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Spinal Immobilization

NEUROLOGICAL

TRAUMA

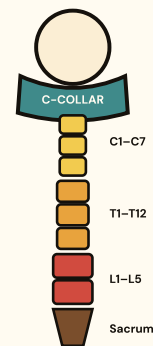
EMERGENCY

HIGH-YIELD NGN

 **Content Source Note:** This topic was not present in Diane's uploaded reference notes. Content drawn from standard NGN NCLEX 2026 references: Saunders Comprehensive Review, ATI Med-Surg, Lippincott Nursing Procedures, ENA Trauma Nursing Core Course (TNCC), and current ACS/ATLS spinal motion restriction guidelines.

1 Definition & Overview

- ◆ **Spinal immobilization (Spinal Motion Restriction, SMR)** = the use of devices (rigid C-collar, backboard, head blocks, straps) to restrict spinal movement when spinal cord injury (SCI) is suspected.
- ◆ **Purpose:** prevent *secondary* neurologic injury from movement of unstable vertebrae against the spinal cord.
- ◆ **Why it matters:** permanent paralysis, neurogenic shock, and respiratory failure are preventable complications when SMR is applied early and correctly.



Neutral alignment — the goal of every move.

2 Pathophysiology

STEP 1 Trauma (MVA, fall, dive, GSW, sports)

STEP 2 Vertebral fracture, dislocation, or ligamentous instability

STEP 3 Unrestricted movement → bone fragments compress, contuse, or sever the spinal cord

STEP 4 Edema + hemorrhage at the level of injury → loss of motor, sensory, autonomic function below the level

RESULT Permanent neurologic deficit, neurogenic shock, respiratory failure (C3–C5)

3 Indications — When to Immobilize

Apply SMR for *any one* of the following (NEXUS & Canadian C-Spine criteria):

- ◆ **High-risk mechanism:** MVA >35 mph, ejection, rollover, motorcycle crash, fall >3× patient's height, diving, axial-load injury
- ◆ **Penetrating trauma** near the spine (GSW, stab)
- ◆ **Altered LOC** after trauma (GCS <15, intoxication, head injury)
- ◆ **Focal neurologic deficit** — weakness, numbness, tingling, paralysis
- ◆ **Midline spinal pain or tenderness** on palpation
- ◆ **Distracting injury** (long-bone fracture, severe pain elsewhere) that may mask spinal pain
- ◆ **Age >65** with *any* fall mechanism
- ◆ **Children <8** with unclear history or unable to communicate
- ◆ **Suspected unstable fracture** after imaging

4 Signs & Symptoms

Early (Compensated)

- ◆ Neck or back pain at the site
- ◆ Paresthesia — numbness, tingling, "pins & needles"
- ◆ Decreased motor strength in extremities
- ◆ Patchy loss of sensation
- ◆ Muscle weakness, unsteady gait

Late (Decompensated)

- ◆ Complete loss of motor / sensory function below injury
- ◆ Flaccid paralysis & areflexia (spinal shock)
- ◆ Loss of bowel & bladder control
- ◆ Priapism (sustained erection)
- ◆ Inability to feel pain, temperature, or pressure

RED FLAGS — Call Provider NOW

- ◆ **Neurogenic shock:**
HYPotension + BRADYcardia + warm/dry skin
- ◆ **Respiratory compromise:**
diaphragmatic paralysis (C3–C5 = "C3, 4, 5 keep the diaphragm alive")
- ◆ **Autonomic dysreflexia** (T6 or above): severe HTN, pounding headache, bradycardia, flushing above injury
- ◆ **Worsening neuro exam** after immobilization

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Priority Nursing Interventions (ABC + Safety)

A Airway & Stabilization First

- ◆ **Apply MANUAL in-line stabilization FIRST** — before any device, before any move.
- ◆ **Open airway with JAW-THRUST** — never head-tilt/chin-lift if SCI is suspected.
- ◆ **Size and apply a rigid cervical collar** (Philadelphia or Aspen).
- ◆ **Place on backboard** with head blocks; secure forehead, chin, chest, hips, knees, feet.
- ◆ **Suction** readily available — patient cannot turn the head to clear secretions.

B Movement & Assessment

- ◆ **LOG-ROLL ONLY** — minimum 4 staff; one nurse controls the head and calls the move.
- ◆ **Assess CMS** (circulation, motor, sensation) *before* and *after* every move.
- ◆ **Keep HOB flat** unless contraindicated; reverse-Trendelenburg if elevated head needed.
- ◆ **Remove backboard ASAP** (within 2 hours) once cleared — prevents occipital and sacral pressure injuries.
- ◆ **Continuous cardiac & resp monitoring**; watch for neurogenic shock.
- ◆ **Insert Foley** (urinary retention common in SCI) & NG tube (paralytic ileus).
- ◆ **DVT prophylaxis** — SCDs + pharmacologic when cleared.
- ◆ **Reposition / pad bony prominences** every 2 hours within restrictions.

6 Pharmacology

DRUG / CLASS	MECHANISM	KEY SIDE EFFECTS	NURSING CONSIDERATIONS
Methylprednisolone (high-dose IV)	Glucocorticoid — reduces cord edema (use is controversial; per protocol within 8 hr of acute SCI)	Hyperglycemia, GI bleed, immunosuppression, delayed wound healing	Monitor BG, stress-ulcer prophylaxis (PPI), assess for infection
Norepinephrine / Dopamine	Vasopressor — supports MAP ≥ 85 mmHg in neurogenic shock to perfuse the cord	Tachydysrhythmias, peripheral ischemia, extravasation necrosis	Central line preferred; titrate per BP; monitor MAP, urine output, lactate
Atropine	Anticholinergic — blocks vagal tone; treats symptomatic bradycardia of neurogenic shock	Tachycardia, dry mouth, urinary retention, blurred vision	Have ready at bedside; monitor HR & rhythm continuously
IV Crystalloids (0.9% NS, LR)	Volume support — use cautiously in neurogenic shock (it's a distributive, not hypovolemic, shock)	Pulmonary edema if over-resuscitated	Monitor lung sounds, JVD, SpO_2 ; vasopressors are often more appropriate than fluids alone
Enoxaparin (LMWH)	Anticoagulant — DVT/PE prevention (paralyzed patients are extremely high risk)	Bleeding, thrombocytopenia (HIT)	Hold for active bleeding; monitor platelets, signs of bleeding
Baclofen / Dantrolene	Skeletal muscle relaxants — treat chronic spasticity post-SCI	Sedation, weakness, hepatotoxicity (dantrolene)	Do NOT stop baclofen abruptly — rebound spasticity & hyperthermia
Stool softeners / Bowel program	Prevents constipation, impaction, and autonomic dysreflexia trigger	Cramping, diarrhea	Scheduled program is essential — impaction is the #1 trigger for autonomic dysreflexia

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NCLEX Test Traps ⚠️

✗ **WRONG** Tilt the head back to open the airway of a trauma patient.

✓ **RIGHT** Use the **JAW-THRUST** maneuver — head-tilt/chin-lift moves the cervical spine.

✗ **WRONG** Apply the cervical collar first, then control the head.

✓ **RIGHT** **Manual in-line stabilization is FIRST**; the collar is applied *around* the hands holding the head.

✗ **WRONG** Ask the patient to turn their head to assess for neck pain.

✓ **RIGHT** **Never move the neck** to assess — palpate gently for midline tenderness with the head held still.

✗ **WRONG** Remove the helmet from a motorcycle crash patient who is breathing fine.

✓ **RIGHT** Leave the helmet on unless airway compromise exists; **removal requires two trained providers** with the head stabilized.

✗ **WRONG** Treat hypotension + bradycardia in a trauma patient as hypovolemic shock and bolus fluids.

✓ **RIGHT** That pattern is **NEUROGENIC shock** — vasopressors + cautious fluids. Hypovolemic shock = hypotension + *tachycardia*.

✗ **WRONG** Reposition the patient by sliding or pulling them up in bed.

✓ **RIGHT** **Log-roll only** with ≥4 staff and the head-holder calling the move.

✗ **WRONG** Keep the patient on the rigid backboard until the doctor says otherwise.

✓ **RIGHT** **Remove the backboard ASAP** (within ~2 hr) once C-spine is cleared — backboards cause rapid occipital/sacral pressure injuries.

✗ **WRONG** A patient with a T4 SCI has a pounding headache and BP 210/110 — give an opioid for pain.

✓ **RIGHT** That is **AUTONOMIC DYSREFLEXIA**: sit upright, find & remove the trigger (full bladder/impaction/tight clothing), then give antihypertensive.

8 Patient & Family Education

- ◆ **Hold still** — do not turn your head, even if uncomfortable.
- ◆ **Report immediately:** new numbness, tingling, weakness, or trouble breathing.
- ◆ **Helmet/equipment removal:** never let untrained bystanders remove sports helmets in the field.
- ◆ **After SCI:**
 - ◆ Inspect skin daily — paralyzed areas cannot feel pressure injuries.
 - ◆ Follow scheduled bowel & bladder program; impaction triggers autonomic dysreflexia.
 - ◆ Wear SCDs; take prescribed anticoagulant — DVT risk is lifelong.
 - ◆ Avoid sudden temperature extremes — autonomic regulation is impaired.
 - ◆ Recognize autonomic dysreflexia (T6+): pounding headache, sweating above injury, severe HTN → **sit up, find trigger, call provider.**
- ◆ **Prevention:** seatbelts, helmets, no diving in unknown water, fall-proof the home.

9 Memory Boosters

N · S · A · I · D

NEXUS criteria — patient *cannot* be cleared without imaging if **ANY** are present:

- ◆ **N** — Neurologic deficit
- ◆ **S** — Spinal midline tenderness
- ◆ **A** — Altered level of consciousness
- ◆ **I** — Intoxication
- ◆ **D** — Distracting injury

C3 · 4 · 5

"C3, 4, 5 keep the diaphragm alive." Injury at or above C5 = phrenic nerve compromise = respiratory failure. Have a BVM and intubation kit ready.

SLOW & LOW

Neurogenic shock = SLOW heart rate + LOW blood pressure + warm/dry skin. Hypovolemic shock is FAST & LOW.

LOG · LIKE · A · LOG

Always log-roll — head, shoulders, hips, and knees move as one unit. One person at the head *calls* the move.

10 NCJMM Clinical Judgment Scenario — 6 Steps

CASE

A 22-year-old male is brought to the ED by EMS after a high-speed MVA in which he was ejected from the vehicle. EMS applied a C-collar and placed him on a backboard. On arrival: GCS 14 (opens eyes to voice, confused), reports neck pain rated 8/10 and numbness/tingling in both legs. **VS: BP 92/54, HR 52, RR 22, SpO₂ 96% on 4 L NC, T 36.4°C.** Skin is warm and dry. He cannot move his lower extremities on command.

STEP 1

Recognize Cues

- High-energy MOI (ejection) → high SCI risk
- GCS 14, confused → altered LOC
- Bilateral lower-extremity numbness & paralysis
- BP 92/54 + HR 52 + warm/dry skin (atypical for trauma)
- Neck pain 8/10

STEP 2

Analyze Cues

- MOI + neuro deficit = probable cervical/thoracic SCI
- HYPOTension + BRADYcardia + warm/dry skin = **neurogenic shock** (NOT hypovolemic)
- RR 22 trending up → watch for diaphragmatic involvement (C3–C5)
- Altered LOC + distracting injury = cannot clinically clear C-spine (NEXUS)

STEP 3

Prioritize Hypotheses

- #1 Acute SCI with neurogenic shock** — life-threatening, time-sensitive
- #2 Impending respiratory failure (cervical level)
- #3 Pressure injury risk from prolonged backboard
- #4 Concomitant traumatic injuries (head, chest, abdomen)

STEP 4

Generate Solutions

- Maintain SMR; do NOT remove collar/backboard until cleared
- Imaging: CT C-spine, thoracic/lumbar series, head CT
- Establish 2 large-bore IVs; prepare vasopressors (norepinephrine)
- Have atropine at bedside for bradycardia
- Continuous cardiac, SpO₂, BP monitoring; have BVM & intubation kit
- Insert Foley (retention/I&O) & NG (ileus)
- Remove backboard ASAP once cleared

STEP 5

Take Action

- Apply O₂; prepare for possible intubation (jaw-thrust only)
- Baseline CMS in all 4 extremities & document
- Start norepinephrine per protocol — target MAP ≥85 mmHg
- Give atropine 0.5 mg IV for HR <50 with symptoms
- Notify provider; expedite imaging; consult neurosurgery
- Log-roll for skin assessment with 4 staff; remove backboard once cleared
- Place SCDs; warming blanket (poikilothermia)

STEP 6

Evaluate Outcomes

- ✓ MAP ≥85 mmHg sustained; HR ≥60
- ✓ SpO₂ ≥94%, RR 12–20, no diaphragmatic fatigue
- ✓ CMS unchanged or improved from baseline
- ✓ Skin intact; backboard removed within 2 hr
- ✓ Foley draining ≥0.5 mL/kg/hr; no abdominal distention
- ✗ If neuro decline, worsening RR, or refractory hypotension → escalate, prepare for ICU/OR

