. However, based on these references, CP2 duration is estimated as 0 - 72 hours for the best case scenarios and 0 - 288 hours for the worst case scenarios.

TABLE 6. RTDC LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Saile 2017 via prior CLiFF	Spaceflight	4

Based on RTDC data from the prior CLiFF, there is a 0% estimate that space adaptation constipation will result in return to definitive care. Confidence for this estimate is strong as many papers also describe space adaptation constipation as self-limiting and corroborates data from Saile, 2017 in the prior CLiFF. *Student graded each paper-- exceeding the grading instructions-- these numbers were left in the spreadsheet for reference.

TABLE 7. LOCL LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Saile 2017 via prior CLiFF	Spaceflight	4

Based on LOCL data from the prior CLiFF, there is a 0% estimate that space adaptation constipation will result in return to definitive care. Confidence for this estimate is strong as many papers also describe space adaptation constipation as self-limiting and corroborates data from Saile, 2017 in the prior CLiFF. *Student graded each paper-- exceeding the grading instructions-- these numbers were left in the spreadsheet for reference.

CAPABILITY RESOURCE TABLE (CRT) OVERVIEW

Capabilities and Resourcing Scope

Overview
Space adaptation back pain is discomfort associated with transitioning into a microgravity environment. It is commonly experienced by astronauts and often mild though the discomfort can be severe enough to interfere with normal operations. This is especially true in the early stages of flight.

CNES: NONE

Diagnostic Scope and Resourcing
Diagnosis relies on history and physical exam

Clinical Phase 1 Duration and Rationale
This version of IMPACT presumes physician level knowledge, skill, and ability will be present on the mission. The CRT working group SME consensus duration is as follows:

CP1 BC (Treated or Untreated): 0.17 hours for set up, history, and physical exam. Given the mild nature of this case the exam will be limited and brief.

CP1 WC (Treated or Untreated): 0.87 for a set up, history, and physical exam. The increased duration reflect a more thorough exam to investigate the more severe symptoms.

This condition requires a Scope of Practice 5 to manage and rule out other similar presenting conditions, assess treatment response, and assess fitness for duty. The more common best case condition will only require SoP 4.

Treatment Scope and Resourcing
The best case is mild and uses only topical pain management such as Lidocaine patches, diclofenac, and hot/cold packs, along with oral pain medications with primacy given to NSAIDs over acetaminophen. Physical therapy supplies and consult are also included as these are likely to be the most effective treatments. The worst case adds muscle spasm medications with muscle relaxants and diazepam for severe pains.

Communications and Support Needs;

Communications are not expected to be necessary beyond the routine medical ground communications given the context and frequency of this condition. However, it is expected that routine ground communication will be present and available to assist with treatment.

References
Barratt, Michael R., Ellen S. Baker, and Sam L. Pool. 2019. "Principles of clinical medicine for space flight." In. New York, NY: New York, NY : Springer.

Kerstman EL, Scheuring RA, Barnes MG, DeKorse TB, Saile LG. Space adaptation back pain: a retrospective study. Aviat Space Environ Med. 2012 Jan;83(1):2-7. doi: 10.3357/asem.2876.2012. PMID: 22272509.

Penchev R, Scheuring RA, Soto AT, Miletich DM, Kerstman E, Cohen SP. Back Pain in Outer Space. Anesthesiology. 2021 Sep 1;135(3):384-395. doi: 10.1097/ALN.0000000000003812. PMID: 33979426.

IMM CLIFF RECONCILATION COMMENTS

IMM CliFF used as the basis for this CliFF. Additional data obtained from HSRB LSAH data [NASA Human System Risk Board presentation on March 26, 2020 (CR SA-02435)], (Barratt, 2019) reference, and (Pool-Goudzwaard, 2015) reference.

LIMITATIONS SUMMARY

There are no data regarding untreated scenarios since there has been treatment available on all spaceflight missions to date. Possible under reporting of SABP by astronauts.

TABLE 8. TASK IMPAIRMENT CALCULATION BASED ON AFFECTED HUMAN SYSTEMS TASK CATEGORIES (HSTC)

Clinical Phase 2: Treatment												
	Affected HSTCs											
	Cognitive - Simple	Cognitive - Complex	Communications	Inter-personal Skills	Vision	Hearing	Cardio-pulmonary	Dentition	GI	GU		
Treated Best Case (TBC)												
Untreated Best Case (UTBC)		664					145					
Treated Worst Case (TWC)		664					145					
Untreated Worst Case (UTWC)	223	664		89			145					
	Affected HSTCs (Continued)								TI Calculation			TI Score
	Hand (Dom)	Hand (Any)	Upper Extremity	Lower Extremity	Ambul & Standing (g)	Translation & Stabilization (microgravity)	Don/Doff Equipment	Pressure Ops	Total Tasks Impaired By Condition	Total Human System Category Tasks Full Mission	TI Decimal	TI %
Treated Best Case (TBC)									0	3763	0	0
Untreated Best Case (UTBC)	132							211	1152	3763	0.306139	30.6139
Treated Worst Case (TWC)	132							211	1152	3763	0.306139	30.6139
Untreated Worst Case (UTWC)	132	564	414	22	196			211	2660	3763	0.706883	70.6883

Clinical Phase 3: Condition End State												
	Affected HSTCs											
	Cognitive - Simple	Cognitive - Complex	Communications	Inter-personal Skills	Vision	Hearing	Cardio-pulmonary	Dentition	GI	GU		
Treated Best Case (TBC)												
Untreated Best Case (UTBC)												
Treated Worst Case (TWC)												
Untreated Worst Case (UTWC)												
	Affected HSTCs (Continued)								TI Calculation			TI Score

	Hand (Dom)	Hand (Any)	Upper Extremity	Lower Extremity	Ambul & Standing (g)	Translation & Stabilization (microgravity)	Don/Doff Equipment	Pressure Ops	Total Tasks Impaired By Condition	Total Human System Category Tasks Full Mission	TI Decimal	TI %
Treated Best Case (TBC)									0	3763	0	0
Untreated Best Case (UTBC)									0	3763	0	0
Treated Worst Case (TWC)									0	3763	0	0
Untreated Worst Case (UTWC)									0	3763	0	0

TABLE 8 KEY
Human System Task Category (HSTC) Definitions: Cognitive-Simple: Tasks requiring simple cognitive involvement (low levels of attention, following simple checklists, and not requiring extensive decision making) in conjunction with inputs from other systems. Cognitive-Complex: Tasks requiring complex cognitive involvement (requiring constant attention, frequent interpretation of outside stimuli to inform real-time situations) in conjunction with inputs from other systems. Communication: Tasks requiring primarily communication, via hearing and speaking. Interpersonal Skills: Tasks requiring interpersonal, social interaction between crew including complex technical tasks that require extended crew interaction. Vision: Tasks in which visual information is required. Hearing: Tasks in which primarily auditory information is required, excluding communication, e.g. hearing alarms, medical auscultation, OOHAs. Cardiopulmonary: Tasks requiring greater-than-baseline cardiopulmonary effort, e.g. physically strenuous activities. Dentition: Tasks requiring use of teeth for mastication. GI (Gastrointestinal): Tasks requring use of the alimentary sytem, e.g. solids/liquids consumption and solids excretion. GU (Genitourinary): Tasks requiring use of the male/female genitourinary systems. Hand (Dominant): Tasks performed using primarily the hand, requiring use of the dominant hand (piloting, medical procedures, dental procedures). Hand (Any): Tasks performed using primarily the hand(s), with no preference for dominance, with equivalent bilateral effectiveness. Upper Extremity: Tasks requiring specific use of the upper extremities, excluding hands. Lower Extremity: Tasks requiring specific use of the lower extremities (excluding ambulation and standing in the presence of gravity), e.g. using exercise equipment. Ambulation and Standing (g): Tasks requiring use of both lower extremities to accomplish ambulation or standing in the presence of gravity. Translation and Stabilization (microgravity): Tasks requiring use of either the upper or lower extremities to accomplish translational movement and stabilization (securing oneself to remain stationary) in the setting of microgravity. Don/Doff Equipment: Tasks requiring the donning of personal equipment (including pressure suit, exercise harness, EVA equipment, etc). Pressure Ops: EVA/contingency tasks performed while pressurized in a suit.

Criteria for Assignment of Conditions to HSTCs (any of the following):
1) Is affected crew member physically incapable of performing the human system task category, without impairment, with the condition?
2) Would the treatment (e.g. medications) impair the crewmember's ability to perform the human system task category? (Does not apply to UTx)
3) Does the condition have a high likelihood of causing a significant aeromedical contraindication with an associated human system task category
4) Would performing tasks in an associated task category worsen the condition? (If so, it is affected).
5) Does pain associated with the condition impair any further human system categories?

TASK IMPAIRMENT COMMENTS

CP2: No comment. CP3: No comment.

EVIDENCE COLLECTION PROCESS

Mesh terms that most closely resembled the best-case and worst-case scenarios, and associated Conditions Included but Not Explicitly Stated (CNES), were utilized to build incidence, duration, RTDC, and LOCL searches by best- and worst-case.

Incidence:
Databases searched for spaceflight and analog incidence data included: PubMed, Google Scholar, NASA Technical Reports Server (NTRS) public search, Defense Technical Information Center (DTIC), and Barratt MR, Baker E, Pool SL. Principles of Clinical Medicine for Space Flight. New York, NY: Springer; 2019. 2nd Edition. Databases searched for terrestrial incidence included: DynaMed, PubMed, and Google Scholar.

Duration, RTDC, LOCL:
Databases searched for duration, RTDC, and LOCL included: Dynamed, Cochrane, PubMed, and Google Scholar. Note, that if duration, RTDC, or LOCL data was found in a DynaMed search, the other search engines were not included. Relevant articles were selected and reviewed. If applicable, the article was included in the CLiFF.

LEVEL OF CONFIDENCE (LOC) SCORING

Articles obtained to update the evidence behind this CLiFF were scored by ExMC editors, based on their applicability to the Exploration Spaceflight environment using the following grading scale:

4 – Confident
3 – Somewhat confident
2 – Neutral
1 – Somewhat unconfident
0 – Not confident

The following considerations factor into the grading scale above:

• How closely does the paper describe the medical condition as defined by the IMPACT 1.0 Condiltion List (relevance)?
• How closely does the population included resemble the astronaut population?
• Quality of the paper (number of subjects, methods, etc.)
• How much does the editor trust the source of the evidence?
• How closely does the editor think that the data represents the exploration spaceflight environment?
• Other considerations, at the discretion of the editor, supported in the comments for LOE scoring.

REFERENCES

Reference
NASA Human System Risk Board presentation on March 26, 2020 (CR SA-02435). Space Adaptation Back Pain: A Retrospective Study. Eric L. Kerstman, Richard A. Scheuring , Matt G. Barnes , Tyson B. DeKorse, and Lynn G. Saile. Aviation, Space, and Environmental Medicine. Vol. 83, No. 1, January 2012. (Kerstman, 2012). Low Back Pain in Microgravity and Bed Rest Studies. Annelies L. Pool-Goudzwaard, Daniel L. Belavý, Julie A. Hides, Carolyn A. Richardson, and Chris J. Snijder. Aerospace Medicine and Human Performance. Vol. 86, No. 6, June 2015. (Pool-Goudzwaard, 2015). Principles of Clinical Medicine for Space Flight. Second Edition. Michael R. Barratt, Ellen S. Baker, and Sam L. Pool. (Barratt, 2019).

ACRONYMS

ACRONYM	PHRASE
AAOMS	American Association of Oral and Maxillofacial Surgeons
AMA	American Medical Association
ARCL	All Remaining Conditions List
ARS	Acute Radiation Sickness
BHP	Behavioral Health and Performance
CAC	Coronary Artery Calcium
CHS	Crew Health and Safety
CL	Condition List
CliFF	Clinical Finding Form
CMO	Crew Medical Officer
COMFORT	Clinical Outcome Metrics for Optimization of Robust Training
CP1	Clinical Phase 1
CP2	Clinical Phase 2
CP3	Clinical Phase 3
CRL	Clinical Resource Level
CRT	Capability Resource Table
CST	Clinical Science Team
DCS	Decompression Syndrome
DRM	Design Reference Mission
ED	Emergency Medicine Doctor
EL	Evidence Library
EMCL	Exploration Medical Condition List
EMT	Emergency Medical Technician
EVA	Extravehicular Activity
EXMC	Exploration Medical Capability
HRP	Human Research Program
ICD	International Classification of Disease
ICL 1.0	IMPACT 1.0 Medical Conditions List
ICU	Intensive Care Unit

IMCL	iMED Condition List
iMED	Integrated Medical Evidence Database
IMM	Integrated Medical Model
IMPACT-MD	Impact Medical Database
IP	Incidence Proportion
IR	Incidence Rate
ISS	International Space Station
IV	Intravenous
JSC	Johnson Space Center
LEO	Low-Earth orbit
LEVA	Lunar Extravehicular Activity
LOCL	Loss of Crew Life
LOM	Loss of Mission
LSAH	Lifetime Surveillance of Astronaut Health
LSO	Lunar Surface Operations
MCL	Master Condition List
MEVA	Medical Extravehicular Activity
NASA	National Aeronautics and Space Administration
N/A	Not Applicable
NP	Nurse Practitioner
OBGYN	Obstetrics and Gynecology
OR	Occurrence Rate
PA	Physician Assistant
PDQ	Pain Disability Questionnaire
PFCL	Proposed Future Conditions List
PPE	Personal Protective Equipment
PTRS	Project Technical Requirements Specification
PRL	Pharmaceutical Resource Level
QTL	Quality Time Lost
RCL	Removed Conditions List
REP	Rochester Epidemiology Study
RTDC	Removal to Definitive Care
SANS	Spaceflight-Associated Neuro-ocular Syndrome
SAS	Space Adaptation Syndrome
SEVA	Spaceflight Extravehicular Activity
SME	Subject Matter Expert
SoP	Standard Operating Procedure
SPE	Solar Particle Event
TBD	To Be Determined
TI	Task Impairment