

# STANDARD TREATMENT WORKFLOW (STW)

## SPINAL INJURY

S S Kale<sup>1</sup>, Sunil Singh<sup>2</sup>, Toni Abraham<sup>3</sup>, Sandeep Mohindra<sup>4</sup>, A K Attri<sup>5</sup>, Murugesan<sup>6</sup>, Raj Kumar<sup>7</sup>, Nupur Pruthi<sup>8</sup>, AS Ramesh<sup>9</sup>, V.Raj Shekhar<sup>10</sup>, K.V.Menon<sup>11</sup>, Deepak Gupta<sup>12</sup>, Sanjay Behari<sup>13</sup>, Arun Kumar Yadav<sup>14</sup>

<sup>1</sup>All India Institute of Medical Sciences Delhi; <sup>2</sup>Apollo, Lucknow; <sup>3</sup>Christian Medical College Vellore Tamil Nadu;

<sup>4</sup>Post Graduate Institute of Medical Education & Research Chandigarh; <sup>5</sup>Government Medical College & Hospital, Chandigarh; <sup>6</sup>Coimbatore Medical College; <sup>7</sup>Saifai Rural Inst; <sup>8</sup>National Institute of Mental Health and

Neuro Sciences, Bengaluru; <sup>9</sup>Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry; <sup>10</sup>Christian Medical College Vellore, Tamil Nadu; <sup>11</sup>Rajagiri Hospital, Kerala; <sup>12</sup>All India Institute Of

Medical Sciences Delhi; <sup>13</sup>Sanjay Gandhi Postgraduate Institute of Medical Sciences Lucknow, Uttara Pradesh;

<sup>14</sup>Armed Forces Medical College, Pune Maharashtra

### CORRESPONDING AUTHOR

S S Kale All India Institute of Medical Sciences Delhi

Email: [neurosurgeryoffice@gmail.com](mailto:neurosurgeryoffice@gmail.com)

### CITATION

Kale SS, Singh S, Abraham T, Mohindra S, Attri AK, Murugesan, Kumar R, Pruthi N, Ramesh AS, Shekhar VR, Menon KV, Gupta D, Behari S, Yadav AK. SPINAL INJURY. Journal of the Epidemiology Foundation of India. 2024;2(2Suppl):S283-S284.

DOI: <https://doi.org/10.56450/JEFI.2024.v2i2Suppl.015>

This work is licensed under a Creative Commons Attribution 4.0 International License.

@The Author(s). 2024 Open Access

### DISCLAIMER

This article/STW, was originally published by Indian Council of Medical Research (ICMR) under Standard Treatment Workflow. The reprinting of this article in Journal of the Epidemiology Foundation of India (JEFI) is done with the permission of ICMR. The content of this article is presented as it was published, with no modifications or alterations. The views and opinions expressed in the article are those of the authors and do not necessarily reflect the official policy or position of JEFI or its editorial board. This initiative of JEFI to reprint STW is to disseminate these workflows among Health Care Professionals for wider adoption and guiding path for Patient Care.

15282 / JHIC



Department of Health Research  
Ministry of Health and Family Welfare, Government of India

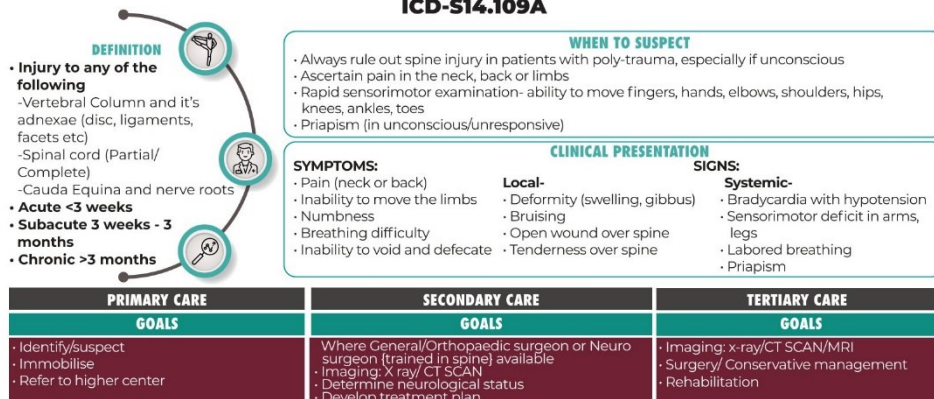


icmr  
INDIAN COUNCIL OF  
MEDICAL RESEARCH  
Serving the nation since 1911

### Standard Treatment Workflow

## SPINAL INJURY

ICD-S14.109A





icmr  
INDIAN COUNCIL OF  
MEDICAL RESEARCH  
Serving the nation since 1971

Department of Health Research  
Ministry of Health and Family Welfare, Government of India

Standard Treatment Workflow

SPINAL INJURY

ICD-S14.109A

**DEFINITION**

- Injury to any of the following
  - Vertebral Column and its adnexae (disc, ligaments, facets etc)
  - Spinal cord (Partial/Complete)
  - Cauda Equina and nerve roots
- Acute <3 weeks
- Subacute 3 weeks - 3 months
- Chronic >3 months

**WHEN TO SUSPECT**

- Always rule out spine injury in patients with poly-trauma, especially if unconscious
- Ascertain pain in the neck, back or limbs
- Rapid sensorimotor examination- ability to move fingers, hands, elbows, shoulders, hips, knees, ankles, toes
- Priapism (in unconscious/unresponsive)

**CLINICAL PRESENTATION**

**SYMPTOMS:**

- Pain (neck or back)
- Inability to move the limbs
- Numbness
- Breathing difficulty
- Inability to void and defecate

**Local-**

- Deformity (swelling, gibbus)
- Bruising
- Open wound over spine
- Tenderness over spine

**SIGNS:**

**Systemic-**

- Bradycardia with hypotension
- Sensorimotor deficit in arms, legs
- Labored breathing
- Priapism

PRIMARY CARE	SECONDARY CARE	TERTIARY CARE
<b>GOALS</b>	<b>GOALS</b>	<b>GOALS</b>
<ul style="list-style-type: none"> <li>Identify/suspect</li> <li>Immobilise</li> <li>Refer to higher center</li> </ul>	<ul style="list-style-type: none"> <li>Where General/Orthopaedic surgeon or Neuro surgeon (trained in spine) available</li> <li>Imaging: X ray/ CT SCAN</li> <li>Determine neurological status</li> <li>Develop treatment plan</li> </ul>	<ul style="list-style-type: none"> <li>Imaging: x-ray/CT SCAN/MRI</li> <li>Surgery/ Conservative management</li> <li>Rehabilitation</li> </ul>
<b>MANAGEMENT</b>	<b>MANAGEMENT</b>	<b>MANAGEMENT</b>
<ul style="list-style-type: none"> <li>ATLS protocol (Airway-breathing-circulation-disability-exposure)</li> <li>Intubate/ventilate with C spine control</li> <li>IV Line Ringer Lactate; collect blood for grouping and cross matching; catheterise</li> <li>Log roll and inspect neck and back for bruise, deformity, tenderness</li> <li>Immobilise with ambulance man's collar/philadelphia collar/spine board/sand bags</li> <li>Manage pain with morphine/pethidine or unless contraindicated</li> <li>Transfer to higher centre</li> </ul>	<ul style="list-style-type: none"> <li>Secondary survey as per ATLS protocol</li> <li>Conscious/ unconscious</li> <li>Log roll and examine cervical, thoracic, lumbar, sacral spine</li> <li>Detailed neurological examination (Frankel scale) and document (Appendix I)</li> <li>Associated injuries</li> <li>Imaging (appropriate X rays, CT whole spine scans/MRI if available)</li> <li>TLICS/SLIC scoring (Appendix II/ III) –                             <ul style="list-style-type: none"> <li>surgery; indicated/doubtful – refer;</li> <li>conservative: brace</li> </ul> </li> <li>MPSS in selected cases (Appendix IV)</li> <li>Apply collar/skull traction/halo vest, brace or spine board to transfer</li> </ul>	<ul style="list-style-type: none"> <li>Detailed neurological evaluation (ASIA scale)</li> <li>Imaging (X Ray, CT, MRI)</li> <li>Classify spinal injury and score</li> <li>TLICS/SLIC &lt;4 conservative management; &gt;5 surgery; 4-case based</li> <li>MPSS as indicated</li> <li>DVT prophylaxis as indicated (Appendix V)</li> <li>Surgery as indicated (decompression/stabilisation)</li> <li>Conservative care-skull traction, halo vest, SOMI brace, TLSO brace</li> <li>Rehabilitation</li> </ul>

**APPENDIX I: FRANKEL SCALE**

- Grade A: Complete neurological injury - No motor or sensory function detected below level of lesion
- Grade B: Preserved sensation only - No motor function detected below level of lesion, some sensory function below level of lesion preserved
- Grade C: Preserved motor, nonfunctional - Some voluntary motor function preserved below level of lesion but too weak to serve any useful purpose
- Grade D: Preserved motor, Functionally useful voluntary motor function below level of injury
- Grade E: Normal motor function - Normal motor and sensory function below level of lesion, abnormal reflexes may persist

**APPENDIX II: TLICS SCORE**

**Table 1**  
**The TLICS with its subcategories and scoring**

Injury Category	Point Value
<b>Injury Morphology</b>	
Compression fracture	1
Burst fracture	2
Translation or rotation	3
Distraction	4
<b>PLC Status posterior ligamentous complex</b>	
Intact	0
Injury suspected or indeterminate	2
Injured	3
<b>Neurological Status</b>	
Intact	0
Nerve root involvement	2
Spinal cord or conus medullaris injury	3
Incomplete cord injury	3
Complete cord injury	2
Cauda equina syndrome	3
Non operative	<4
Equivocal	4
Operative	>4

**APPENDIX III: SLIC SCORE**

Characteristics	Points
<b>Injury Morphology</b>	
No abnormality	0
Compression fracture	1
Burst fracture	2
Distraction	3
Translation/rotation	4
<b>Integrity of the disco-ligamentous complex</b>	
Intact	0
Indeterminate	1
Disrupted	2
<b>Neurological Status</b>	
Intact	0
Nerve root injury	1
Complete cord injury	2
Incomplete cord injury	3
Persistent cord compression	+1
Non operative	<4
Equivocal	4
Operative	>4

**APPENDIX IV: MPSS GUIDELINES (MODERATE EVIDENCE AND WEAK RECOMMENDATION)**

- Methyl Prednisolone Sodium Succinate: 30mg/kg bolus and 5.4mg/kg/hr x 23 hours
- Role of MPSS:
  - May consider but be aware of the complications of high dose of steroids
  - Acute spinal cord injury less than 8 hours, incomplete neurology: consider
  - Acute spinal cord injury more than 8 hours, incomplete/complete cord injury neurology: no role
  - Acute spinal cord injury less than 8 hours, complete neurology: no role
  - Acute spinal cord injury with thoracic/abdominal visceral injury: contraindicated

**APPENDIX V: DVT PROPHYLAXIS**

- All neurologically compromised (non-ambulatory) patients within 72 hours must receive DVT prophylaxis.
- Subcutaneous LMW Heparin/ fixed low dose unfractionated heparin
- No adjusted dose unfractionated heparin
- Duration 8-12 weeks depending on risk factors

**ANCIILLARY PROCEDURES**

<ul style="list-style-type: none"> <li>Goal MAP ≥ 85 mmHg for blunt/incomplete penetrating injury</li> </ul>	<ul style="list-style-type: none"> <li>Goal MAP ≥ 65 mmHg for complete penetrating injury</li> </ul>	<ul style="list-style-type: none"> <li>Nor-epinephrine IV infusion (0.1- 0.5 mcg/kg/min)</li> </ul>	<ul style="list-style-type: none"> <li>Early neurosurgical decompression of acute spinal cord compression (&lt; 72 hours) is recommended</li> </ul>	<ul style="list-style-type: none"> <li>Consider early tracheostomy (&lt; 7 days) in high cervical injury (C1-C5) patients</li> </ul>
--	--	---	---	--

**ABBREVIATIONS**

<ul style="list-style-type: none"> <li>ATLS: Advanced Trauma Life Support</li> <li>CT: Computed Tomography</li> <li>DVT: Deep Vein Thrombosis</li> <li>LMW: Low Molecular Weight Heparin</li> <li>MAP: Mean Arterial Pressure</li> </ul>	<ul style="list-style-type: none"> <li>MRI: Magnetic Resonance Imaging</li> <li>SLIC: Subaxial Injury Classification</li> <li>SOMI: Sternal Occipital Mandibular Immobilizer</li> <li>TLICS: Thoracolumbar Injury Classification and Severity</li> <li>TLSO: Thoracic-Lumbar-Sacral Orthosis</li> </ul>
--	---

**REFERENCES**

1. Consortium for Spinal Cord Medicine. Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals. J Spinal Cord Med. 2008;31(4):403-79. doi: 10.1043/0799-0268.31.4.408. PMID: 18953939. PNCID: PNCID580434
2. Fehlings MG, Tetreault LA, Wilson JR, Kwon BK, Burns AS, Martin AR, Haverlyuk G, Harrop JS. A Clinical Practice Guideline for the Management of Acute Spinal Cord Injury: Introduction, Rationale, and Scope. Global Spine J. 2017 Sep;27(9):845-846. doi: 10.1177/215258271733387. Epub 2017 Sep 5. PMID: 29164036. PNCID: PNCID5849446
3. Fehlings MG, Tetreault LA, Aarabi B, Anderson P, Arnold PM, Brocchi DS, Chiba K, Dettori JB, Furlan JC, Harrop JS, Haverlyuk G, Holly LT, Howley S, Jeji T, Kalsi-Ryan S, Kotter M, Kurpad S, Kwon BK, Marino RJ, Martin AR, Massicotte E, Meri G, Middleton JW, Nakashima H, Nagoshi N, Palmieri K, Singh A, Skelly AC, Tsai EC, Vaccaro A, Wilson JR, Yee A, Burns AS. A Clinical Practice Guideline for the Management of Patients With Acute Spinal Cord Injury: Recommendations on the Type and Timing of Rehabilitation. Global Spine J. 2017 Sep;27(9):2315-2385. doi: 10.1177/215258271770910. Epub 2017 Sep 5. PMID: 29164029. PNCID: PNCID5849333
4. National Clinical Guideline Centre (UK). Spinal injury: Assessment and initial management. London: National Institute for Health and Care Excellence (NICE); 2016 Feb. PMID: 26913323
5. Waters SC, Hadley MN, Hurlbert RJ, Anand B, Dhall SS, Gels DE, Harrigan MR, Bosible CJ, Drake TC, Theodore RE. American Association of Neurological Surgeons. Congress of Neurological Surgeons. Guidelines for the management of acute cervical spine and spinal cord injuries 2013 update. Neurosurgery. 2013 Aug;60(CN\_suppl\_1):B2-91. doi: 10.1227/01.neu.0000430379.3224771f. PMID: 23839357
6. Liu Z, Yang Y, He L, Pang M, Luo C, Liu B, Hong L. High-dose methylprednisolone for acute traumatic spinal cord injury: A meta-analysis. Neurology. 2019 Aug 27;93(9):e841-e850. doi: 10.1212/WNL.0000000000007998. Epub 2019 Jul 29. PMID: 3158677

**KEEP A HIGH THRESHOLD FOR INVASIVE PROCEDURES**

This STW has been prepared by national experts of India with feasibility considerations for various levels of healthcare system in the country. These broad guidelines are advisory, and are based on expert opinions and available scientific evidence. There may be variations in the management of an individual patient based on his/her specific condition, as decided by the treating physician. There will be no indemnity for direct or indirect consequences. Kindly visit the website of ICMR for more information: [icmr.gov.in](http://icmr.gov.in) for more information. ©Indian Council of Medical Research, Ministry of Health & Family Welfare, Government of India.