

SFA
FMR
EMR
PCP
Standard Approach and Ongoing Assessment

SFA
FMR
EMR
PCP
Maintain C-spine control (if able) while assessing need for spinal motion restriction (SMR)

Patient alert, cooperative and stable with no neurological symptoms?

Yes

Presence of neck pain following blunt trauma?

Yes

*High risk factor for spinal injury which mandates SMR?

No

**Low risk factor for spinal injury which allows safe assessment of range of motion?

Yes

Able to voluntarily Rotate neck 45° left and right?

No

SFA
FMR
EMR
PCP
Continue treatment and assessment until transfer of care to EMS

Patient Safety Considerations

- SMR and C-collar application are contraindicated in all cases of isolated penetrating trauma
- If Thoracic or Lumbar spinal injury suspected from symptoms, signs or mechanism of injury, patients should be laid supine as tolerated and not be asked to ambulate
- An alert, cooperative and stable patient with no neurological symptoms and no neck pain can be transported without a C-collar
- The long board may be used for extrication and may not necessarily be for patient transport
- The long board is not necessary for SMR

Confounding Factors that may obscure or invalidate the findings of an examination include:

- Acute stress reaction
- Intoxication
- Altered level of consciousness
- Distracting injuries
- Communication difficulties
- Dementia / Delirium

In these situations complete spinal motion restriction is indicated.

*High risk factors for spinal injury include but not limited to:

- Fall from 1m / 5 stairs or greater
- Axial load to head (e.g. diving injury)
- MVC (speed greater than 100 km/hr, rollover, ejection)
- Motorized recreational vehicles
- Bicycle collision with object
- Medical risk factors (example: arthritis, prolonged steroid use, degenerative bone disease, history of cervical surgery)

**Low risk for spinal injury include any of the following:

- Ambulatory at any time
- Absence of pain during midline palpation
- Delayed (not immediate) onset of neck pain
- Simple rear-end MVC

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Perform Spinal Motion Restriction

Background

The C-Spine Assessment Protocol is to be applied to blunt trauma patients where there is a potential for a cervical spine injury and/or the potential for pre-hospital C-spine clearance where the practitioner needs to assess the requirement for spinal motion restriction (SMR). It is imperative that the practitioner primarily assesses the patient and not the scene or mechanism to determine the need for SMR. To facilitate this, the Canadian C-Spine Rule has been incorporated into the protocol to aid practitioners' decision-making.

The Canadian C-Spine Rule applies to alert, cooperative, and stable adult blunt trauma patients where there is a potential for C-spine injury with neck pain and/or trauma markings above the level of the clavicles.

C-collar application and SMR are contraindicated in all cases of isolated penetrating trauma (ie: knife/gun). There is documented increased mortality due to the delay to definitive care with surgical interventions as a result of increased on scene time while applying C-collar and SMR. Of note, the long board can still be used to facilitate the extrication of the patient.

Patient Safety Considerations

- SMR and C-collar application are contraindicated in cases of isolated penetrating trauma
- An alert, cooperative and stable patient with no neurological symptoms and no neck pain can be transported without a C-collar
- The long board is not necessary for SMR
- If the first responder is uncomfortable in determining the likelihood of a C-Spine injury, they are encouraged to maintain manual C-Spine control until the arrival of the EMS
- If Thoracic or Lumbar spinal injury is suspected from symptoms, signs or mechanism of injury, patients should be laid supine as tolerated and should not be asked to ambulate

Etiology

1. This algorithm is designed to help the practitioner make an informed determination of the need for spinal motion restriction in the field. It is for alert and stable trauma patients where cervical spine injury is a concern.
2. Perform spinal motion restriction (SMR) if any of the following are present:
 - a. High-risk factors
 - Fall from 1 m / 5 stairs or greater
 - Axial load to head (e.g. diving injuries)
 - MVC (Speed greater than 100 km/h, rollover, ejection)
 - Motorized recreational vehicles

- Bicycle collision with object
 - Medical risk factors (for example, arthritis, prolonged steroid use, degenerative bone disease, history of cervical surgery)
 - MVC with death of another occupant in the same vehicle
 - Collisions involving ATVs, motorbikes, and snowmobiles
 - Pedestrian/cyclist struck by motor vehicle at greater than 15 km/h
- b. Altered Level of Consciousness
- Glasgow Coma Scale 14 or less
 - Disorientation to person, place, time, and/or event
 - Inability to remember 3 objects after 5 minutes
 - Delayed or inappropriate response to external stimuli
- c. Paresthesia – including any abnormal motor or sensory neurological finding (e.g. numbness, tingling, weakness)
- Unequal handgrip strength
 - Inability to raise arm(s) against gravity
 - Inability to move toes
 - Inability to perform plantar flexion and dorsiflexion of the feet
 - Sensory deficits such as weakness or numbness or radicular (electric or shooting) pain
- d. Tenderness/deformity of spine
- Almost all spinal injuries are associated with either pain or tenderness localized to the spine
 - Pain felt deeply in the neck should be considered spine pain
- e. Alcohol/drugs affecting judgement
- f. Communication difficulties (e.g. language barrier)
- g. Distracting painful injury:
- Long bone fracture

- Abdominal or thoracic injury causing distress
 - Large laceration, degloving, or crush injury
 - Large burns
 - Any other injury-producing acute functional impairment
- h. Degenerative bone disorder, ankylosing spondylitis, Down's syndrome – assure the neutral position corresponds to the underlying medical condition
- i. Suspicion of spinal injury on the part of the practitioner
3. If any of the following low-risk factors for spinal injury are present, evaluate patient for need for spinal motion restriction:
- a. Ambulatory at any time
 - b. Absence of pain during midline palpation
 - c. Delayed (not immediate) onset of neck pain
 - d. Simple rear-end MVC, excluding:
 - Pushed into oncoming traffic
 - Hit by bus / large truck
 - Rollover
 - Hit by high-speed vehicle (100 km/hr or greater)

On evaluation, if unable to voluntarily rotate the neck 45 degrees left and right, regardless of pain, use SMR.

Range of Motion Examination

Ask the patient to voluntarily rotate their neck 45 degrees to the left and right regardless of pain. If the patient can rotate their neck, spinal motion restriction is not indicated.

Examination landmark considerations:

| Nerve Root | Movements |
|------------|-----------------------------------|
| C5 | Shoulder abduction, elbow flexion |
| C6 | Elbow flexion (semi pronated) |
| C7 | Finger extension, elbow extension |
| C8 | Finger flexors |
| T1 | Small muscles of the hand |

| Nerve Roots | Movement |
|-------------|--|
| L1, L2 | Hip flexion |
| L3, L4 | Knee extension |
| L5 | Extension of great toe |
| S1 | Hip extension, knee flexion, plantar flexion |

Spinal Motion Restriction (SMR)

1. Where possible, SMR should be maintained with a properly fitted C-collar and/or blanket-rolls (or a comparable commercial device) secured to the stretcher with tape when appropriate. If a c-collar would pull the patient out of neutral alignment, then it should not be applied.
2. Supine positioning is the preferred position for patients requiring SMR. However, if these patients cannot be transported supine, they should be maintained in a reasonable position of comfort with neutral alignment of the spine relative to the patient's underlying medical condition or their current presentation.
3. SMR should not take priority over management of life-threatening co-morbidities such as airway management or hemorrhage control.
4. Long boards can be used for extrication or as a means of moving an immobile patient to the stretcher but is not required to achieve SMR and is contraindicated in patients who have a long transport and/or wait times (greater than 30 minutes).
5. EMS practitioners may remove the patient from the long board and place them supine with a C-collar and head rolls/head blocks, onto an EMS stretcher (secured with stretcher seatbelts), as soon as deemed safe and practical to do so.
6. In cases in which SMR is indicated as per protocol, patients with life-threatening respiratory compromise exacerbated by the supine position (i.e. head, facial/neck trauma, severe respiratory disease, body habitus), may be transported on the stretcher in semi-Fowlers or high Fowlers (maintaining SMR with a C-collar/head blocks and secured with stretcher seatbelts).
7. Patients with C-collars in place should not be transferred via wheelchair or walking.
8. With regard to the pillow/padding of SMR patients, the priority is maintaining neutral alignment as near as possible. Continue with light padding or small pillows which do not alter the normal cervical alignment of patients as long as the SMR techniques still ensures appropriate control, immobilization and stabilization of the C-spine.

9. Once again: C-collar application and SMR are contraindicated in all cases of isolated penetrating trauma. C-collar application and SMR are NEVER indicated in any isolated penetrating trauma. There is documented increased mortality due to the delay to definitive care with surgical interventions as a result of increased on scene time while applying C-collar and SMR. Of note, the long board can still be used to facilitate the extrication of the patient.