Clinical Finding Form (CliFF)

Branch: Baseline

ICL94_Space Adaptation - Headache

Spaceflight headache or space adaptation headache is a headache attributed to travel in microgravity (Starling 2018). Previously, space motion sickness syndrome was inclusive of this condition, but it is now recognized as a separate disorder. There has been acknowledgment that space adaptation headaches often do not occur concomitantly with motion sickness. In the 3rd edition of the International Classification of Headache Disorders (ICHD-3), the International Headache Society (IHS) defines this condition as a nonspecific headache with the following: “A. Any new headache fulfilling criterion C; B. The subject has travelled through space; C. Evidence of causation demonstrated by both of the following: 1. headache has occurred exclusively during space travel and 2. headache has spontaneously improved on return to earth; D. Not better accounted for by another ICHD-3 diagnosis.” Headaches that occur within the first five days of spaceflight are typically attributed to this condition. They are usually self-limited and typically resolve when homeostasis of cephalad fluid shifts occur (Hodkinson et al., 2017). Analog studies using simulated microgravity have demonstrated that in addition to fluid redistribution, there are changes in hemoconcentration, hormones and tight-junctions that may contribute to space adaptation headaches as well (Feuerecker et al., 2016). Other conditions that are related but not covered in this CLiFF include: headache, headache-CO2 and altitude sickness.

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

The incidence rate was derived two LSAH data gathering events (Walton, 2010; Saile et. al, 2017). Regrettably, the authors of this CLiFF did not have direct access to the data from those LSAH events. Consequently, information was taken detailing these events from the previous IMM CLiFF entitled " Headache (Space Adaptation) Cliff.” Per this resource: “headaches that began during Days 1 to 5 and for which no other attribution, such as CO or CO2 exposure, caffeine withdrawal, toxic exposure or DCS, had been determined. When a crew member took an analgesic and the reason indicated was headache, we counted that as a headache event.” In total, they found 281 events over 807 person-missions. At the time of this CLIFF completion, a repeat LSAH data gathering event was not possible and missions past 2017 are not represented. Antonsen et al. (2017) was rated less highly than the data in the previous IMM CLiFF as the data in Table 1 could not be adequately reconciled with this specific condition’s definition. For example, Table 1 described 33 cases of headache for an incidence of 2.27. The same table also listed ‘Fluid shift’ as a category and described this as “composition change and facial fullness.” In this category, there were a total of four events and incidence of 0.28. Unfortunately, it is unknown how many headaches or fluid shifts are specific to space adaptation. Of note, it was observed that in the Antonsen et al. paper Table 1 was mislabeled as 'ISS through Exp 40' when it should read ' ISS expeditions 9 and 14 through 40'. Table 2 from the same source detailed 233 events in the ‘Headache (space adaptation)’ category. Vein et al. (2009), analyzed survey data from 17 participants. Symptoms were categorized into four specific time frames of space flight were used and the ‘launch’ classification would be applicable to this condition. Nine astronauts (53%) experienced headache during this time-period. This study was downrated secondary to its cross-sectional design, limited years of inclusivity and vulnerability to recall bias.

ANALOG LITERATURE

This is a space-related condition and there are no analog studies that are applicable to deriving an incidence value. However, there are several studies in which the microgravity environment has been simulated on earth for the purpose of studying physiological changes (Oosterhout et al., 2015; Feuerecker et al., 2016).

TERRESTRIAL LITERATURE

This is a space-related condition and there are no applicable terrestrial studies.

OVERALL INCIDENCE SUMMARY

INCIDENCE

Mean: 0.3488 person-missions and SD 0.01678.

INCIDENCE SUMMARY

The Bayesian posterior distribution for the incidence rate given the spaceflight data (281 events over 807 person-missions) under an uninformative prior is Beta(shape1=281.02, shape2=542.67) with mean 0.3488 and SD 0.01678. Evidence: Spaceflight – IMM LSAH data requests (Walton and Saile) 281 events over 807 person-missions. IP: 0.3482 (95%CI: 0.3153, 0.3822). Antonsen table 2 reflects the IMM categorizations of symptoms from the initial LSAH data request (Walton). Table 1 reflects a different categorization of symptoms from the second LSAH data request (Saile). Since both are based on identical data sources but IMM data is categorized specifically for Space Adaptation headaches, the editors and biostatistician decided to just use the IMM data.

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
0.341172

SD
0.0165093

Beta
(Alpha): 281.02
(Beta): 542.67

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

TABLE 2. INCIDENCE LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Walton, 2010	Spaceflight	4
Saile et al., 2017	Spaceflight	4
Antonsen et al., 2017	Spaceflight	3
Vein et al., 2009	Spaceflight	2
Oosterhout et al., 2015	Analog	0
Feuerecker et al., 2016	Analog	0

Spaceflight incidence data was rated the highest as this is a condition, by definition, that can only occur in space. Analog and terrestrial studies would not accurately represent incidence for this condition.

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

This CLiFF condition is event-based and consequently there are no known preventative measures. However, to help exclude other causes of headache pathologies, at L-21/18 months, if greater than 2 years since ISS section, crewmembers undergo MRI/MRA neuroimaging, a full annual medical exam L-6/9 months and brief medical exams at L-7/10 and L-1/2 days by the Flight Surgeon. Barratt et al. (2019) reports that applicants with a history of migraines or cluster headaches are disqualified from the selection process.

BEST CASE SCENARIO DEFINITION

An uncomplicated course of space adaptation syndrome-related headache, which resolves spontaneously or with minor symptomatic treatment.

WORSE CASE SCENARIO DEFINITION

A severe space adaptation related headache poorly responsive to available treatment.

CONDITIONS INCLUDED, BUT NOT EXPLICITLY STATED (CNES)

None

BEST CASE/WORST CASE PROBABILITY COMMENTS

Per the previous IMM effort: “Based on the Real World System data set there were 48 events and of those events, one was the worst case. Since there is a worst case the percentage can be calculated from the empirical data. The worst case is 2.08% (1/48), while the best case is 97.92% (47/48) (Saile L., 2017).” In Vein et al. (2009), time in microgravity was split into four categories for use in their survey: launch, stay at space station, landing and EVA. Although it can currently take less than 24 hours to international space station, a decade prior, the average was reported as three days of travel time ('NASA STEM Engagement' 7/12/2021). Consequently, the launch and stay at space station would be pertinent to this condition, as space adaptation would be expected to occur within the first 5 days of spaceflight. Out of 17 astronauts, one astronaut had a severe headache during launch and zero had a severe headache during stay at the space station (0-5.9%). Given that the Saile LSAH data had access to reported events in real time and was not subject to recall bias and also covered a greater number of missions, 2.08% was chosen as the worst-case probability. Space headache was studied in a head-down-tilted bed simulation on earth, which is the considered the “gold standard for simulating the physiological effects of weightlessness on the human body” (van Oosterhout et al,, 2015). Out of 50 headache episodes in this study, 17 were considered severe (34%). Given that the proportion of severe cases were greatly different from data taken from true flight data, this study was not used to calculate the worst-case probability.

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

Citation	Source	LOC Value
Saile et al., 2017	Spaceflight	4
Vein et al., 2009	Spaceflight	2
van Oosterhout et al., 2015	Analog	1

Only spaceflight data was utilized given the condition’s definition. Worst-case probability estimates from the previous IMM CLiFF effort were used as there had been no further studies published in the interim.

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)	0.3488 person-missions and SD 0.01678	98 - 98	100	0.21	23.2527	1	8	0	0	0	0	0
Treated Worst Case (TWC)		2 - 2	100	1.03	26.7606	24	120	0	0	0	0	0
Untreated Best Case (UTBC)	N/A	N/A	N/A	0.21	29.1257	1	8	0	0	0	0	0
Untreated Worst Case (UTWC)	N/A	N/A	N/A	1.03	53.8932	24	120	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

Space headaches are part of the Space Adaptation Syndrome (SAS), theorized to be due to the cephalad fluid shifts that occur in the first several days of microgravity (Hodkinson et al., 2017). The best-case scenario refers to a headache that is self-resolving or resolves with one or two doses of medication (NSAID, acetaminophen). The worst-case scenario may require several doses of multiple oral medications or even intravenous or intramuscular formulations. Given that this condition only exists in microgravity, there is no acceptable RTDC terrestrial-surrogate for this condition.

TREATED BEST CASE (TBC) SCENARIO COMMENTS

In the prior IMM iteration, duration was estimated to be one-to-eight hours based on the terrestrially accepted medication regimen of NSAID or acetaminophen dosage for headache of every four-to-eight hours as-needed (Schachtel et al., 1996; Gilmore et al, 2011). The authors for this CLiFF could find no published data regarding the duration of the treated best-case scenario. Unfortunately, crewmembers can use certain medications with flight surgeon input for low-risk conditions including headache (Blue et al. 2019). Consequently, subject matter expert opinion concurred that one-to-eight hours was a reasonable estimate. RTDC and LOCL are not expected for this condition.

TREATED WORST CASE SCENARIO (TWC) COMMENTS

In the prior IMM iteration, duration was estimated to be 24 to 120 hours based on the consensus that spaceflight headaches would resolve within 120 hours (five days). In a head-down-tilted bed rest simulation study, there were six headaches reported from 22 subjects on day one, with three that persisted into day five (van Oosterhout et al,, 2015). The study-period did not extend beyond day five. However, headaches that occur beyond the initial 72 hours need to be further investigated for other etiologies, such as carbon monoxide toxicity (Barratt et al., 2019). To date, there have been no instances of RTDC or LOCL secondary to this condition in spaceflight.

UNTREATED BEST CASE (UTBC) SCENARIO COMMENTS

There exists little accessible data regarding duration for the untreated best case. Subject matter expert consensus was that it would be no less than the treated best-case-scenario. Again, RTDC and LOCL are not expected for this condition.

UNTREATED WORST CASE (UTWC) SCENARIO COMMENTS

Duration is expected to be no less than the treated worst-case-scenario. To date, there have been no instances of RTDC or LOCL secondary to this condition in spaceflight

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

Citation	Source	LOC Value
Schachtel et al., 1996	Terrestrial	1
Gilmore et al, 2011	Terrestrial	
Blue et al. 2019	Spaceflight	
van Oosterhout et al,, 2015	Analog	

There was a lack of literature available to derive duration ranges and therefore these values are based largely on estimates from terrestrial treatments and subject matter consensus.

TABLE 6. RTDC LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Walton, 2010	Spaceflight	4
Saile et al., 2017	Spaceflight	

Only spaceflight data was utilized given the condition's definition.

TABLE 7. LOCL LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Walton, 2010	Spaceflight	4
Saile et al., 2017	Spaceflight	

Only spaceflight data was utilized given the condition's definition.

CAPABILITY RESOURCE TABLE (CRT) OVERVIEW

Capabilities and Resourcing Scope

Overview
While the cause is not known (as is true for many terrestrial headaches) space adaptation headaches are largely self limited and require symptomatic treatment only. These headaches are likely caused by multiple variables in the flight environment and may not represent a single condition, such as; dehydration, fatigue, poor lighting, stress, and atmospheric conditions.

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): 0.21 hours for set up, history, and physical exam.

CP1 WC (Treated or Untreated): 1.03 for a set up, history, and a more thorough exam including neurological, fundoscopic, and vision testing to rule out other, more dangerous causes of headaches.

This condition requires a Scope of Practice 4 to manage and rule out other similar presenting conditions, assess treatment response, and assess fitness for duty. However, most of the treatment will not rise above level 1 and the more common best case requires only SoP 1.

Treatment Scope and Resourcing
The best case is mild and uses pain medications, with primacy given to NSAIDs over acetaminophen and antiemetics. The worst case adds medications for a refractory headache including metoclopramide, oral steroids, promethazine, magnesium gluconate, and caffeine. Diphenhydramine is included to mitigate extrapyramidal symptoms as akathisia in a spacecraft would be a singularly uncomfortable experience. Additionally, non pharmacological techniques, such as pressure point massage, schedule changes, and location changes within the spacecraft are also included.

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.

IMM CLIFF RECONCILATION COMMENTS

The predecessor to this CLiFF was entitled "Headache (Space Adaptation)." Given lack of access to the original LSAH pulls and this being a condition that only occurs in microgravity, many of the resources between this CLiFF and the prior iteration remain the same. For this effort, with the help of a biostatistician, incidence data was updated to reflect person-missions rather than person-years as this condition can only be expected to occur at the initiation of spaceflight.

LIMITATIONS SUMMARY

• The authors to this CLiFF did not have access to the original LSAH data and thus there was an implied dependence on already published sources. • There is some overlap between this condition and other CLiFF conditions such as headache, headache-CO2, altitude sickness. • Several assumptions needed to be made regarding duration and the untreated cases given lack of available studies. • There is likely an underreporting of this condition in spaceflight studies given that most cases do not result with much impairment and do not require consultation with a flight surgeon.

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)		664										
Untreated Best Case (UTBC)		664		89								
Treated Worst Case (TWC)		664										
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)								211	875	3763	0.232527	23.2527
Untreated Best Case (UTBC)	132							211	1096	3763	0.291257	29.1257
Treated Worst Case (TWC)	132							211	1007	3763	0.267606	26.7606
Untreated Worst Case (UTWC)	132	564						211	2028	3763	0.538932	53.8932

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.

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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