

The Evidence Against Backboards

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Like any profession, EMS has its share of dogma. Dogma is defined as an authoritative belief or principle that is considered to be valid regardless of its actual accuracy. Often its origin is lost to history. People who question dogma are sometimes considered heretics. The mantra “That’s how we’ve always done it!” is common in EMS.

However, medicine in the 21st century calls for evidence-based practice. We must provide care that has been demonstrated in unbiased ways to improve patient outcomes. Such is the case with prehospital spinal immobilization.

I entered the world of EMS in 1974 and worked in a busy EMS system until I entered medical school in 1983. During that era we used backboards when we felt they were indicated. This included such cases as diving injuries, high-velocity motor vehicle collisions where there was sign or symptom of neurologic injury, and injuries that clearly pointed to spinal trauma.

We carried soft cervical collars and long and short aluminum backboards, but in reality we rarely employed them. We only applied them when, in our judgment, they were indicated. There was no blanket statement regarding application of backboards in that era.

In 1987, when I graduated from medical school, the world of EMS had radically changed. Almost overnight, virtually all patients were now immobilized on complex devices that included rigid cervical collars, backboards, straps and head blocks. And this practice was applied to many patients who had very little likelihood of spinal trauma (e.g., elderly patients with isolated hip fractures). As I’ve considered this over the years, it’s become clear that this practice began with the introduction of the 1984 DOT EMT curriculum.¹

This document was intended to “dumb down” the EMT curriculum in order to make it easier to deliver and open it to a broader base of providers. This entailed minimization of medical terminology and an emphasis on skills that could be broadly applied without adequate knowledge of the indications for them. This was particularly true for backboards. As you can see from Table 1, virtually any condition qualified for spinal immobilization with a backboard based on the 1984 EMT curriculum.

Modern EMS practices should be based on the best available scientific evidence. Practices without evidence of benefit must be abandoned. For example, the American Heart Association has put tremendous effort into ensuring its recommendations are based upon the best available scientific evidence. This has resulted in a marked decline in the use of medications in the treatment of such conditions as arrhythmias and a much simpler approach to cardiac arrest. Such strategies should be similarly applied to EMS practices—particularly the use of backboards.

The long-held belief that backboards are effective is based upon dogma of dubious validity. While the exact origins of backboards in EMS are unclear, noted trauma surgeon J.D. “Deke” Farrington recommended their use in 1968.² These recommendations became a part of the EMT textbooks of the era and are now ingrained in the EMS culture.

In this discussion we will investigate the scientific evidence for and against the routine use of backboards in prehospital care. Actually, there is little or no evidence supporting the use of backboards, so most of the evidence will be against it.

- Do backboards adequately immobilize the cervical spine?

The current practice of spinal immobilization is based on the concept of splinting: a fractured bone must be splinted from the joint above the fracture to the joint below. Likewise, a joint problem must be splinted from the bone above the joint to the bone below. Because the spinal column contains 33 bones, it is difficult to isolate which bones or joints may be injured and thus must be immobilized. Because of this the strategy is to immobilize the entire spine using a long backboard as a splint until the specific injury, if any, can be determined.

Overall, the concept seemed to make sense. However, as with many long-standing EMS practices, there is not any scientific evidence that backboards effectively immobilize the spine. More important, there is no scientific evidence that they improve patient outcomes. In a 1983 study, researchers found cervical collars did not restrict neck movement significantly better than using no collar whatsoever.³ A Canadian study found spinal immobilization techniques during simulated vehicle motion to be generally ineffective.⁴ A 1998 Tennessee-based study examined the commonly used Aspen cervical collar and concluded “full cervical immobilization is a myth.”⁵

In an interesting study, researchers from the University of New Mexico compared the outcomes of patients with blunt spinal cord injuries between two distinctly different hospitals and cultures: the University of Malaya hospital in Kuala Lumpur, Malaysia, and the University of New Mexico Hospital in Albuquerque. These hospitals were similar in terms of size, clinical resources and physician training. All patients in Albuquerque were immobilized. In Kuala Lumpur, none were. In fact, most nursing and medical staff there had never actually seen spinal immobilization. Interestingly, they found less neurologic disability in the nonimmobilized patients in Malaysia compared to those immobilized in New Mexico.⁶

- Backboards may not be effective, but I’d rather be safe than sorry. Certainly we all want to make our patients better and prevent further injury. However, placing a patient on a backboard is not without adverse effects.

First, backboards are uncomfortable. In a 1994 study, 21 healthy volunteers ages 10–43 were immobilized on long backboards. None had prior back pain or known back problems, and all remained immobilized for 30 minutes. Overall, 100% of the patients developed pain within the 30-minute observation period, and 55% graded their pain as moderate or severe. Of these, 29% developed additional symptoms over the next 48 hours.

A 1998 study compared spinal immobilization between a backboard and a vacuum mattress. Authors found that patients immobilized with a backboard for 30 minutes were 3.1 times more likely to have symptoms, 7.9 times more likely to complain of occipital pain and 4.3 times more likely to have lumbosacral pain.⁷ A similar study found pain to be common with spinal immobilization, and occipital padding did not help alleviate it.⁸ A British study found that a vacuum splint provided significantly superior stability and comfort compared to a backboard.⁹

Another concern about spinal immobilization with a backboard is the ability to manage the airway. Cervical collars and spinal immobilization have been found to reduce mouth opening by 20%–25%.¹⁰ In a 2001 review of spinal immobilization, the authors wrote, “Because airway obstruction is a major cause of preventable death in trauma patients, and spinal immobilization, particularly of the cervical spine, can contribute to airway compromise, the possibility that immobilization may increase mortality and morbidity cannot be excluded.”¹¹

Spinal immobilization also restricts respirations. In one study of 39 healthy volunteers, it restricted respirations by an average of 15%, and this was more pronounced at the extremes of age.¹² A Turkish study found a statistically significant decrease in respirations with various types of spinal immobilization (e.g., long backboard, KED).¹³

The argument that one would “rather be safe than sorry” by routinely immobilizing is a non sequitur. You have a device (long backboard) that has not been proven to benefit patients, and in some situations can cause pain and even harm. How is that “being safe”?

- Spinal injuries are uncommon

It is often assumed that spinal injuries are common. Actually they are quite uncommon. In a study of 34,069 patients with blunt trauma, only 2.4% had cervical spine injuries, and most of those were stable (so spinal immobilization was not necessary). Of those injuries, 29.3% were considered insignificant.¹⁴ In a large Los Angeles study of 57,532 trauma patients who were assaulted, researchers found the incidence of cervical spine fractures associated with blunt trauma was 0.41%. Spinal injury in penetrating trauma was also uncommon. The same study found the incidence of cervical spine injuries associated with gunshot wounds to be 1.35%, while the incidence for stab wounds was only 0.11%.¹⁵

Furthermore, virtually all spinal cord injuries secondary to penetrating trauma will have obvious neurologic deficits.¹⁶ A multicenter study found prehospital spine immobilization to be

associated with higher mortality in penetrating trauma and concluded it should not be routinely used in every patient with penetrating trauma.¹⁷ A New Orleans study found the use of cervical spine immobilization in penetrating trauma actually increased the risk of death.¹⁸ Based on these and other studies, the Prehospital Trauma Life Support (PHTLS) Executive Committee modified its recommendations as follows:

- There are no data to support routine spine immobilization in patients with penetrating trauma to the neck or torso.
- There are no data to support routine spinal immobilization in patients with isolated penetrating trauma to the cranium.
- Spine immobilization should never be done at the expense of accurate physical examination or identification and correction of life-threatening conditions in patients with penetrating trauma.
- Spinal immobilization may be performed after penetrating injury when a focal neurologic deficit is noted on the examination, although there is little evidence of benefit even in these cases.¹⁹

Conclusion

In summary, it is time we all took a hard look at the practice of immobilizing patients on long backboards. From a hospital standpoint, patients who arrive in spinal immobilization are at an increased risk of aspiration and pain. Typically these patients require intense nursing care until they are removed from the backboard. In a busy emergency department and trauma center, patients can remain on backboards for long periods. Also, patients who arrive with spinal immobilization in place are more apt to receive imaging (e.g., CT scan, MRI) than those who don't. Most prehospital personnel don't realize that prehospital decisions can significantly impact later emergency department/trauma center care and patient costs.

In most emergency departments and trauma centers, patients with known cervical spine injuries are simply left in cervical collars and placed onto soft beds following imaging. Why place a patient with even a suspected cervical spine injury on a long backboard when standard hospital practice is to place patients with known spinal injuries on soft beds?

It is time to rethink prehospital spinal immobilization. Let's turn our attention to something that really benefits the patient.

Table 1: Injuries to the Spine

1. Dangers

a. It is especially important to provide proper care for patients with suspected spinal injuries since damage to the spinal cord can result in paralysis.

b. Therefore, all unconscious accident patients should be treated as if they had spinal injuries and all conscious patients should be carefully checked for spine injuries prior to movement.

c. Accident patients with weakness or numbness of arms or legs must be assumed to have spine injuries

2. Signs. The following signs may be indicative of spinal cord injury:

a. Pain. The patient may be aware of pain in the area of injury.

b. Tenderness. Gently touching the suspected area may result in increased pain.

c. Painful Movement. If the patient tries to move, the pain may increase-never try to move the injured area for the patient.

d. Deformity. Deformity is rare although there may be an abnormal bend or bony prominence.

e. Cuts and Bruises. Patients with neck fractures will have cuts and bruises on the head or face. Patients with injuries in other spine area will have bruises on the shoulders, back or abdomen.

f. Paralysis. If the patient is unable to move or feels no sensation in some part of his body, he may have a spinal fracture.

3. Emergency Care

a. In addition to caring for life-threatening problems, the most important consideration for a victim with a suspected spine injury is to immobilize him BEFORE moving.

b. Unless it is necessary to change a patient's position to maintain an open airway or there is some other compelling reason, it is best to splint the neck or back in the original position of the deformity.

c. Patients with suspected spine injuries will require cervical collars and immobilization on a spine board or special stretcher.

Excerpted from: United States Department of Transportation/National Highway Traffic Safety Administration. Emergency Medical Technician—Ambulance: National Standard Curriculum, 1984.

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