

## INDICATIONS FOR PREHOSPITAL SPINAL IMMOBILIZATION

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Indications for prehospital spinal immobilization have changed dramatically over the history of modern EMS systems. The first recommendations from the American Academy of Orthopedic Surgeons (AAOS) primarily included the use of symptoms and physical findings of potential spinal injury as indication for immobilization.<sup>1</sup> As it became clear that early emergency department (ED) evaluation of potential spinal injuries was not accurate or complete, the prehospital practice shifted to immobilization of essentially all patients with any potential for spinal injury.<sup>2</sup> This change in practice shifted emphasis from symptoms and physical findings to mechanism of injury. Mechanism of injury has persisted as the primary indication for spinal immobilization in nearly all U.S. EMS systems. Currently, spinal immobilization is often performed based only

on the mechanism of injury without consideration of the patient's symptoms and physical findings.

Cost-effective ED care of trauma patients has advanced significantly, and numerous studies examining indications for spine radiographs in trauma patients have been published.<sup>3-22</sup> The findings of these studies universally support the use of clinical criteria to determine the need for spinal radiographs. They also support the presumption that without symptoms and physical findings associated with spinal injury, no significant spinal injury exists. In addition, there have been no reported cases of spinal cord injury developing during appropriate normal patient handling of trauma patients who did not have a cord injury incurred at the time of the trauma. Although early emergency medical literature identified mishandling of patients as a common cause of iatrogenic injury, these instances have not been identified anywhere in the peer-reviewed literature and probably represent anecdote rather than science. Mechanistically, it seems unlikely that, after a significant trauma, the proportionately small additional energy imparted to the spine by the EMS providers would cause a patient with a spine fracture to develop a cord injury not caused by the initial trauma.

Retrospective literature has documented the association of the

criteria presented here with spinal fracture. Prospective prehospital studies have also been reported that support the use of clinical findings as indicators of the need for prehospital spinal immobilization.<sup>23-27</sup> Several EMS systems across the country have implemented prehospital protocols using clinical criteria as indication for spinal immobilization.<sup>28,29</sup>

Spinal immobilization on a rigid backboard is not an innocuous procedure. Besides the direct cost of the equipment, there are also significant effects on patient comfort and the cost of ED evaluation. Respiratory compromise due to the strapping techniques used and pressure complications from rigid immobilization have been reported.<sup>30,31</sup> Head and back pain is a nearly universal complication of prolonged rigid spinal immobilization and can alter ED presentation and evaluation, necessitating radiographs that might have been avoided by omitting spinal immobilization in asymptomatic patients.<sup>32,33</sup>

Based on the current ED and prehospital literature as cited here, spine immobilization is indicated in prehospital trauma patients who sustain an injury with a mechanism having the potential for causing spinal injury and who have at least one of these clinical criteria:

1. altered mental status
2. evidence of intoxication

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Approved by the NAEMSP Board of Directors February 22, 1999. Received March 3, 1999; accepted for publication March 3, 1999.

Presented at the NAEMSP mid-year meeting, Incline Village, Nevada, July 1997.

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3. a distracting painful injury (e.g., long-bone extremity fracture)
4. neurologic deficit
5. spinal pain or tenderness

Patients without a mechanism of injury with the potential for causing spinal injury or those patients without one of the above clinical findings may safely have spinal immobilization omitted. These patients should be evaluated at an appropriate ED and should be transported in a position of comfort. EMS systems adopting procedures for clearance from prehospital spinal immobilization must develop mechanisms for education and quality improvement to ensure safe and appropriate use of clearance protocols.

These criteria represent clinical judgments by the EMS personnel, and supporting educational materials are critical to their accuracy. Assessment of altered mental status, for example, requires that there be no language or communication barriers (e.g., hearing impairment) between the EMS personnel and the patient. Extremes of age may also impact the provider's ability to accurately assess the patient's perception and communication of pain. Similarly, intoxication may be difficult to ascertain in the EMS environment. Maio et al. have reported that EMS providers may not accurately identify intoxication in victims of motor vehicle crashes.<sup>34</sup> There has been no prospectively validated definition for a painful distracting injury in the literature, although many authors utilize the above definition. Finally, the presence of spinal pain or tenderness may be variably interpreted. All of these issues must be clarified prior to implementation of a clinical clearance protocol.

The literature is limited in regard to the use of clearance protocols in pediatric patients. Spinal fractures and cord injuries in children are rare,<sup>35,36</sup> and most manifest as overt clinical findings.<sup>37</sup> Yet, the low incidence of pediatric spine fractures

makes prospective validation of pediatric criteria extremely difficult. EMS systems should consider this limitation when developing spinal immobilization clearance protocols. Additional research to validate clearance protocols in practice, in pediatric patients, and across various levels of EMS training for patients of all ages should be conducted.

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