EMS Spinal Precautions & the Use of the Long Backboard: What YOU need to know

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Objectives

- Discuss the rationale behind the use of long the backboard in trauma patients
- Describe the risks associated with the use of the long backboard
- Understand the rationale for removing the recommendation of routine use of the long backboard of all trauma patients
- Distinguish the difference between spinal immobilization and spinal precautions

Disclosures

- C. Eric McCoy, MD, MPH
  - No commercial interest
  - No financial relationships
  - No conflicts of interest

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A brief history of the long backboard

- Field spinal immobilization w/c-collar/backboard standard practice since 1960's
- Primarily used for pts w/ suspected spinal injury (trauma)

History of the log backboard

- 1966: report by Geisler, et al. in the Medical Services Journal, Canada...

  ...Attributed "delayed onset of paraplegia" in hospitalized patients w/spinal fractures to "failure to recognize the injury and protect the patient from the consequences of his unstable spine."

History of the log backboard

- 1966: report by Geisler, et al. in the Medical Services Journal, Canada...

  retrospective study of surgical management of spinal column injury

  Included a discussion of only 2 patients!!!

  Pt developed paraplegia w/sensory level at T10
History of the log backboard

- 1966: report by Geisler, et al. in the Medical Services Journal, Canada...
- X-ray identified T-spine fracture and patient taken to OR for laminectomy
- Pt eventually developed permanent paralysis at T4 level

Authors concluded that the patient “surely would have been protected from the paraplegic condition had the spinal instability been recognized and precautions taken?”

After this publication, medical community subscribed to belief that pts w/ blunt force trauma (i.e. MVCs) should be immobilized on rigid devices to minimize delayed paralysis in setting of occult spinal injury

Accidental Death and Disability

- Development of modern EMS systems in U.S. attributed to...
- "EMS White Paper"
- Resulted in EMS Systems act of 1973
History of the log backboard

- 1968: Farrington described placement of cervical collar and long or short backboard as necessary to keep head and neck from sagging during extrication.


History of the log backboard

- Backboard designed to assist in minimizing spinal movement during complex extrication by freeing hands of EMS providers from holding spinal precautions.

History of the log backboard


- Advocated use of spinal immobilization using cervical collar and backboard for trauma patients with signs/symptoms of spinal injury.
History of the log backboard

- Concerns that rescuers would inadvertently worsen unstable spinal injuries during extrication/transport led to adoption of field spinal immobilization protocols w/ c-collars and backboards1-7
- Belief was that spinal injuries underappreciated by EM/EMS providers
- Belief arose that EMS providers placing spinal injury patients at risk8-10

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History of the long backboard

- From these concerns . . . EMS providers began applying spinal immobilization using c-collars and backboards, based on mechanism alone11
- Even if patients were asymptomatic
- Fear was for exacerbating occult spinal injuries

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History of the long backboard

- EMS providers instructed to immobilize/maintain until cleared by MD
- Term "spinal immobilization" came to include both concept – limiting spinal motion – and method which it was achieved – c-collar and backboard
- Thus . . . c-collar/backboard because nearly universal standard practice for all trauma pts w/ a mechanism of injury that could potentially injure spine
Side Effects of Backboards

Side effects of backboards - Pain

- Pain is not limited to areas of contact with backboard
- Pain in cervical/lower back due to anatomically incorrect positioning caused by the flat backboard
- Lower back and cervical pain reported to persist in previously pain-free, healthy volunteers 24 hrs after being subjected to only 1 hr on a backboard

Side effects of backboards - imaging

- Can be difficult to distinguish between injury pain vs. backboard pain
- Clinicians may have to image areas that are painful solely due to backboard
- Unnecessary radiological studies associated with:
  - Prolong lengths of stay in the ED
  - Cost of evaluation

Side effects of backboards - respiratory

- In healthy, nonsmoking males, tightened chess straps have a restrictive effect:
  - Lowers Forced Vital Capacity (FVC)
  - Lowers Forced Expiratory Volume (FEV1)
  - Lowers forced mid-expiratory flow

- For pts w/ chest wall/lung injury, backboard straps interfere w/ resp mechanics
- Removal of straps improves ventilation in the face of such injuries

References:

Side effects of backboards – pressure sores

- Rigid backboards lead to pressure sores
- Immobilization in immediate post-injury period assoc w/ pressure sores
- Occipital and sacral pressure are higher for pts on rigid backboard
  - Compared to padded backboard
  - Pressures are above that needed to cause ulcers
- Significant tissue hypoxia can occur in sacral area of healthy adults w/in 30 min

The Judicious Use of Backboards

Judicious use of backboards

- Field spinal precautions are intended to:
  - Prevent spinal injury in pts w/ an unstable spinal injury
  - Potentially prevent worsening of unsuspected occult spinal injury
- Backboard can be useful during extrication (position of injury à amb cot)
- Benefits of backboard once pt on cot is less clear/fewer well described in the lit
- To date, no outcome studies on contribution of backboard to maintenance of spinal precautions after extrication complete
Judicious use of backboards

- Difficult to study assoc btw risk factors and spinal injury 2/2 rare event rates
- C-spine injury reported at a rate of 5% in trauma pts (0.7% w/ cord injury)\(^1\)

2018: Hauswald et al. compared neurologic outcome of spinal injury\(^1\)

- New Mexico (All included EMS pts received immobilization w/ backboard)
- Malaysia (None of included pts received immobilization w/ backboard)
- OR for neurologic disability higher in New Mexico group
  - OR 2.03; 95% CI 1.03 – 3.99
  - Comparable in age, mech of injury, and spinal injury level

2010: Haut et al. query of NTDB comparing outcomes in penetrating trauma in those immobilized in the field w/ vs. w/o backboard\(^2\)

- OR of death for spine-immobilized patients (OR=2.06; 95% CI 1.35 – 3.13)
- Only 0.01% of pts in sample had incomplete, unstable spinal injures requiring operative fixation
- Unclear if backboard would have been useful or harmful


Judicious use of backboards

- In pediatric trauma, spinal immobilization associated with:
  - Increased pain
  - Increased radiographic imaging
  - Increased hospital admission

- Guidelines/position statement implies similar recs as adults

- Rescuers must be judicious in their decision to keep pts on backboard

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NAEMSP/ACSCOT Position

- “Appropriate patients to be immobilized with a backboard may include those with:
  - Blunt trauma and altered level of consciousness;
  - Spinal pain or tenderness;
  - Neurologic complaint (e.g., numbness or motor weakness);
  - Anatomic deformity of the spine;
  - High energy mechanism of injury and:
    - Drug or alcohol intoxication;
    - Inability to communicate and/or
    - Distracting injury”

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NAEMSP-ACSCOT Position

- “Patients for whom immobilization on a backboard is not necessary include those with all of the following:
  - Normal level of consciousness (GCS 15);
  - No spine tenderness or anatomic abnormality;
  - No neurologic findings or complaints;
  - No distracting injury;
  - No intoxication.”
Practices Limiting the Use of Spinal Immobilization

Limiting the use of spinal immobilization

- Prospective & retrospective studies have shown that EMS providers are able to safely evaluate and identify pts w/ suspected spinal injuries in the field

- Domeier et al reports spinal immobilization could be reduced by 37% when compared to spinal immobilization based solely on mechanism

- Other studies have corroborated these findings

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Limiting the use of spinal immobilization

- Based in part on these studies, NAEMSP endorsed selected spinal immobilization in 1999.
- Subsequent studies have supported this position and the recommendations for selective spinal immobilization are maintained in the 2013 NAEMSP-ASCCOT consensus position paper.
Penetrating trauma

- Hoot et al. compared outcomes of death in patients immobilized in the field vs. those who were not (NTDB query) 

- Reported higher death for patients immobilized w/ penetrating trauma

- Only 0.01% had incomplete, unstable spinal injuries requiring operation

- As a result of this study, use of backboard during transport of penetrating trauma no longer recommended

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Penetrating trauma and spinal precautions

- "Patients with penetrating trauma to the head, neck or torso and no evidence of spinal injury should not be immobilized on a backboard."
Penetrating trauma and spinal precautions

- "Spinal precautions can be maintained by application of a rigid cervical collar and securing the patient firmly to the EMS stretcher, and may be most appropriate for:
  - Patients who are found to be ambulatory at the scene;
  - Patients who must be transported for a protracted time, particularly prior to interfacility transfer; or
  - Patients for whom a backboard is not otherwise indicated."

Penetrating trauma and spinal precautions

- "Whether or not a backboard is used, attention to spinal precautions among at-risk patients is paramount. These include application of a cervical collar, adequate security to a stretcher, minimal movement/transfers, and maintenance of in-line stabilization during any necessary movement/transfer."

Spinal Precautions During Transport
Spinal precautions during transport

- Ambulance stretcher is in effect a padded backboard
- In combination w/ c-collar and straps, stretcher provides appropriate protection
- Cot mattress can conform to anatomic shape of the spine (nonslick surface)
- May forgo if likely to cause injury/significant discomfort (e.g. elderly kyphotic)

Updating EMS protocols – Cultural Change

- Literature suggest that backboards may have utility as an adjunct for spinal precautions during extrication
- No demonstrated evidence of preventing injury deterioration in transport
- Numerous studies indicating that backboard may be harmful

Updating EMS protocols – Cultural Change

- Change from "spinal immobilization" to "spinal precautions" is both subtle and significant
- Protecting the spine in pt w/ potential spinal injury is still an important EMS skill
- Spinal precautions involved same care/attention to spinal protection as spinal immobilization
  - Only exception being the judicious use of the backboard during transport
- Growing number of EMS systems foregoing use of backboard for transport
  - Xenia Fire Dept – Ohio
  - Alameda County – CA
  - Rio Rancho Fire Dept – Mexico
  - State of Maryland (for penetrating trauma)
  - Orange County – CA
Review Questions

THANK YOU!

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