Clinical Finding Form (CliFF)

Branch Baseline

ICL72_Neuropathy - Central, Impingement Related

There is no IMM LD68 CliFF for this condition. This condition consists cervical radiculopathy and lumbar radiculopathy. Cervical radiculopathy is typically caused by an impingement or displacement of a cervical nerve root by a herniated or prolapsed disc or by bony irregularities associated with cervical spondylosis. Lumbar radiculopathy is typically caused by an impingement or displacement of a lumbar nerve root by a herniated or prolapsed disc or by bony irregularities associated with lumbar spondylosis. Peripheral nerve impingement syndromes such as carpal tunnel syndrome are not included. Incidence values are based on analog military populations. A composite incidence value will need to be determined by adding incidence values for cervical impingement and lumbar impingement. Best case/worst case percentages and CP2 durations based on terrestrial general population data. RTDC probabilities are based on best and worst case definitions and terrestrial general population data. LOCL probabilities are based on best case and worst case definitions.

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

No spaceflight data is available for this condition.

ANALOG LITERATURE

Schoenfeld, A. J., et al. (2012). "Incidence and Epidemiology of Cervical Radiculopathy in the United States Military 2000 to 2009." J Spinal Disord Tech 25(1): 17-22. Schoenfeld, A. J., et al. (2012). Characterization of the Incidence and Risk Factors for the Development of Lumbar Radiculopathy. J Spinal Disord Tech 25(3): 163-167.

TERRESTRIAL LITERATURE

Radhakrishnan, K., et al. (1994). "Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990." Brain 117 (Pt 2): 325-335. Sampath, P., et al. (1999). "Outcome in patients with cervical radiculopathy. Prospective, multicenter study with independent clinical review." Spine (Phila Pa 1976) 24(6): 591-597. Peul, W. C., et al. (2007). "Surgery versus prolonged conservative treatment for sciatica." N Engl J Med 356(22): 2245-2256. Lequin, M. B., et al. (2013). "Surgery versus prolonged conservative treatment for sciatica: 5-year results of a randomized controlled trial." BMJ Open 3(5). Bailey, C. S., et al. (2020). "Surgery versus Conservative Care for Persistent Sciatica Lasting 4 to 12 Months." N Engl J Med 382(12): 1093-1102.

OVERALL INCIDENCE SUMMARY

INCIDENCE

mean 6.646E-3 and SD 2.223E-5

INCIDENCE SUMMARY

The Bayesian posterior distribution for the incidence rate given the U.S. Military analog data (91,808 events over 13,813,333 person-years) under an uninformative prior is Gamma(shape=89380.29, rate=13448734) with mean 6.646E-3 and SD 2.223E-5. Evidence: • Cervical – Analog – Schoenfeld 2012 – Incidence and Epidemiology of Cervical Radiculopathy in the United States Military 2000 to 2009. 24,742 events over

13,813,333 person-years. IR: 1.791E-3 (95%CI: 1.769E-3, 1.814E-3). • Lumbar – Analog – Schoenfeld 2012 – Characterization of the Incidence and Risk Factors for the Development of Lumbar Radiculopathy. 4.86 per 1kpy. Also, using the same database between 2000 and 2009. 67,066 cases over 13,813,333 person-years. IR: 4.855E-3 (95%CI: 4.818E-3, 4.892E-3) Given these references report on the same data source, it is possible to sum the events over the two sites to model to get an overall rate. Total events 91,808 over 13,813,333 person-years. IR: 6.646E-3 (95%CI: 6.603E-3, 6.689E-3).

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
0.006646

SD
2.223E-05

Gamma
(Shape): 89380.3
(Rate): 1.34487E+07

TABLE 2. INCIDENCE LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Schoenfeld, 2012	Terrestrial	3

LOC = 3 (somewhat confident) based on terrestrial studies. Not given a LOC of 4 (confident) since terrestrial general population and analog military data may not be directly applicable to the astronaut population during spaceflight due to the uniqueness of the astronaut population and the spaceflight environment.

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

No preflight preventive measures.

BEST CASE SCENARIO DEFINITION

Neuropathy due to nerve impingement that resolves spontaneously (i.e. pinched nerve) or with symptomatic treatment (this excludes peripheral impingement syndromes).

WORSE CASE SCENARIO DEFINITION

Persistent neuropathy due to impingement that requires nerve-modulating agents, steroids, or surgical intervention. (This excludes peripheral impingement syndromes)

CONDITIONS INCLUDED, BUT NOT EXPLICITLY STATED (CNES)

None

BEST CASE/WORST CASE PROBABILITY COMMENTS

Best case/worst case percentages of 54-74%/26-46% based on probability of surgical treatment from terrestrial studies. References: Radhakrishnan, K., et al. (1994). "Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990." Brain 117 (Pt 2): 325-335. Sampath, P., et al. (1999). "Outcome in patients with cervical radiculopathy. Prospective, multicenter study with independent clinical review." Spine (Phila Pa 1976) 24(6): 591-597. Peul, W. C., et al. (2007). "Surgery versus prolonged conservative treatment for sciatica." N Engl J Med 356(22): 2245-2256. Lequin, M. B., et al. (2013). "Surgery versus prolonged conservative treatment for sciatica: 5-year results of a randomized controlled trial." BMJ Open 3(5). Bailey, C. S., et al. (2020). "Surgery versus Conservative Care for Persistent Sciatica Lasting 4 to 12 Months." N Engl J Med 382(12): 1093-1102.

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

Citation	Source	LOC Value
Radhakrishnan, 1994	Terrestrial	3
Sampath, 1999	Terrestrial	3
Peul, 2007	Terrestrial	3
Lequin, 2013	Terrestrial	3
Bailey, 2020	Terrestrial	3

Best case/worst case percentages of 54-74%/26-46% based on probability of surgical treatment from terrestrial studies. LOC = 3 (somewhat confident). Radhakrishnan, K., et al. (1994). "Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990." Brain 117 (Pt 2): 325-335. Sampath, P., et al. (1999). "Outcome in patients with cervical radiculopathy. Prospective, multicenter study with independent clinical review." Spine (Phila Pa 1976) 24(6): 591-597. Peul, W. C., et al. (2007). "Surgery versus prolonged conservative treatment for sciatica." N Engl J Med 356(22): 2245-2256. Lequin, M. B., et al. (2013). "Surgery versus prolonged conservative treatment for sciatica: 5-year results of a randomised controlled trial." BMJ Open 3(5). Bailey, C. S., et al. (2020). "Surgery versus Conservative Care for Persistent Sciatica Lasting 4 to 12 Months." N Engl J Med 382(12): 1093-1102.

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 6.646E-3 and SD 2.223E-5	54 - 74	100	1.8	38.67	336	672	0	0	0	0	0
Treated Worst Case (TWC)		26 - 46	100	1.9	38.67	1008	1344	0	1	5	0	0
Untreated Best Case (UTBC)	N/A	N/A	N/A	1.8	42.52	336	672	0	0	0	0	0
Untreated Worst Case (UTWC)	N/A	N/A	N/A	1.9	44.88	1008	1344	38.7	100	100	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

There is no IMM LD68 CliFF for this condition. Incidence values are based on analog military populations. Composite incidence value will need to be determined by adding incidence values for cervical impingement and lumbar impingement. Best case/worst case percentages and CP2 durations based on terrestrial general population data. RTDC probabilities are based on best and worst case definitions and terrestrial general population data. LOCL probabilities are based on best case and worst case definitions.

TREATED BEST CASE (TBC) SCENARIO COMMENTS

No RTDC or LOCL is expected for the treated best case scenario based on the definition.

TREATED WORST CASE SCENARIO (TWC) COMMENTS

1-5% probability of RTDC based on worst case surrogates of cauda equina syndrome or profound motor neuropathy. References: Dynamed - Cervical Spinal Stenosis and Cauda Equina Syndrome. LOCL is not expected.

UNTREATED BEST CASE (UTBC) SCENARIO COMMENTS

No RTDC or LOCL is expected for the untreated best case scenario based on the definition.

UNTREATED WORST CASE (UTWC) SCENARIO COMMENTS

RTDC is expected (100%) based on worst case definition (persistent neuropathy with no available treatment). LOCL is not expected.

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

Citation	Source	LOC Value
Weber et al, 1993	Terrestrial	3
Kuijper et al, 2009	Terrestrial	
Peul et al, 2007	Terrestrial	

Treated best case: Weber- Average Piriformis Syndrome: 4 weeks; Age 45.9; M 41%. Kuijper- Average age 47y; M 55%; Smokers 43%; some patients still have pain at 6mo. LOC = 3 (somewhat confident). Treated worst case: Peul et al, 2007 - Sciatica: 4 weeks to 52 weeks; Age 41.7; F 37%; RDQ 16.5

TABLE 6. RTDC LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
N/A	Case definition	4
Spijker-Huiges et al, 2015	Terrestrial	

Treated best case RTDC = 0% based on best case definition (neuropathy due to nerve impingement that resolves spontaneously or with symptomatic treatment): LOC = 4 (confident). Treated worst case RTDC = 1-5% based on worst case surrogates of cauda equina syndrome or

profound motor neuropathy: LOC = 3 (somewhat confident). References: Spijker-Huiges et al, 2015. Untreated best case RTDC = 0% based on best case definition (neuropathy due to nerve impingement that resolves spontaneously or with symptomatic treatment): LOC = 4 (confident). Untreated worst case RTDC = 100% based on worst case definition (persistent neuropathy with no available treatment): LOC = 4 (confident).

TABLE 7. LOCL LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
N/A	Case definition	4

LOCL is not expected in any scenarios based on best case and worst case scenario definitions: LOC = 4 (confident). There is no evidence to support that LOCL is associated with cervical nerve root impingement or lumbar nerve root impingement.

CAPABILITY RESOURCE TABLE (CRT) OVERVIEW

Capabilities and Resourcing Scope Overview Worst Case Definition: Persistent neuropathy due to impingement that requires nerve-modulating agents, steroids, or surgical intervention. (This excludes peripheral impingement syndromes) Best Case Definition: Neuropathy due to nerve impingement that resolves spontaneously (i.e. pinched nerve) or with symptomatic treatment (this excludes peripheral impingement syndromes). This is just a central (brain and spinal cord) impingement syndrome, and does not include impingement of anything peripheral to that. Diagnostic Scope and Resourcing In the best-case scenario, diagnosis is based on history and physical examination (musculoskeletal and neurologic) only. Imaging, including ultrasound would be helpful in diagnosis of peripheral neuropathy, but is unlikely to be informative in a central impingement. In the worst-case scenario, diagnosis is based on history, physical examination (musculoskeletal, neurologic, and vital signs), and imaging. The utility of musculoskeletal ultrasound would be determined on a case-by-case basis. It was included as a non-necessary capability. This diagnostic framework is consistent with the terrestrial workup for peripheral vs central impingement based on severe disease. It may be used to rule out peripheral disease. 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): 1.8 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 CP1 WC (Treated or Untreated): 1.9 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 including a musculoskeletal ultrasound 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, or an intern level. Treatment Scope and Resourcing Most best-case in terrestrial populations resolve without need for medication at all and just require physical therapy. However, NSAIDs are being given as part of the differential because we are not likely to be sure of the source of the pain. Terrestrially, worst-case conditions may require reduction of inflammation with anti-inflammatory medications and neuropathic pain modulators such as gabapentin are being given for relief. Additionally the following notes should be made concerning the Worst case scenario: 1 - Muscle relaxants are not resourced to this condition because they do not actually help true neuropathic pain. 2 - We are not including the ground communication because we believe that it should not be absolutely required for making a differential or starting treatment. 3 - NSAIDs are being given as part of the differential because we are not likely to be sure of the source of the pain. Communications and Support Needs While real-time video and audio loop communications are desired for diagnosis and treatment, they were not considered a necessity, particularly in the best-case scenario. For the WC, consultation with ground specialists to facilitate treatment and healing was considered helpful, but again not necessary. REFERENCES

IMM CLIFF RECONCILATION COMMENTS

There is no IMM CliFF for this condition.

LIMITATIONS SUMMARY

There is no spaceflight data. Terrestrial general population and analog military data may not be directly applicable to the astronaut population during spaceflight due to the uniqueness of the astronaut population and the spaceflight environment.

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					145					
Treated Worst Case (TWC)		664										
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)	132		414				34	211	1455	3763	0.38666	38.666
Untreated Best Case (UTBC)	132		414				34	211	1600	3763	0.425193	42.5193
Treated Worst Case (TWC)	132		414				34	211	1455	3763	0.38666	38.666
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.

REFERENCES

Reference
Schoenfeld, A. J., et al. (2012). "Incidence and Epidemiology of Cervical Radiculopathy in the United States Military
2000 to 2009." J Spinal Disord Tech 25(1): 17-22. Schoenfeld, A. J., et al. (2012). Characterization of the Incidence and Risk Factors for the Development of Lumbar Radiculopathy. J Spinal Disord Tech 25(3): 163-167. Radhakrishnan, K., et al. (1994). "Epidemiology of cervical radiculopathy. A population-based study from Rochester, Minnesota, 1976 through 1990." Brain 117 (Pt 2): 325-335. Sampath, P., et al. (1999). "Outcome in patients with cervical radiculopathy. Prospective, multicenter study with independent clinical review." Spine (Phila Pa 1976) 24(6): 591-597. Peul, W. C., et al. (2007). "Surgery versus prolonged conservative treatment for sciatica." N Engl J Med 356(22): 2245-2256. Lequin, M. B., et al. (2013). "Surgery versus prolonged conservative treatment for sciatica: 5-year results of a randomized controlled trial." BMJ Open 3(5).
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Kuijper, B., et al. (2009). "Cervical collar or physiotherapy versus wait and see policy for recent onset cervical radiculopathy: randomised trial." BMJ (Clinical research ed.) 339: b3883
Weber, H., et al. (1993). "The natural course of acute sciatica with nerve root symptoms in a double-blind placebo-controlled trial evaluating the effect of piroxicam." Spine (Phila Pa 1976) 18(11): 1433-1438
Spijker-Huiges, A., et al. (2015). "Radiating low back pain in general practice: incidence, prevalence, diagnosis, and long-term clinical course of illness." Scand J Prim Health Care 33(1): 27-32

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