

CAT (Critically Appraised Topic) Worksheet

Title: Utility of Spinal Board Immobilization in Minor Trauma

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Clinical Scenario:

I went to a witnessed assault call where a young male had been “sucker punched” in the face and fell backwards from his own height and struck his head on asphalt. On arrival the patient was GCS 15, sitting up, and getting ready to rise to stand. There were many people milling around at the scene acting dramatically making it potentially unsafe and the medics looked to me for a discussion of what to do with regard to spinal immobilization. As the patient had some mild C-spine tenderness but no other spinal tenderness I told them to follow their protocols but that I thought a collar and manual immobilization to the ambulance was sufficient as the patient was ambulatory and we had to walk the patient up a relatively steep slope that would make carrying a spinal board difficult and potentially dangerous. One medic insisted we put the patient on a spine board as per protocol and we discussed the utility of doing this in minor trauma as current EHS protocols and teaching seems to strongly recommend spine board immobilization.

PICO (Population – Intervention – Comparison – Outcome) Question:

PICO: In adult patients (age > 12 y/o) with minor blunt trauma (i.e. no dangerous mechanism) in the pre-hospital setting, does spine immobilization with full spinal board in addition to a traditional collar or manual immobilization prevent secondary spinal cord injuries?

P: adult patients with minor trauma and no dangerous mechanism

I: spinal board immobilization

C: cervical collar and manual stabilization for spinal immobilization

O: prevention of secondary spinal cord injury

Search Strategy: PubMed MESH Search

("Trauma, Nervous System"[Mesh] AND "Immobilization"[Mesh]) AND "Emergency Medical Services"[Majr]

Search Outcome:

The search above yielded 43 articles. Many of the articles were greater than 10 years old and most were not helpful in answering this particular clinical query. Few studies examined the use of spinal immobilization in clinical practice and even fewer examined the incremental benefit of the use of spinal board. The only papers to examine the incremental benefit of spinal board involved biomechanical studies of healthy volunteers that looked at the degree of increased immobilization achieved using spinal board immobilization in addition to a cervical collar and appropriate strapping.

No methodologically sound papers examined clinical outcomes in spinal injury. No randomized controlled trials on this topic were found and none will likely ever be conducted due to ethical limitations (i.e. randomization).

Relevant Papers:

Papers selected for review included a systematic review, a cohort-control study, a highly referenced study examining the implementation of a selective spinal immobilization protocol for pre-hospital providers and the latest set of international "evidence-based" guidelines on the topic of cervical spine immobilization in trauma .

Ahn, H., Singh, J., Nathens, MacDonald, R.D., Travers, A., Tallon, J., Fehlings, M.G. & Yee, A. Pre-hospital care management of a potential spinal cord injured patient: A systematic review of the literature and evidence-based guidelines. *Journal of Neurotrauma*, 28:1341-1361 (August 2011).

Hauswald, M., Ong, G., Tandberg, D. & Omar, Z. Out of Hospital spinal immobilization: Its effect on neurologic injury. *Academic Emergency Medicine*, Vol 5(3): 214-219, 1998.

Theodore, N., Hadley M.N., Aarabi, B., Dhall, S.S., Gelb D.E., Hurlbert, R.J., et al. Prehospital cervical spine immobilization after trauma. *Neurosurgery*, 2013, Mar;72 Suppl2:22-34.

Stroh G, Braude D. Can an out-of-hospital cervical spine clearance protocol identify all patients with injuries? An argument for selective immobilization. *Ann Emerg Med*. 2001;37(6):609-615.

Upon review of the systematic review by Ahn et al. and the latest “evidence-based” guidelines from the American Association of Neurological Surgeons it is clear that much of the evidence for the use of spinal immobilization in trauma derives from a historical decrease in the number and severity of spinal cord injuries as spinal immobilization was more widely implemented in North America in the 1970s and into the 1980s. With regard to spinal boards in particular, the evidence largely derives from biomechanical and radiographic studies that indicate that spinal immobilization with a rigid spinal board and strapping decreases spinal movement in healthy volunteers. These biomechanical studies are affected by considerable methodological bias in terms of the subjectivity and variability of spinal movement measurements used and the fact the results of studies conducted in healthy volunteers cannot be easily applied to trauma patients. As such, there is no strong clinical evidence that spinal immobilization with a spinal board improves outcomes or prevents secondary spinal cord injuries.

Of studies examining clinical outcomes, one cohort paper by Hauswald et al. compared spinal cord outcomes between an American hospital with an EMS service that used full spinal board immobilization versus a Malaysian hospital that received all its patients without immobilization. Although the paper demonstrated fewer spinal cord injuries in the non-immobilized Malaysian patients, the methodological limitations (e.g. completely different healthcare systems and no prehospital providers in Malaysia) inherent in this comparison make it thought provoking but non-instructive. Likely the most instructive clinical paper came from Stroh and Braude in 2002 which examined the ability of pre-hospital providers to apply a selective spinal immobilization protocol which ensured all those in need of spinal immobilization were in fact immobilized while also decreasing the number of unnecessary immobilizations and their adverse effects (e.g. pressure sores, pain). This paper demonstrated a 99% sensitivity for spinal immobilization by pre-hospital providers and a reduction in immobilization by approximately one third.

Ultimately, no papers examined the incremental benefit of spinal board on clinical outcomes in trauma and no papers examined the use of spinal boards versus cervical collars and manual stabilization. As was demonstrated in the systematic review and guidelines referenced above, the state of the evidence in pre-hospital spinal immobilization only allows us to ask and rudimentarily answer “what constitutes optimal spinal immobilization” and “when should it be applied?” – further delineation remains somewhat difficult at this time.

Clinical Bottom Line:

*** The original PICO offered above is unanswerable due to lack of specific evidence related to the effect of spinal immobilization of clinical outcomes and no studies addressing different immobilization techniques in different clinical contexts (collar vs. collar and spine board and major vs. minor trauma). However, I will provide my own answer to the questions raised by the systematic review and through my own research.

What constitutes optimal spinal immobilization?

Based, largely on biomechanical studies, it seems that a rigid cervical collar, a rigid spine board with padding, head blocks and head (x2) and body strapping (x3) represents optimal spinal immobilization.

When should spinal immobilization be employed?

Spinal immobilization should be utilized for *extrication* and *transport* of patients in the pre-hospital setting when patients are "*at risk*" for spine injury including major traumatic mechanism (e.g. high-speed rollover), altered sensorium (head injury, intoxication), bony spinal tenderness, paresthesias in the extremities, distracting injuries (e.g. femur fracture) or major head and facial injuries.

Spinal immobilization should be discontinued as soon as is reasonably possible after clinical and radiographic clearance of spinal injury. The rigid spine board can usually be discontinued during the in-hospital secondary survey although some institutions continue to utilize the spine board in major trauma until the initial return from radiography so as to facilitate and decrease spinal movement during transfer into the CT scanner.