Clinical Finding Form (CliFF)

Branch: Baseline

ICL108_Tendinopathy/Enthesopathy/Bursitis/Over-Use Injuries - Upper Extremity

Tendinopathy – Upper Extremity is a fairly broad condition covering overuse in the upper extremity. Specifically covering tendinopathy, enthesopathy, bursitis, and all other overuse injuries of the upper extremity.

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

There are no documented episodes of tendinopathy, tendinitis, tenosynovitis, or bursitis in spaceflight. Therefore, terrestrial studies are used to estimate the incidence and outcomes of this condition in spaceflight.

ANALOG LITERATURE

A military population were used as analog for astronauts in spaceflight. This may result in an overestimation of incidence since the rigorous physical training and activities of typical military personnel compared to astronauts in the spaceflight environment would result in a significant overestimation of the incidence and severity of this condition.

TERRESTRIAL LITERATURE

General terrestrial population studies were used to estimate the outcomes for astronauts in spaceflight. This may result in a slight overestimation of the impact of this condition since the microgravity environment of spaceflight typically results in decreased forces on joints, muscles, and tendons of the lower extremities. However, exercise countermeasures during the transit phase of spaceflight missions and terrestrial EVAs could contribute to the development of lower extremity tendinopathies and bursitis.

OVERALL INCIDENCE SUMMARY

INCIDENCE

mean 0.016 and SD 0.005989

INCIDENCE SUMMARY

The Bayesian posterior distribution for the incidence rate given data from an analog Naval Special Warfare study, estimated assuming independence of MSK injury location and type, is Gamma(shape=7.137, rate=446.079) with mean 0.016 and SD 0.005989. The rate of MSK injuries was modeled using the data from a Naval Special Warfare analog (63 injuries over 210 person-years). The probability of the injury being located within the upper extremity was also modeled from the same source data (24 out of the 63 injuries). The probability of the injury type being relevant to this condition was modeled from the same source as well (8 out of the 63 injuries). Assuming independence of type and location, the adjusted incidence rate was estimated from the overall model incorporating all the data elements. All priors were uninformative. Analog Naval Special Warfare – Lovalekar 2016. Descriptive Epidemiology of Musculoskeletal Injuries in Naval Special Warfare Sea, Air, and Land Operators. 210 person-years of chart review. 63 total injuries reported over 210 person-years. 24 out of the 63 were located in the upper extremity. 8 of the 63 were relevant to the condition (6 Tendonitis/Tenosynovitis/Tendinopathy and 2 Bursitis). The overall rate and proportions will be used to estimate the site-specific relevant condition incidence rate. Since we don't have access to data about the joint site and condition distribution, we will assume independence in the probabilities of MSK conditions occurring, i.e. where the injury occurs is independent of which type of injury. This is a noted

limitation of the incidence approach for the upper and lower extremity Tendinopathy CliFFs.

TABLE 1. INCIDENCE MODEL

Incidence Details

Incidence Type
General

Segment
All

Env. Exposure
NA

Sex
Any

Crowns
Any

Contacts
Any

Pregnancy
Any

Incidence Distribution

Occurrence Dist
Poisson

Incidence Dist.
Gamma

Mean
0.0159994

SD
0.00598889

Gamma
(Shape): 7.137
(Rate): 446.079

TABLE 2. INCIDENCE LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Lovalekar, 2016	Military Analog	2

LOC = 2 (neutral) based on a military analog population study. This study probably results in an overestimation of incidence. There were no good terrestrial general population studies available to estimate the incidence of this condition. No spaceflight data are available.

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

The Astronaut Strength, Conditioning and Rehabilitation (ASCR) program and Astronaut gym at Johnson Space Center are strategic to providing pre-flight strengthening in attempts to prevent or mitigate injuries as well as post-flight rehabilitation. The Strength Coach's primary role is to provide an exercise plan designed to achieve flight physical readiness and prevent musculoskeletal injuries during spaceflight training.

BEST CASE SCENARIO DEFINITION

A tendinopathy/enthesopathy, bursitis, or overuse injury which can be managed symptomatically (e.g. rest, non-opioid analgesics, physical therapy) and does not impact mission objectives.

WORSE CASE SCENARIO DEFINITION

A tendinopathy/enthesopathy, bursitis, or overuse injury which requires treatment (e.g. corticosteroid injection, dry needling, physical therapy, nitroglycerin patches), or impacts mission objectives. Elective surgery may be necessary post-mission.

CONDITIONS INCLUDED, BUT NOT EXPLICITLY STATED (CNES)

None

BEST CASE/WORST CASE PROBABILITY COMMENTS

Probability determined by looking at Table 2 from Hauret, K. G., et al. (2010). To best capture potential "worst cases" for upper extremity, included conditions listed as "Joint derangement; Joint derangement with neurological involvement; Stress fracture; Sprain/strain/rupture; Dislocation" and divided that by the total number of patients in the Upper Extremity category, yielding 10.3%. Trying to accurately represent worst case with our definition including things like needing PT or steroid injections is difficult to capture, but this seems like a reasonable estimate of worst case for overuse injuries.

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

Citation	Source	LOC Value
Hauret, 2010	Terrestrial	2

Probability determined by looking at Table 2. To best capture potential "worst cases" for upper extremity, included conditions listed as "Joint derangement; Joint derangement with neurological involvement; Stress fracture; Sprain/strain/rupture; Dislocation" and divided that by the total number of patients in the Upper Extremity category, yielding 10.3%. Trying to accurately represent worst case with our definition including things like needing PT or steroid injections is difficult to capture, but this seems like a reasonable estimate of worst case for overuse injuries.

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 0.016 and SD 0.005989	90 - 90	100	1.36	8.75631	336	672	0	0	0	0	0
Treated Worst Case (TWC)		10 - 10	100	1.36	10.5102	1080	8760	0	0	0	0	0
Untreated Best Case (UTBC)	N/A	N/A	N/A	1.36	19.333	720	8760	0	0	0	0	0
Untreated Worst Case (UTWC)	N/A	N/A	N/A	1.36	41.7752	4320	8760	38.666	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

Upper extremity tendinopathy is a broad category of overuse injuries, which can include lateral and medial epicondylitis, biceps tendinosis, supraspinatus calcific tendinosis, and carpal tunnel syndrome. Though most are more mild in nature, self-resolution of any tendinopathy may take months (or years if more severe). Interventions beyond physical therapy are of mixed efficacy, and it is difficult to lump treatments together to provide a confident estimate of recovery versus persistent morbidity for all conditions. There is no LOCL expected under any scenario in this ICL.

TREATED BEST CASE (TBC) SCENARIO COMMENTS

Best case scenarios can still last anywhere from 3 weeks to 12 months even with very conservative measures. Anywhere from 10-17% of patients may experience persistent/chronic pain. No RTDC or LOCL is expected.

TREATED WORST CASE SCENARIO (TWC) COMMENTS

Worst case scenarios likely persist beyond 6 weeks and may take up to 18 months to completely resolve. Literature directly comparing more advanced treatment modalities are difficult to assess, even within an isolated disease process (e.g. lateral epicondylitis), let alone when taking into account other various/common overuse injuries (e.g. biceps tendinosis, medial epicondylitis, carpal tunnel). Once again, no study found resulted in mortality for this scenario so LOCL is not expected within the scope of this ICL.

UNTREATED BEST CASE (UTBC) SCENARIO COMMENTS

Best case scenarios can still last anywhere from 3 weeks to 12 months even with very conservative measures. Anywhere from 10-17% of patients may experience persistent/chronic pain. No RTDC or LOCL is expected.

UNTREATED WORST CASE (UTWC) SCENARIO COMMENTS

Worst case episodes of upper extremit tendinosis have been documented to last for years. A high percentage of individuals will experience chronic pain that, depending on their profession, may prevent them or limit them in their work but does not represent a medical emergency. Therefore, RTDC and LOCL are not expected.

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

Citation	Source	LOC Value
Haahr JP, 2003	Analog	2
Smidt N, 2006	Analog	
Finnoff, 2011	Analog	
Sayegh, 2015	Analog	

These papers focus heavily on lateral epicondylitis (tendinopathy of the common extensor tendon / extensor carpi radialis brevis), but this is one of the most common overuse tendinopathies of the upper extremity. Well described and fairly consistent range in the literature. Main drawback is that patients may not reflect Astronaut Corps likely resulting in a longer than expected return to full function for on orbity missions (i.e. a conservative estimate). As Spaceflight data is fairly sparse, better assessments will be difficult.

TABLE 6. RTDC LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Haahr JP, 2003	Terrestrial	1
Smidt N, 2006	Terrestrial	
Feuerstein, 1993	Terrestrial	
Krogh TP, 2012	Terrestrial	
Roh YH, 2017	Terrestrial	

Using a surrogate of hospitalization for RTDC, tendinopathies of the upper extremity are simply not expected to result in hospitalization thus resulting in 0% for RTDC for all condition scenarios.

TABLE 7. LOCL LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Haahr JP, 2003	Terrestrial	1

Extensive literature search shows no evidence to support the notion of LOCL in the setting of upper extremity tendinopathy, thus (like RTDC) resulting in 0% for all condition scenarios.

CAPABILITY RESOURCE TABLE (CRT) OVERVIEW

Capabilities and Resourcing Scope

Overview

Tendinopathy/enthesopathy/bursitis/over-use injuries encompasses multiple diagnoses that may occur in the upper extremity as stated in the title. (Examples may include but are not limited to lateral common extensor tendinopathy (lateral epicondylitis), subacromial bursitis). The best-case scenario can be managed symptomatically and does not impair mission objectives, whereas the worst-case scenario requires treatment and/or impacts mission objectives and may require surgical intervention post-mission.

CNES: N/A

Diagnostic Scope and Resourcing

In both the best- and worst-case scenario, diagnosis is based on history and physical examination (musculoskeletal and neurologic). Musculoskeletal ultrasound was considered a useful adjunct in diagnosis, but not a necessity for the diagnosis. It was included as a non-necessary capability. X-ray and MRI capabilities will not be possible in-flight.

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): 1.36 hours
CP1 WC (Treated or Untreated: 1.36 hours

This CRT includes a scope of practice code of 5 (which correlates to an “Experienced procedure trained generalist attending (ED attending)” and was included for musculoskeletal ultrasound and interpretation.

Treatment Scope and Resourcing

Terrestrially, tendinopathy, enthesopathy, bursitis, and over-use injuries can have a prolonged recovery with progress and relapses based on the activity level of the patient.

The best-case scenario management includes pain management, NSAIDs, acetaminophen and iontophoresis with dexamethasone (which terrestrially has shown improvements in both pain and function in tendinopathy). Iontophoresis is a topical application of medication utilizing the charge of the particles to disperse the medication into the skin directly over an affected tendon. Physical therapy is the mainstay of treatment. Exercise modification is also recommended, but not built into the CRT as this does not represent a clinical resource.

The worst-case scenario management has the following additional resources: Corticosteroid injection for bursitis, needle tenotomy for tendinopathy, and topical nitroglycerin patches for tendinopathy. It should be noted that corticosteroid injections should only be used for bursitis in this condition and not for tendinopathy as injection of corticosteroids into the tendon will weaken the tendon and put it at risk for rupture. Topical nitroglycerin for chronic tendinopathy is an off-label treatment that has been used successfully in Sports Medicine for approximately 20 years with meta-analysis level data supporting its efficacy for pain reduction and improved function. While nitroglycerin patches are not currently included on the spaceflight formulary, nitroglycerin tablets and spray are, providing precedence for flying nitroglycerin. Again, physical therapy is the mainstay of treatment. Orthopedic surgery capabilities are outside the scope of medical resources for this CRT.

Communications and Support Needs

While real-time video and audio loop communications are desired for diagnosis and treatment, they were not considered a necessity for the best-case scenario. For the worst-case scenario, consultation with ground specialists to facilitate treatment and healing was considered necessary given the limited diagnostic and treatment capabilities in-flight.

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IMM CLIFF RECONCILATION COMMENTS

No prior IMM CliFF

LIMITATIONS SUMMARY

• Under-reporting for this condition could have occurred during past space missions due to subtle overuse injuries that were not of clinical consequence. This may result in underestimation of the incidence. • No spaceflight data are available for this medical condition. • The population studied to calculate incidence was Special Forces operators. They are more likely to be younger and more active than astronauts during spaceflight. • The group studied may result in an overestimation of the incidence and impact of this condition since the microgravity environment of spaceflight typically results in decreased forces on joints, muscles, and tendons of the lower extremities. Since we don't have access to incidence data about the joint site and condition distribution, we assumed independence in the probabilities of MSK conditions occurring, i.e. where the injury occurs is independent of which type of injury. This is a noted limitation of this incidence approach for both the upper and lower extremity CliFFs. • The incidence and outcomes for overuse injuries was not included because relevant incidence data was not available for overuse. However, many of the other conditions described in this CLiFF result from overuse injuries.

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										
Treated Worst Case (TWC)												
Untreated Worst Case (UTWC)		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)			414				34	211	659	3763	0.175126	17.5126
Untreated Best Case (UTBC)	132		414				34	211	1455	3763	0.38666	38.666
Treated Worst Case (TWC)	132		414				34	211	791	3763	0.210205	21.0205
Untreated Worst Case (UTWC)	132		414				34	211	1689	3763	0.448844	44.8844

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)		664										
	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)	132		414				34	211	1455	3763	0.38666	38.666

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