

Do not move! Spinal immobilization or spinal motor restriction: the long-lasting debate from the Napoleonic Wars to 2024 SIMEU policy statement

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The management of spinal trauma in the pre-hospital setting is based on techniques of immobilization for prevention of secondary neurological damage in high-risk patients during transportation.¹ Since the '70s, the traditional form of Preventive Spinal Immobilization (PSI) has been carried out using a long spinal board, head blocks, and immobilization straps often associated with the placement of a cervical collar.² The first documentation of this practice comes from the early 19th century, when pre-hospital trauma care was introduced on the battlefields of the Napoleonic Wars.³ This strategy is still adopted by many pre-hospital medical services worldwide and taught as the gold standard on many tra-

ma courses. The traditional form of PSI is indeed based more on pragmatism than on high-quality studies supporting its efficacy.³

It is well demonstrated that PSI can have both psychological and physical impacts with severe and harmful consequences,^{4,5} including anxiety, combativeness, raised intracranial pressure,^{6,7} pain, discomfort,⁸ pressure ulcers,⁹ difficulties in airway management, decreased lung functional residual capacity,¹⁰ and dural sac compression.¹¹ Furthermore, the application of PSI increases the on-scene time and consequently delays the arrival at a trauma center with a negative impact on patient outcome.^{12,13} A systematic review of the literature conducted between 1990 and 2020 by Hawkrige *et al.* demonstrated that none of the nine eligible studies reported any benefits of spinal collars in the pre-hospital setting.¹⁴ PSI is associated with higher mortality in penetrating trauma.¹⁵ In a retrospective observational study from January 1, 2013, to December 31, 2015, including patients with traumatic injury, possible spinal trauma, and verified spinal trauma using hospital discharge ICD-9/10 diagnosis codes, no change in the incidence of spinal cord injury was identified following implementation of spinal motor restriction protocols, which reduced the use of long spinal boards.¹⁶ The same results have been reached in a 4-year retrospective study of patients older than 60 years with a suspected cervical spine injury (fracture or cord). After protocol implementation, the authors observed less full immobilization (59.4% to 28.1%, $p < 0.001$), an increase in the use cervical collar only (8.9% to 27.2%, $p < 0.001$), and less use of immobilization device (15.5% to 31.6%, $p = 0.003$), with no differences in the incidence of neurologic deficits and mortality.¹⁷ In 2018, a joint position paper of the American College of Surgeons Committee on Trauma (ACS-COT), American College of Emergency Physicians (ACEP), and the National Association of EMS Physicians (NAEMSP) introduced the term "spinal motion restriction" (SMR) instead of PSI. Both terms refer to the same concept, but SMR emphasizes the goal of the procedure, *i.e.*, to minimize unwanted movement of the potentially injured spine. SMR can be realized using a scoop stretcher, vacuum splint, ambulance cot, or another similar device to which a patient is safely secured. Indications for SMR following blunt trauma include an acutely altered level of consciousness (*e.g.*, GCS < 15, evidence of intoxication); midline neck or back pain and/or tenderness; focal neurological signs or symptoms (numbness or motor weakness); anatomic deformity of the spine; distracting circumstances or injuries that impair the patient's ability to contribute to a reliable examination. High-energy trauma is no longer a criterion for spinal immobilization in the adult population.¹⁸

The current evidence base for traditional techniques used during pre-hospital extrication of trauma patients is poor and more based on pragmatism than evidence-based research. Dixon *et al.* demonstrated that conventional extrication techniques record up to

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four times more cervical spine movement during extrication than controlled self-extrication.¹⁹ Guided self-extrication is the best primary route of egress from a vehicle unless it is clearly impracticable or unachievable²⁰ for patients of all ages.²¹ For those patients who cannot self-extricate, a minimally invasive extrication approach should be employed to minimize entrapment time. The correct approach should balance the benefits and risks/burdens of SMR, and all the interventions should be goal-oriented (spinal cord/column protection in the context of overall patient and provider safety) rather than technique-oriented (immobilization).²²

In light of the new evidence, the Italian Society of Emergency Medicine (SIMEU) produced a policy statement on extrication and spinal motion restriction in trauma patients (in press. Available from July 2024 at <https://www.simeu.it/w/articoli/leggi> Articolo/302/dir).

Here is a brief summary of the SIMEU recommendations: i) indications for SMR following blunt trauma include an acutely altered level of consciousness; midline neck or back pain and/or tenderness; focal neurologic signs and/or symptoms; anatomic deformity of the spine; distracting circumstances or injury or any similar injury that impairs the patient's ability to contribute to a reliable examination; ii) penetrating trauma not requiring SMR; iii) the high energy mechanism of injury criterion alone is not an indication for SMR in an adult traumatized patient; iv) the long spinal board is intended just as an extrication device and not for the transport of patients. It should be removed if an adequate number of trained personnel are present before the pre-hospital transport phase; v) SMR should be maintained by ensuring that the patient remains securely positioned on the ambulance cot with a cervical collar in place and ambulance bed immobilization straps; vi) a vacuum mattress with head fixation and neck support can represent a valid alternative to the rigid cervical collar; vii) in cases of intolerance to the cervical collar or in the presence of pre-existing neck deformities (e.g., degenerative deformities in elderly patients), the SMR can be guaranteed by transport in a comfortable position using soft materials and padding in association with a head immobilizer and tape systems; viii) "standing take down" practice should be avoided; ix) self-extrication or minimally assisted extrication should be pursued as a first-line strategy in all trauma patients, except in cases of the inability of the patient to understand or follow rescuers' instructions and injuries or conditions, acute or pre-existing, that prevent the patient from assuming or maintaining an upright position (pelvic fractures, unstable fractures of the lower limbs, etc.); x) hospitals should be prepared and equipped to carefully and quickly remove patients from a long backboard, scoop stretcher, or vacuum mattress as soon as possible after arrival at the hospital. Safe transfer from ambulance stretcher to hospital bed may require the use of a slider board or similar device in order to maintain SMR during patient movement; similarly, patients can be moved safely for radiological diagnostics in the emergency room.

We are aware that the process of transforming the rules of extrication and SMR will not be quick and simple because it involves altering long-standing practices. We need to remember that the management of these patients extends beyond the pre-hospital environment to the emergency room, where the new SMR rules offer a safe and effective strategy to avoid prolonged, useless, and potentially harmful immobilization. As a consequence, it will be essential to provide trauma patient care training not just to emergency physicians and nurses, but also to volunteer ambulance personnel who administer first aid as well as personnel from diagnostic and imaging services.

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