



**Maine EMS Trauma Advisory Committee  
Consensus Statement and Clinical Advice for Trauma Management**

# **SPINAL IMMOBILIZATION IN TRAUMA**

**PLEASE REMEMBER:**

Transfers or consultations related to **spine immobilization** – *regardless of age, comorbidities, or intended destination* – should be directed to the attending **trauma surgeon** at your regional **trauma center**. The trauma surgeon will recommend or facilitate subsequent actions or consultations as needed.

Approved February 2015

## **PART I: Key Concepts**

- A. EMS providers can effectively employ a guideline to assess patients for spine injury
- B. Use of such guideline safely reduces the number of patients immobilized
- C. Backboards have NEVER BEEN proven to effectively prevent injuries to the spine
- D. Backboards HAVE BEEN demonstrated to cause pain (which in turn leads to increased radiography by hospital clinicians), cause pressure sores, and decrease respiratory function (especially at the extremes of age).
- E. Backboards have NO ROLE during inter-facility transfer, EVEN IF the patient has a diagnosed spine injury

## PART II: Annotations and Rationale

- A. *EMS Providers, using appropriate protocols, are able to safely and effectively discover which patients require spine immobilization.*

Maine EMS, under the guidance of Dr. Peter Goth and then EMS medical director Dr. Norm Dinerman, introduced protocols in the mid 1990's allowing for EMS providers to selectively immobilize the spine. This practice was studied by another former Maine EMS medical director, Dr. John Burton, and was found to be effective (i.e. EMS providers immobilized 40% fewer cervical spines)<sup>4</sup> and safe (1 unstable fracture not immobilized out of 12,988 patients leading to a negative predictive value of 99.9% [95% CI = 99.8-100])<sup>3</sup>.

- B. *Patients who require immobilization will continue to be immobilized by EMS providers.*

The above findings suggest that, when utilized properly, the current EMS protocols work extremely well in identifying patients with spine injury. Maine EMS will continue to stress the importance of diligent application of this protocol and, when patients cannot be cleared on scene, they will be immobilized. In brief, Maine EMS is not changing WHO is immobilized, but HOW these patients are immobilized. The major changes with the new EMS protocol rests on the mechanism of immobilization and a de-emphasis of backboards.

While Maine EMS and the Trauma Advisory Committee are attempting to limit the use of backboards, pre-hospital and hospital providers should recognize there remain circumstances in which use of a backboard is appropriate. Backboards should be utilized to extricate patients from vehicles or other situations when they are unable to extricate themselves (critical patients, patients with lower extremity injuries, severe head injuries, etc.). Of note, backboards are only one means of extrication. Other methods may be used at the discretion of the treating EMS provider. In most instances, once on the EMS litter, the backboard is redundant and can be removed. However, in some settings, it may be appropriate for the backboard to remain. Those settings include, but are not limited to the following:

- 1) Cases in which the backboard is being utilized as an element of the splinting strategy
- 2) Cases in which the patient is at risk for vomiting and may need to be turned to the side for airway protection during transport.
- 3) Cases in which the patient is unresponsive or agitated (i.e.: head injury)
- 4) Cases in which removal of the backboard would otherwise delay transport to definitive care in a critical patient.

C. *The benefit of long backboards is largely unproven as a mechanism of immobilizing the spine.*

The long back board was entered into the EMS paradigm for the management of potential spine injuries in the 1960's after a case report from 1966 suggested that delayed paraplegia was due to "faulty handling" and could have been prevented. This concept was accepted by the larger medical community and became the standard for management of patients with possible spine injuries.

Despite this wide acceptance, there remains no concrete evidence that backboards do in fact prevent spine movement during patient transport. This may be due to the rigid nature of the backboard which forces loss of natural lordosis and kyphosis. Alternate methods of spine immobilization can be utilized. In fact, the methods of spine immobilization should include securing a patient to a rigid surface combined with soft padding. In many circumstances, this can be accomplished by securing the patient to the EMS litter.

D. *Use of backboards can have complications, including pain (leading to unnecessary radiography), pressure sores, and respiratory compromise.*

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<sup>13</sup>

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.<sup>15</sup> Increased exposures to radiation from medical imaging have been associated with increased risk of cancer.<sup>2</sup>

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 some evidence pointing to a 17% decrease in respiratory function, especially at the extremes of age.<sup>5</sup> For those 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.<sup>14</sup> Significant tissue hypoxia in the sacral area occurs after just 30 minutes in healthy adults placed on a rigid, unpadded backboard.<sup>1</sup>

- E. *Use of a backboard during patient transport should be limited. Most patients can be safely and effectively immobilized without a backboard. This includes patient's being transferred between health care facilities, even when known spine injuries exist.*

"The ambulance stretcher is in effect a padded back-board and, in combination with a cervical collar and straps to secure the patient in a supine position, provides appropriate spinal protection for patients with spinal injury.

Once the patient is secured to the ambulance cot, the backboard becomes redundant, as the standard transport cot provides a flat surface to which the patient can be secured. Like the hospital bed, the ambulance cot can provide spinal protection, and the straps can reduce spinal flexion, rotation, and lateral motion. In addition, the cot mattress can conform to the anatomic shape of the spine and the non-slick surface minimizes patient movement on the cot."<sup>21</sup>

Backboards will NOT be removed entirely from the EMS protocols. Circumstances will remain during which backboards are utilized. Certainly backboard will remain one of the predominant means by which patients are extricated to an EMS litter, however, backboards may be left in place under other circumstances, as listed above under B.

- F. *Backboards should be avoided in patients suffering from penetrating trauma.*

The incidence of incomplete, unstable spine injury in penetrating trauma is low (0.01% based on a query of the National Trauma Data Bank<sup>11</sup>). Cervical spine immobilization is associated with an increased risk of death in patients with penetrating injuries to the neck, especially gun shot wounds, by either hemorrhage or airway compromise. Cervical spine immobilization does not appear to prevent progression of neurologic injury in cases of penetrating cervical trauma and may negatively affect patients with vascular and airway injuries. Based on the extremely low incidence of injury, the morbidity associated with placing a cervical collar/backboard and the lack of evidence surrounding backboard use, cervical collar and backboard use should be limited to only the above circumstances. These patients may still warrant immobilization, however, as mentioned above, in many circumstances, this can be accomplished on the EMS litter.

- G. *Pre-hospital and hospital personnel must communicate about the EMS provider's risk assessment for spine injury and work collaboratively to*

*move the patient from the EMS litter to the hospital stretcher using methods that minimize movement of the spine.*

Without a backboard present, the EMS provider's concern regarding spine injury may not be as evident for receiving hospitals. It is imperative that receiving hospitals and transporting EMS providers clearly communicate the EMS provider's risk assessment for spine injury. When factors exist that preclude the EMS provider from clearing the spine, EMS providers and hospital personnel must cooperate to safely remove the patient from the EMS litter to the hospital stretcher using techniques such as slide boards, sheets, lifts, etc.

- H. *In the few instances patients are placed on backboards, hospitals should remove the backboard as soon as practical in the Emergency Department*

Due to the above listed complications of backboard use, in the few incidences that a patient arrives to an Emergency Department with a backboard in place, the backboard should be removed as soon as feasible.

- I. *When in doubt, call the trauma center.*

## Part III: References

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