



Medical Direction and Practices Board

WHITE PAPER

Spinal Immobilization Update

BACKGROUND

The use of a cervical spine collar and backboard as the primary method of protecting a suspected spinal injury dates back to the foundation of EMS. Spinal immobilization has been largely unchanged since its introduction into U.S. prehospital medicine in the 1960's. EMS providers have been taught that c-spine collars and rigid backboards were the only way to safely protect spine-injured patients from delayed paralysis in the setting of occult spinal column injury. This thinking has been largely unchallenged until today.

WHAT IS NOT CHANGING?

Selective spinal immobilization was introduced to Maine EMS in the early 1990s. In 2000, the NEXUS study validated safe spinal clearance and the Maine EMS protocols were updated to reflect the success of this groundbreaking study. Former Maine EMS Medical Director, Dr. John Burton validated the Maine practice of spinal evaluation with a study of 32,000 Maine EMS cases. Burton's study showed Maine EMS providers only missed one clinically significant spinal fracture while caring for 32,000 patients and concluded that EMS providers can effectively and safely implement a protocol assessing patients with suspected spine injuries.

We know with an extremely high level of confidence that our current spinal evaluation protocol can safely rule out spine injuries; therefore, the Medical Direction and Practice Board has no intention of changing it. None of the 2015 protocol updates make any changes to how Maine EMS providers evaluate spine injuries.

Any patient who fails our spinal evaluation must be assumed to have an unstable spine injury. It is critical to protect these patients and keep them safe by immobilizing their spine and ensuring that they arrive to the hospital with minimal movement to their spine.

SO WHAT IS BEING UPDATED?

We are updating HOW we immobilize the spine. A great deal of literature has been published since we last updated the Maine EMS selective spinal immobilization protocol. Backboards are excellent extrication tools, but are not the best tool for immobilization during patient transport.

That current literature on this topic can be organized into several important themes:

1. Backboards can harm patients by causing the following:
 - a. Pain
 - b. Unnecessary imaging while in the emergency department
 - c. Respiratory compromise
 - d. Pressure sores
2. Appropriate patients can safely self-extricate from motor vehicles
3. Appropriate ambulatory patients who fail spinal evaluation can safely walk to and sit then lie down on an EMS cot (rather than performing standing take-downs)

4. EMS cots are excellent spinal immobilization tools.

LITERATURE REVIEW

PAIN

The hard, stiff backboard focuses pressure on points of skin that it contacts. This decreases tissue perfusion and causes pain. Backboards also cause pain in the low back and cervical spine because of anatomically incorrect positioning due to placing a curved spine on a flat board. This low back and cervical pain persisted in healthy adults for 24 hours after spending only one hour on the board.¹

UNNECESSARY RADIOLOGICAL TESTING

The pain described above can make it difficult to distinguish pain due to underlying spine injury versus pain due to the backboard itself. Clinicians may be forced to perform imaging of these areas.² Increased exposure to radiation from medical imaging has been associated with increased risk of cancer.³ Additionally, as stewards of the health care system, all providers should be critical of therapies that are contrary to the triple aim of outcome (including satisfaction), population health, and cost.

RESPIRATORY COMPROMISE

Studies have shown that straps tightened across the chest of patients laying flat on backboards have a restrictive effect and make it harder to breathe with up to a 17% reduction in respiratory function and greatest effects at the extremes of age.⁴ For patients with underlying lung and chest injuries, these tight straps further disrupt the mechanics of breathing. Releasing these straps improve breathing.

PRESSURE SORES

Multiple studies have confirmed Linares', et al. 1987 association of immobilization on backboards with the development of pressures sores.⁵ Significant tissue hypoxia in the sacral area occurs after just 30 minutes in healthy adults placed on a rigid, unpadded backboard.⁶

WHEN SHOULD A BACKBOARD BE USED?

A backboard, scoop stretcher or other extrication device may be warranted for use during transport, based on the EMS provider's judgment in the following circumstances:

1. When extricating a patient who is inappropriate for self-extrication.
2. Patients at risk for vomiting who are unable to manage their own airway (intoxicated/head injured with altered mental status/etc.) and may need to be turned to their side during transport.
3. Multisystem trauma or multiple long bone fractures in which the backboard is an element of the splinting strategy.
4. Unresponsive or agitated patients.
5. When removal would delay transport of an unstable patient.

IDENTIFYING PATIENTS FOR SELF-EXTRICATION

These are the same patients who are appropriate for sign off. They are calm, cooperative, sober and alert. They have no language or other barriers to communication. They can reliably hold their whole spine still while moving themselves carefully from a vehicle. They have no injuries (such as lower extremity injuries) that may inhibit their ability to self extricate.

SAFELY TRANSPORTING PATIENTS WITH KNOWN SPINAL INJURIES

Backboards have no role in inter-facility transport. The EMS cot is a safer, more comfortable and more appropriate spinal immobilization device. These patients should be secured to the EMS cot as if they were being secured to the backboard. The EMS cot serves the same role as a padded spinal board. Placing the patient on (and taking the patient off) the EMS cot must be done with strict spinal precautions. Slide boards are very useful in these situations.

Maine EMS and the MDPB are sharing this and similar educational tools with hospitals, emergency departments, physicians, nurses, and others. Despite this effort, there may be times in which controversy remains regarding the best mechanism in which to transport patient with known spine injuries. Please discuss management options with the transferring physicians; however, Maine EMS, the MDPB, and the Trauma Advisory Committee agree that backboards are not the standard of care for the inter-facility transport of patients, even when the patient has a known spine injury.

A COT IS BETTER THAN A BACKBOARD

The standard EMS cot provides a flat surface to which the patient can be secured. The pad conforms to the curves of the spine and distributes pressure evenly to protect from pressure sores. Securing the patient to the EMS cot with straps can reduce spinal flexion, rotation, and lateral motion. The surface of the cot mattress further reduces patient movement. Once on the cot, a backboard becomes redundant and should be removed unless otherwise needed (see above).

IMMOBILIZING AMBULATORY PATIENTS

These patients DO NOT need a standing take down. EMS places the c-collar and holds spine still in traditional technique while the cot is placed behind the patient's back. The patient may then sit on the cot; and then lie flat with EMS guidance.

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- ¹ Lerner EB, Billittier AJ, Moscati RM. The effects of neutral positioning with and without padding on spinal immobilization of healthy subjects. *Prehosp Emerg Care.* 1998;2:112-6.
 - ² March j, Ausband S, Brown L. Changes in physical examination caused by use of spinal immobilization. *Prehosp Emerg Care.* 2002;6:421-4.
 - ³ Berrington de Gonzalez A, Mahesh M, Kim K, et al. Projected cancer risks from computed tomographic scans performed in the United States in 2007. *Arch Int Med.* 2009;169:2071-7.
 - ⁴ Baur D, Kowalski R. Effect of spinal immobilization devices on pulmonary function in healthy, nonsmoking man. *Ann Emerg Med.* 1988;17:915-8.
 - ⁵ Linares HA, Mawson AR, Suarez E, et al. Association between pressures sores and immobilization in the immediate post-injury period. *Orthopedics.* 1987;10:571-3.
 - ⁶ Berg G, Nyberg S, Harrison P, et al. Near-infrared spectroscopy measurement of sacral tissue oxygen saturation in healthy volunteers immobilization on rigid spine boards. *Prehosp Emerg Care.* 2010;14:419-24