

# H05: Spinal Cord and Neck Trauma

Ryan Ackerman

Updated: June 19, 2024

Reviewed: March 01, 2021

## Introduction

Spinal cord injuries (SCI), while relatively rare, contribute significantly to morbidity and disability among those affected. Spinal motion restriction (SMR) must be undertaken on any patient who is at risk for SCI. Traditional SMR devices, such as cervical collars and rigid immobilization boards, carry risks of their own and should not be applied without a clinical indication to do so.

Contemporary care for potential SCI patients does not need to be an "all or nothing" approach, but instead should be patient centric. At all times the risks of applying SMR should be weighed against its benefits for each individual patient.

Cervical spine injuries are often the sole source of focus; attention must be paid to thoracic and lumbar injuries as well.

## Essentials

- The mechanism of injury alone is not an accurate predictor of spinal column/cord injury.
- The NEXUS C-Spine clearance tool may be used for adult patients.
- NEXUS only applies to cervical spine injuries. Thoracolumbar injuries must be assessed separately.
- Factors such as intoxication, altered levels of consciousness, language barriers, and major distracting injuries can all confound the assessment of spinal injuries.
- Only multi-trauma patients or those with new onset neurological impairment require conveyance on a clamshell stretcher.
- Full SMR refers to a cervical collar, foam rolls (without taping of the head), and a clamshell throughout transport regardless of transport time

## Additional Treatment Information

- Known risks associated with SMR include: airway compromise; respiratory restriction; pressure ulcers; decreased cardiac output; vomiting/aspiration; increased intracranial pressure; pain; increased scene time; and more complicated ER management.
- Elderly patients (age  $\geq 65$ ) are at greater risk for spinal fractures from lower force injuries. Careful attention must be paid to thorough assessment with any trauma above the clavicles.
- Penetrating trauma requires rapid conveyance. SMR has been shown to increase mortality in these patients.
- Early and frequent focused neurological assessments (motor, sensation) may help monitor an evolving injury.
- Spinal cord injuries often require higher perfusion pressures to overcome swelling. Target a systolic BP  $> 120$  mm/hg in patients with clear signs of neurological deficit.

## Referral Information

- Triage according to the [Pre-hospital Triage and Transport Guidelines for Adult and Pediatric Major Trauma](#) decision tool, including Physiological Criteria, Anatomical Criteria, Mechanism of Injury Criteria, and Special Considerations.
- All patients with spinal cord and neck trauma should be conveyed to the closest appropriate trauma receiving hospital as per local trauma destination guidelines or clinical pathway.

## General Information

- [NEXUS Criteria:](#)
  1. Does the patient have midline tenderness of the cervical spine?

2. Is the patient's level of consciousness altered? (Must be alert and oriented to time, person, place, and event.)
  3. Are there new focal neurological deficits?
  4. Is the patient intoxicated? (Judgement and pain sensation must be intact.)
  5. Is there a major distracting injury significant enough to interfere with their ability to assess pain response when palpating spine?
- If the answer to all five NEXUS questions is "no," SMR is not warranted.
  - Thoracolumbar injuries: If the patient does not require SMR based on the NEXUS criteria but has any of the following findings, do not sit the patient up or raise the head of the stretcher on the assumption that thoracic or lumbar injuries may be present:
    - Fall from height > 3m
    - Axial loading to head or base of spine
    - High speed MVC > 100 km/h
    - Rollover MVC
    - New back deformity, bruising, or bony midline tenderness

## Interventions

### First Responder

- Apply [spinal motion restriction](#) as clinically indicated
- Supplemental oxygen as required
  - → [A07: Oxygen Administration](#)

### Emergency Medical Responder – All FR interventions, plus:

- Initiate conveyance; consider intercept with additional resources

### Primary Care Paramedic – All FR and EMR interventions, plus:

- Treat nausea/vomiting:
  - [Dimenhydrinate](#)
- Correct hypo-perfusion/hypotension:
  - → [D03: Vascular Access and Fluid Administration](#)
  - For suspected or confirmed spinal cord injury, target systolic BP of > 120 mmHg

### Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Secure airway if required
  - → [PR18: Anesthesia Induction](#)

### Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Grading using ASIA scoring.
- Manage hemodynamic instability:
  - MAP > 80-85 mmHg for isolated spinal cord injury
  - Consider balanced fluid administration.
  - Vasopressor administration may be required
    - [Call ETP prior to vasopressor](#)
    - [Phenylephrine](#)
    - [Dopamine](#)
    - [Norepinephrine](#)
    - [Epinephrine](#)
- Respiratory support
  - Signs of impending respiratory failure
    - increasing rate

- decreasing forced vital capacity
- rising PCO<sub>2</sub>
- falling PO<sub>2</sub> (late)
- If mechanical ventilation is required, refer to mechanical ventilation procedure guideline
- Arterial or venous blood gas analysis
  - Adjust mechanical ventilation to ensure adequate oxygenation, appropriate ventilation, and safe ground ventilating parameters

## Evidence Based Practice

### Spinal Injury

#### Supportive

- [In-line stabilization for intubation](#)
- [C-Spine Clearance](#)
- [Scoop stretcher](#)
- [Self Extrication](#)
- [Leave Helmet in Place](#)

#### Neutral

- [Steroid](#)
- [Spinal Precautions](#)
- [Short Extrication Devices \(ex: KED\)](#)

#### Against

- [Long Spinal Immobilization Devices](#)
- [Cervical Collar](#)
- [Immobilization in Penetrating Trauma](#)

## References

1. Abram S, et al. Routine spinal immobilization in trauma patients: What are the advantages and disadvantages? 2010. [\[Link\]](#)
2. Chan D, et al. The effect of spinal immobilization on healthy volunteers. 1994. [\[Link\]](#)
3. Connor D, et al. On behalf of the consensus group, Faculty of Pre-Hospital Care. Pre-hospital spinal immobilisation: An initial consensus statement. 2013. [\[Link\]](#)
4. Çorbacıoglu SK, et al. Effect of Spinal Immobilization with a Long Backboard and Cervical Collar on the Vital Signs. 2016. [\[Link\]](#)
5. Gonzalez RP, et al. Prehospital clinical clearance of the cervical spine: A prospective study. 2013. [\[Link\]](#)
6. Ham W, et al. Pressure ulcers from spinal immobilization in trauma patients: A systematic review. 2014. [\[Link\]](#)
7. Harrop JS, et al. The cause of neurologic deterioration after acute cervical spinal cord injury. 2001. [\[Link\]](#)
8. Hauswald M. A re-conceptualisation of acute spinal care. 2013. [\[Link\]](#)
9. Hauswald M, et al. Out-of-hospital spinal immobilization: Its effect on neurologic injury. 1998. [\[Link\]](#)
10. Haut ER, et al. Spine Immobilization in Penetrating Trauma: More Harm Than Good? 2010. [\[Link\]](#)
11. Kaups KL, et al. Patients with gunshot wounds to the head do not require cervical spine immobilization and evaluation. 1998. [\[Link\]](#)

12. Mays, Ben. "Is full pre-hospital spinal immobilisation best for the patient? A review of current controversies." 2016. [\[Link\]](#)
13. Michaleff ZA, et al. Accuracy of the Canadian C-spine rule and NEXUS to screen for clinically important cervical spine injury in patients following blunt trauma: a systematic review. 2012. [\[Link\]](#)
14. Mobbs RJ, et al. Effect of cervical hard collar on intracranial pressure after head injury. 2002. [\[Link\]](#)
15. Oto B, et al. Early secondary neurologic deterioration after blunt spinal trauma: A review of the literature. 2015. [\[Link\]](#)
16. Stuke LE, et al. Prehospital spine immobilization for penetrating trauma--review and recommendations from the Prehospital Trauma Life Support Executive Committee. 2011. [\[Link\]](#)
17. Sundstrøm T, et al. Prehospital Use of Cervical Collars in Trauma Patients: A Critical Review. 2014. [\[Link\]](#)
18. Totten VY, et al. Respiratory effects of spinal immobilization. 1999. [\[Link\]](#)
19. Tran J, et al. Prospective Validation of Modified NEXUS Cervical Spine Injury Criteria in Low-risk Elderly Fall Patients. 2016. [\[Link\]](#)

