

Current practice and future directions for field backboard and c-spine immobilization

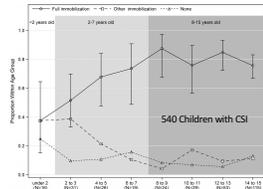
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“Spinal stabilization is therefore **essential for every child** who sustains a suspicious mechanism of injury (where the head, neck, or spine may be involved), who has pain or tenderness of the spine, or who has signs or symptoms of weakness or loss of sensation.”

“Whenever the mechanism of injury, signs, or symptoms suggests possible spinal injury, **the entire spine must be stabilized**. This is best performed with the patient supine on a rigid spine board and in a neutral, in-line position.”

Pediatric Education for Prehospital Providers, 3rd e., 2014

540 Children with CSI

Variability of Prehospital Spinal Immobilization in Children at Risk for Cervical Spine Injury Kim et al. *Pediatr Emerg Care* 2013;29: 413-418



Why doesn't EMS properly immobilize children?

- EMS uneasiness with young children in general and their abilities to assess pain?
- EMS perception of limited options for immobilizing young children?
- Lack of evidence for the efficacy of spinal immobilization in children?
- Fear that we are causing harm?



“Evolving scientific evidence demonstrates that some of these current out-of-hospital care practices **cause harm** including airway compromise, respiratory impairment, aspiration, tissue ischemia, increased intracranial pressure, and pain, and can result in increased use of diagnostic imaging and mortality.”

ACEP Board of Directors, 2015



“Long backboards are commonly used to attempt to provide rigid spinal immobilization among emergency medical services trauma patients. However, the **benefit of long backboards is largely unproven.**”

“Spinal precautions can be maintained by application of a rigid cervical collar and securing the patient firmly to the EMS stretcher...”

EMS SPINAL PRECAUTIONS AND THE USE OF THE LONG BACKBOARD
National Association of EMS Physicians and American College of Surgeons Committee on Trauma, 2013



Landscape of adult prehospital spine immobilization is changing

- Chan, et al. *Annals Emerg Med*. 1994
 - 21 healthy volunteers; 10-45y immobilized for 30 minutes. All had immediate pain; 8 still at 48 hours
- McHugh, et al. *Acad Emerg Med*. 1998
 - 129 patients immobilized. Up to 60% had increased neck and back pain.
- Bauer, et al. *Annals of Emerg Med*. 1988
 - 15 healthy volunteers had decreased pulmonary function immediately post immobilization
- Terje Sundström, et al. *Journal of Neurotrauma*. 2014
 - Ill fitting c-collars may worsen CSI, add difficulty to airway management, cause pressure ulcers, lead to increased radiological studies from pain



Landscape of adult prehospital spine immobilization is changing

- Gunshot wound victims should be immobilized less
 - Haut et al. *J Trauma*. 2010; 68:115.
 - Those immobilized were twice as likely to die
 - Number Needed to Treat = 1032; NNHarm = 66
- Many protocols moving toward selective immobilization
 - Mental status, intoxication, distracting injury, neurologic exam, and midline c-spine tenderness
 - NEXUS. Hoffman et al. *NEJM*. 2000. 343:94-9. 34,069 patients; 818 c-spine injuries



Landscape of adult prehospital spine immobilization is changing

- Protocols moving toward selective immobilization
 - *The Canadian C-Spine Rule for radiography in alert and stable trauma patients.* Stiell et al. *JAMA*. 2001. 286:1841-8. 8924 patients; 151 c-spine injuries
- Alternatives to rigid longboards



vacuum spine board



How appropriate is this shift in practice to **pediatric** prehospital spine immobilization?

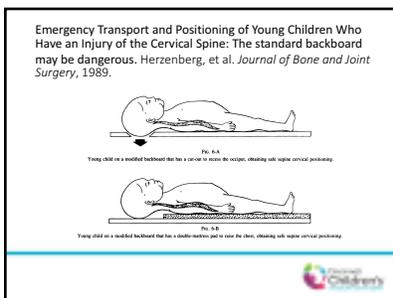
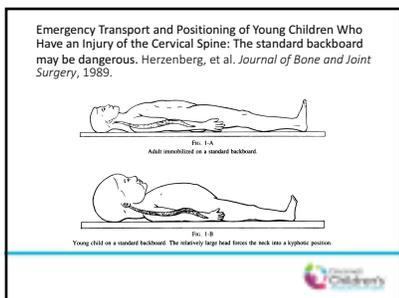
Potential Adverse Effects of Spinal Immobilization in Children. Leonard, et al. *Prehospital Emergency Care* 2012;16:513-518

285 patients presenting to ED = 173 immobilized + 112 not immobilized; 1 CSI

Table 2. Effects of Spinal Immobilization in Children

	Spine-immobilized Prior to Evaluation (n = 173)	Not Spine-immobilized but Met ACS Guidelines for Spinal Immobilization (n = 112)	Odds Ratio/ Hazard Ratio (95% CI)
Pain score—median (range)	3 (0-4)	2 (0-4)	2.1 (1.4-3.4)*
Cervical spine imaging, % (95% CI)	56.6 (49.0-64.2)	13.4 (7.0-20.1)	6.2 (4.5-8.4)*
ED length of stay—median (range), hours	2.8 (0.5-13.1)	2.8 (0.5-10.8)	0.96 (0.76-1.2)
ED disposition, % (95% CI)			
Home	58.4 (51.7-65.1)	65.7 (57.8-73.6)	Reference
Fluor or transfer	31.8 (24.9-38.7)	11.6 (6.5-16.6)	4.0 (2.7-5.9)*
ICU or OR	9.8 (8.4-11.3)	2.7 (0.6-7.4)	5.3 (3.5-79.0)*

- Factors Associated With Cervical Spine Injury in Children After Blunt Trauma.** Leonard, et al. *Ann Emerg Med.* 2011;58:145-155
- Case-control study of children younger than 16 years, from 17 hospitals presenting after blunt trauma, and who received cervical spine radiographs
 - 540 children with cervical spine injury
 - Having 1 or more factors was 98% sensitive and 26% specific for cervical spine injury
 - Would have identified 98% of children with cervical spine injury and reduced exposure to spinal immobilization and radiation for the non-cervical spine injury children by more than 25%
- 8 factors associated with cervical spine injury (adjusted odds-ratio 95% CI)**
- Altered mental status 3.0 (2.1-4.3)
 - Focal neurologic findings 8.3 (5.6-12.2)
 - Neck pain 3.2 (2.3-4.4)
 - Torticollis 1.8 (1.1-2.9)
 - Substantial torso injury 1.9 (1.1-3.4)
 - Conditions predisposing to cervical spine injury 15.0 (2.9-78.0)
 - MVC 2.5 (1.8-3.6)
 - Diving 73.0 (9.6-555.6)



- NASEMSO-National Model EMS Guideline for Spinal Care, 2014**
- Cervical collar for any of the following:
 - Patient complains of midline neck or spine pain
 - Any midline neck or spinal tenderness with palpation
 - Any abnormal mental status (including extreme agitation) or neurologic deficit
 - Any evidence of alcohol or drug intoxication
 - Another severe or painful distracting injury is present
 - Torticollis in children
 - A communication barrier that prevents accurate assessment
 - If none of the above apply, patients should not have a cervical collar placed
 - Long boards
 - Patients should not routinely be transported on long boards, unless the clinical situation warrants long board use
 - Long spine board should be reserved for patient movement in non-ambulatory patients who meet immobilization criteria and should be removed as soon as is practical
 - When securing pediatric patients to a spine board, the board should have a recess for the head, or the body should be elevated approximately 2 cm to accommodate the larger head size and avoid neck flexion when immobilized

There is a desperate need for the development and validation of a pediatric cervical spine injury risk assessment tool. That work is underway.

Thank you.