

Clinical Finding Form (CLiFF)

Branch

Baseline

ICL88_Skin Infection - Viral/Fungal

Skin infections are a common complaint on earth that also have been reported fairly frequently during spaceflight. The etiology of skin infections can involve a wide range of bacteria, viruses, and fungi. Bacterial skin infections are the subject of a separate CLiFF. Viral and fungal skin infections, the subject of this CLiFF, generally only affect the superficial layers of the skin. They may be persistent and may not respond well to treatment. However, while bothersome, they generally are not associated with significant morbidity or mission impact. Examples of viral skin infections include HSV (causing perioral or labial lesions), HPV (causing warts), molluscum contagiosum, and viral exanthems such as from EBV. Viral exanthems noted in childhood (such as from chickenpox, rubella, and measles), are not common in adults and are mitigated by vaccinations. This CLiFF does not cover sexually transmitted diseases such as genital warts (HPV), HIV, and genital herpes as they may be covered in future CLiFFs and are thought to be highly unlikely. Herpes zoster infection (shingles) and mouth ulcers are also the subject of other CLiFFs. Fungal infections may include tinea corporis, tinea pedis, tinea cruris, tinea capitis, candidal skin infections, and skin infections from endemic mycoses. Humid environments and poor hygiene can contribute to increased incidence and severity of fungal skin infections. Infections may be caused by the direct effects of microgravity on immunity or characteristics of the cabin environment, such as moisture, airborne contaminants, and condensate. Hygiene may also suffer during spaceflight which can predispose an individual to viral and fungal infections. Treatment consists of topical or oral anti-virals (such as acyclovir) or anti-fungals (such as terbinafine).

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

17 occurrences of skin infections have occurred in spaceflight. This number was retrieved from the 2017 Skin Infection CLiFF and the same citation was used. This number, however, encompasses all types of skin infections (bacterial, viral, fungal, and parasitic), so the incidence data has limitations. 62% of infections (of which there were a total of 17), for instance, were bacterial in nature according to the IMM CLiFF which referred to the Barratt textbook. The original citation for this proportion of bacterial infections could not be found. Saile (2017) added 4 more events, however it is unclear the etiology of these infections. Given that 62% of these infections were assumed to be bacterial in nature, the remainder are attributed to fungal and viral infections. The other possibility (parasitic infections such as lice and scabies) are unlikely to occur in the spaceflight environment.

ANALOG LITERATURE

(Gan W. et al., 2013) examined the incidence of dermatological conditions in a cohort of military conscripts including fungal skin infections and insect bites. Fungal skin infection incidence was 6.7/100 per year (n=18749; 2526 cases of fungal infection over 2 years). The population consisted of fit males; mean age 20.5; 83% Chinese; 8% Malay. No worst case scenario related to fungal infection (3 cases of contact dermatitis moved to non-combat status). The aforementioned study presents a representative view of a healthy Singapore male population with few pre-existing condition. Limitations of the study cited included the age (younger than astronauts), environment (hot, humid, and terrestrial), and the use of consultation records as data source, thus the data was dependent on the quality of examination. The tropical environment increased the risk of fungal infection compared to the spacecraft cabin environment. Limited demographic information was presented in the study. Finally, only fungal infections were studied, not viral.

TERRESTRIAL LITERATURE

(Sigurgeirsson B et al., 2013) examines global prevalence of onychomycosis. Analysis of 11 population based studies and 21 hospital studies ranging from 1969-2012. Hospital studies were excluded. Mean prevalence was 3.6%. Supgroup analysis: mean prevalence of European and North American studies is 4.3%. Study presents an estimate of onychomycosis in the general global population. Studies of prevalence on specific groups (children, elderly, diabetics etc...) excluded. (studies suggest due to regional differences- people walk barefoot in africa, prevalence in central africa is markedly lower than in Europe and North America)

OVERALL INCIDENCE SUMMARY

INCIDENCE

mean 0.1419 and SD 0.03448

INCIDENCE SUMMARY

The Bayesian posterior distribution for the incidence rate of skin infection given the spaceflight data (17 events over 45.49 person-years) under an uninformative prior and adjusting (assuming 38% of skin infections are viral or fungal) is Gamma(shape=16.94, rate=119.36) with mean 0.1419 and SD 0.03448.

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

0.141924

SD

0.0344824

Gamma

(Shape): 16.94

(Rate): 119.36

TABLE 2. INCIDENCE LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Marshburn TH et al, 2008	Spaceflight	3
Gan W et al, 2013	Analog	2
Villa L et al, 2010	Terrestrial	1
Walton M et al, 2010	Spaceflight	4
Caputo R et al, 2001	Terrestrial	2
Sigurgeirsson B et al., 2013	Terrestrial	1
Gan W et al, 2013	Analog	2

The best flight data available indicates that there have been 17 documented skin infections of all types during spaceflight. The etiology of skin infections includes bacterial, viral, fungal, and parasitic causes. Existing data does not show the breakdown of these infections by etiology. The previous IMM CLIFF refers to Barratt's textbook as stating 62% of skin infections have been bacterial. The primary reference for this statistic has

not been determined. Clinically, however, this is a reasonable breakdown. The risk of parasitic skin infections in the spaceflight environment is thought to be extremely low and is disregarded. Thus, the other 38% of skin infections are assumed to be viral or fungal. This was applied to the known 17 skin infections documented during spaceflight.

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, there is serious interest in the documentation and analysis of healing of skin pathologies during spaceflight. At L-10 days, the crew and flight surgeon undergo training on the use of the 35mm still and digital cameras so that they can document any minor/major infections/allergies/hypersensitivities/injuries in flight. This training is conducted as part of the Medical Operations Preflight Briefing.

BEST CASE SCENARIO DEFINITION

Mild viral or fungal skin infection, that resolves without treatment, or minimal treatment with topical or a single course of oral antivirals or antifungals.

WORSE CASE SCENARIO DEFINITION

Moderate to severe viral or fungal skin infection that could require a second course of antivirals/antifungals, or could be refractory to treatment.

CONDITIONS INCLUDED, BUT NOT EXPLICITLY STATED (CNES)

Herpes zoster infections and sexually transmitted infections are not included. However, non-venereal HPV and HSV infections are included.

BEST CASE/WORST CASE PROBABILITY COMMENTS

The best case/worst case probability was calculated on clinical cure rate of topical terbinafine from a Cochrane review of topical antifungal treatment for tinea cruris and tinea corporis. There was a 746/1000 clinical cure rate reported.

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

Citation	Source	LOC Value
Westerberg DP et al, 2013	Terrestrial	2
Piraccini BM et al, 2010	Terrestrial	2
El-Gohary M et al, 2014	terrestrial	3

The best case/worst case probability based on a clinical cure rate of topical terbinafine from a Cochrane review of topical antifungal treatment for tinea cruris and tinea corporis (746/1000).

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 0.1419 and SD 0.03448	75 - 75	100	1.28	0.451767	48	1008	0	0	0	0	0
Treated Worst Case (TWC)		25 - 25	100	1.26	3.25538	336	2016	0	0	0	0	0
Untreated Best Case (UTBC)	N/A	N/A	N/A	1.28	3.25538	48	5040	0	0	0	0	0
Untreated Worst Case (UTWC)	N/A	N/A	N/A	1.26	17.0874	336	6570	6.51076	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

Viral and fungal skin infections are generally self-limiting and uncomplicated; therefore, can be managed without treatment or through use of topical antifungals, topical steroids, or topical acyclovir. However, skin infections are difficult to effectively treat, with low rates of clinical cure. More severe infections may require oral or IV antiviral or antifungal medications. Untreated cases may last for the duration of the mission.

TREATED BEST CASE (TBC) SCENARIO COMMENTS

Mild fungal or viral infections may resolve in as little as 48 hours. Treatment for patients with tinea capitis infection is effective, but the treatment duration may be as long as 4-6 weeks (Moriarty B. et al., 2012)). RTDC and LOCL are not expected, thus values are set to 0%.

TREATED WORST CASE SCENARIO (TWC) COMMENTS

For treatment of candidiasis refractory to topical treatment, oral fluconazole for 7 days is indicated. If this fails, a second 7 day course of fluconazole could be tried (total minimum treatment 14 days). If treating a fluconazole resistant strain of candida species, IV medications may be needed. The maximum duration may involve treatment of tinea capitis, wherein 6 weeks of treatment is not adequate and up to 12 weeks is needed. (AK Sahoo. et al., 2016). For treated worst case scenarios, RTDC and LOCL are not expected, thus values are set to 0% for this condition.

UNTREATED BEST CASE (UTBC) SCENARIO COMMENTS

By definition, the best case may be self-resolving and not require treatment. Cases may resolve spontaneously within 48 hours. The maximum duration is based on a viral skin infection such as molluscum contagiosum in immunocompetent adults which is usually self-limiting within 6-9 months (Nguyen HP et al., 2014). RTDC and LOCL are estimated at 0% for UTBC.

UNTREATED WORST CASE (UTWC) SCENARIO COMMENTS

There is a paucity of data to inform the untreated worst case as randomized trials would be unethical. The CP2 minimum value was taken as 14 days, indicating the duration of time calculated for the treated worst case. As the skin infection may not resolve without treatment, the CP2 maximum value was taken as 6-9 months (Nguyen HP et al., 2014). RTDC and LOCL are not expected and are taken as zero.

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

Citation	Source	LOC Value
JW E et al., 2021	Terrestrial	3
Pappas P et al, 2015	Terrestrial	
Kreijkamp-Kaspers S et al, 2017	Terrestrial	
Weller R et al, 1998	Terrestrial	
Mandy SJ et al, 1974	Analog	
Landsman AS et al, 2010	Terrestrial	

All CP2 duration studies are representative of treatment of viral and fungal skin diseases in the general population, with the exception of Mandy SJ et al., 1974, which examined airmen. All evidence selected were studies in immunocompetent adults, where possible. However, some studies draw data from the general population, which includes subjects with factors affecting treatment time (chronic disease, immunocompromised). As viral and fungal diseases are more common in these demographics, duration will be affected. There was a paucity of data for untreated cases.

TABLE 6. RTDC LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
N/A	N/A	3

Fungal and viral skin infections as defined in this CLiFF are not expected to result in RTDC. Therefore, a search was not performed.

TABLE 7. LOCL LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
N/A	N/A	3

Fungal and viral skin infections as defined in this CLiFF are not expected to result in LOCL. Therefore, a search was not performed.

CAPABILITY RESOURCE TABLE (CRT) OVERVIEW

Capabilities and Resourcing Scope Overview Worst Case Definition: Moderate to severe viral or fungal skin infection that could require a second course of antivirals/antifungals, or could be refractory to treatment. Best Case Definition: Mild viral or fungal skin infection, that resolves without treatment, or minimal treatment with topical or a single course of oral antivirals or antifungals. Mild viral infection associated medical response is to address the pain and discomfort associated with the condition but the most important is that the depth of the infection is determined and monitored. Generally this condition is one of discomfort rather than a medical emergency. The CRT condition focuses solely on the physical exam and the ultrasound determination of the depth of infection in the best and worst cases as well as antifungal and anti-viral therapies. Diagnostic Scope and Resourcing In the best-case scenario, diagnosis is based on history and physical examination. In the worst-case scenario, diagnosis is based on history and physical examination. 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): 1.28 hours This is the longest reasonable time to complete this task for an experienced clinician adjusted for being in the spaceflight environment to do the following: 1 - Take a proper history of the patient 2 - Perform a physical on the patient 3 - Ultrasound infected area to determine spread CP1 WC (Treated or Untreated): 1.26 hours This is the longest reasonable time to complete this task for an experienced clinician adjusted for being in the spaceflight environment to do the following: 1 - Take a proper history of the patient 2 - Perform a physical on the patient 3 - Ultrasound infected area to determine spread The highest scope of practice code used in this CRT which includes interpretation of diagnosis, performing diagnostic tests and performing treatment would be a four: this is an intern level. Treatment Scope and Resourcing In the best-case scenario, treatment is limited to antivirals, antifungals, and mild pain management. The worst case scenario is essentially the same. Communications and Support Needs In the best-case and worst-case scenario, diagnosis can be difficult because the determination of the depth and breadth of infection is difficult, communication and teaching of the ultrasound would be ideal. REFERENCES

IMM CLIFF RECONCILIATION COMMENTS

No previous CLiFF data to inform this condition.

LIMITATIONS SUMMARY

- The previous IMM CLiFF refers to Barratt's textbook as stating 62% of skin infections have been bacterial. The primary reference for this statistic has not been determined. Clinically, however, this is a reasonable breakdown.
- It is likely that very minor viral/fungal infections have not been reported in the past which could lead to an underestimation of the true incidence.
- Some viral skin infections are associated with infectious diseases. It would be expected that the incidence would rise amongst the crew once one member of the crew is infected. There may be some overlap with other CLiFFs such as those dealing with allergic reactions and bacterial skin infections, particularly when the etiology of the infection is not clear.
- Sexually transmitted infections were not included because they may be included separately in a later version. In addition, STI's are unlikely to occur because of pre-flight screening and, presumably, lower rates of sexual activity during spaceflight.
- There is a paucity of data concerning untreated viral and fungal skin infections.

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)												
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)							34		34	3763	0.00903534	0.903534
Untreated Best Case (UTBC)							34	211	245	3763	0.0651076	6.51076
Treated Worst Case (TWC)							34	211	245	3763	0.0651076	6.51076
Untreated Worst Case (UTWC)	132						34	211	1041	3763	0.276641	27.6641
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	T1 Decimal	T1 %
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)							34	211	245	3763	0.0651076	6.51076

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 requiring use of the alimentary system, 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 Condition 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