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Spinal Motion Restriction

Selective SMR, technique, penetrating trauma, children and cord injury, for EMT, paramedic and CEN

14 sources + more detail
erbasics.com/sheets/spinal-motion-restriction.html
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SET-UP Doing it well



1 Restriction, not immobilization

Collars, boards and cots limit spinal motion; none truly immobilize. The 2018 ACS-COT, ACEP and NAEMSP joint statement calls it spinal motion restriction (SMR): a sized collar, with head, neck and torso in line on a cot, scoop, vacuum mattress or board.

EXAM TIP Exams test selective SMR. Adults: findings decide, not mechanism; an alert, sober adult with no midline pain or tenderness, deficit, deformity, distracting injury or unreliable exam needs no collar, even after a crash. Children: a high-risk crash or diving injury alone is enough.

A 2025 NAEMSP review found no proven benefit and clear harms; it urges fewer collars, boards only for extrication, and a focus on shock. Debated; the 2018 statement stands.

2 Adult blunt trauma: who needs SMR

- Altered mental status: GCS <15, intoxication, extreme agitation
- Midline neck or back pain or tenderness
- Focal neuro signs or symptoms: numbness, tingling, weakness
- Spinal deformity
- Distracting injury: long-bone fracture, degloving, crush, large burn
- Unreliable exam: emotional distress, communication barrier, dementia

Mechanism (vehicle crash, axial load, fall >10 ft) raises suspicion but should not decide alone (NASEMSO). ED imaging rules (the Canadian rule requires imaging for age ≥65 or a dangerous mechanism alone):

RULE	APPLIES TO	LOW RISK ONLY IF
NEXUS	Blunt trauma	All 5: alert, sober, no midline tenderness, deficit or painful distracting injury
Canadian C-spine	Alert, stable adults	No high-risk factor (age ≥65, dangerous mechanism, paresthesias); a low-risk factor; rotates neck 45° each way

3 Doing it well

- Sized rigid collar, whole spine aligned; don't force manual holds on alert patients moving freely
- Ambulatory: collar on, then walk to the cot
- Vehicle: adults and booster-seat children self-extricate; harnessed infants and toddlers stay in the car seat
- Board, scoop or vacuum mattress to extricate and transfer; lift-and-slide, not log-roll
- On the cot, remove the board with enough trained hands; on a short transport, leaving it on may be better
- Flat and supine; for breathing trouble, severe head injury or cooperation, raise the head end about 30°, spine in line. Never sit the patient up.

SAFETY Boards and tight straps cause pain, limit chest rise and start skin ischemia within minutes. A patient in SMR who vomits can aspirate: keep suction ready.

ED: slide the patient off the board soon after arrival, with enough staff; keep the collar until a provider clears the spine.

4 Penetrating trauma

The 2018 statement gives SMR no role in penetrating trauma. In adults, an EAST meta-analysis tied immobilization to higher mortality (risk ratio 2.4), with no neurologic benefit shown. NASEMSO: no collar for a penetrating neck wound, even with neuro symptoms; it can delay recognizing injury or airway compromise.

SAFETY Some protocols and older texts add SMR when a penetrating wound causes a new deficit; the 2018 statement and NASEMSO do not. Follow your agency's protocols, and never let SMR delay airway, bleeding control or transport.

5 Children and older adults

- Age alone never decides; weigh whether an infant or a patient with dementia can be assessed reliably
- Child collar triggers: neck pain, torticollis, deficit, altered mental status, high-risk crash, diving injury, major torso injury
- Large head: pad under the shoulders to keep the neck neutral
- Straps across chest and pelvis, not the abdomen
- Older adults: higher fracture risk, but kyphosis, ankylosing spondylitis or fragile skin can make a standard collar or board unsuitable; pad in a position of comfort

6 Cord injury: breathing and shock

SAFETY C3-C5 supply the diaphragm: a high cervical cord injury can stop breathing; lower injuries weaken it. Be ready to assist ventilation.

FEATURE	NEUROGENIC SHOCK	SPINAL SHOCK
What	Loss of sympathetic tone	Temporary loss of all cord function below the injury
Level	Cervical or upper thoracic, usually above T6	Any cord level
Signs	Low BP, slow HR, warm pink skin, hypothermia	Flaccid paralysis, no reflexes, no rectal tone, priapism

- Hypotension after trauma is bleeding until proven otherwise; with a cord injury, correct SBP <90 promptly
- EMT: recognize neurogenic shock, keep supine and warm, support breathing, call ALS early
- Paramedic/ED: cautious fluids, then a vasopressor; norepinephrine preferred (alpha and beta)
- Paramedic/ED: atropine for symptomatic bradycardia; suctioning can trigger it
- Hospital MAP: 85-90 for 7 days (AANS/CNS 2013); AO Spine 2024: at least 75-80, not pushed above 90-95, for 3-7 days

Drugs and doses: follow your agency's or institution's protocols.

EXAM TIP Classic item: hypotension, bradycardia and warm skin after neck injury is neurogenic shock; flaccid paralysis with absent reflexes is spinal shock.

MORE Anatomy, tracts and cord syndromes

The cord ends at the conus medullaris at about L1–L2 in adults; below it lie nerve roots (the cauda equina), so a low lumbar injury gives lower motor neuron signs: flaccid weakness and lost reflexes. Injuries cluster at C4–C6 and the thoracolumbar junction (T11–L2). Older adults fracture C1–C2, often the odontoid, in ground-level falls; ankylosing spondylitis makes the spine a brittle lever; children under about 8 injure C1–C3 (large head, lax ligaments).

TRACT	CARRIES	CROSSES
Lateral corticospinal	Voluntary movement	Medulla, so a cord lesion weakens the same side
Dorsal columns	Position, vibration, fine touch	Medulla, so loss is on the same side
Spinothalamic	Pain, temperature, crude touch	Within 1–2 segments, so loss is on the opposite side

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