

Pain and tissue-interface pressures during spine-board immobilization.

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STUDY OBJECTIVES: Although spine boards are one of the main EMS means of immobilization and transportation, few studies have addressed the discomfort and potential harmful consequences of using this common EMS tool. We compared the levels of pain and tissue-interface (contact) pressures in volunteers immobilized on spine boards with and without interposed air mattresses.

DESIGN: Prospective crossover study. **SETTING:** Emergency department of Methodist Hospital of Indiana, Indianapolis, Indiana. **PARTICIPANTS:** Twenty healthy volunteers who had not taken any analgesic drugs in the preceding 24 hours, were not experiencing any pain at the time of the study, and did not have history of chronic back pain. **INTERVENTIONS:** To simulate prehospital transport conditions, we immobilized volunteers with hard cervical collars and single-buckle chest straps on wooden spine boards with or without commercially available medical air mattresses. The crossover order was randomized. After 80 minutes, immobilization measures were discontinued and the subjects were allowed to get off the boards for a recovery period of 60 minutes. Subjects were then studied for a second 80-minute period with the opposite intervention. At baseline and at 20-minute intervals, the level of pain was rated with a 100-mm visual analog scale. Tissue-interface pressures were measured at the occiput, sacrum, and left heel. **RESULTS:** Mean pain on the visual analog scale was 9.7 mm at the end of the mattress period and 37.5 mm at the end of the no-mattress period ($P = .0001$). Although there were no significant differences in pain between the two groups at time 0, volunteers reported significantly more pain during the no-mattress period at 20 ($P = .003$), 40 ($P = .0001$), and 60 minutes ($P = .0001$). All 20 subjects reported that immobilization on the spine board with the mattress was "much better" (five-point scale) than that without the mattress. Interface pressure levels were significantly less in the mattress period than in the no-mattress period measured at occiput ($P = .0001$), sacrum ($P = .0001$), and heel ($P = .0001$). **CONCLUSION:** In a simulated immobilization experiment, healthy volunteers reported significantly less pain during immobilization on a spine board with an interposed air mattress than during that on a spine board without a mattress. Tissue-interface pressures were significantly higher on spine boards without air mattresses. This and previous studies suggest that immobilization on rigid spine boards is painful and may produce tissue-interface pressure high enough to result in the development of pressure necrosis ("bedsores"). Emergency care providers should consider the use of interposed air mattresses to reduce the

pain and potential tissue injury associated with immobilization on rigid spine boards.

[Acad Emerg Med.](#) 1995 Aug;2(8):725-8.[Links](#)

Padded vs unpadded spine board for cervical spine immobilization.

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OBJECTIVES: To determine whether padding the long spine board improves patient comfort, affects cervical spine (c-spine) immobilization, or increases sacral transcutaneous O₂ tension. **METHODS:** A prospective randomized, controlled crossover study of healthy volunteers was conducted over a two-week period. Participants included 30 volunteers with no previous history of c-spine injury or disease. The subjects were randomized to either padded or unpadded long spine board immobilization with serial measurements of discomfort (using a visual analog scale) and transcutaneous tissue O₂ tension obtained at zero and 30 minutes. Measurements of ability to flex, extend, rotate, and laterally bend the c-spine were made using a goniometer. The subjects then returned a minimum of three days later to complete the opposite half of the study (padded vs unpadded boards). **RESULTS:** Subject discomfort was significantly reduced in the padded group compared with the unpadded group ($p = 0.024$). There was no significant difference in flexion ($p = 0.410$), extension ($p = 0.231$), rotation ($p = 0.891$), or lateral bending ($p = 0.230$) for the two groups. There was no significant difference in the actual drop in sacral transcutaneous O₂ tension from time zero to 30 minutes for the padded and the unpadded groups (mean drop = 14.8% +/- 17.5% vs 12.2% +/- 16.8%, respectively; $p = 0.906$). **CONCLUSION:** Adding closed-cell foam padding to a long spine board significantly improves comfort without compromising c-spine immobilization. Sacral tissue oxygenation does not appear affected by such padding for healthy volunteers.

[Cochrane Database Syst Rev.](#) 2008 Oct 8;(4):CD001735.



[Links](#)

Support surfaces for pressure ulcer prevention.

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BACKGROUND: Pressure ulcers (also known as bedsores, pressure sores, decubitus ulcers) are areas of localised damage to the skin and underlying tissue due to pressure, shear or friction. They are common in the elderly and immobile and costly in financial and human terms. Pressure-relieving beds, mattresses and

seat cushions are widely used as aids to prevention in both institutional and non-institutional settings. OBJECTIVES: This systematic review seeks to answer the following questions:(1) to what extent do pressure-relieving cushions, beds, mattress overlays and mattress replacements reduce the incidence of pressure ulcers compared with standard support surfaces?(2) how effective are different pressure-relieving surfaces in preventing pressure ulcers, compared to one another? SEARCH STRATEGY: For this second update the Cochrane Wounds Group Specialised Register was searched (28/2/08), The Cochrane Central Register of Controlled Trials (CENTRAL)(2008 Issue 1), Ovid MEDLINE (1950 to February Week 3 2008), Ovid EMBASE (1980 to 2008 Week 08) and Ovid CINAHL (1982 to February Week 3 2008). The reference sections of included studies were searched for further trials. SELECTION CRITERIA: Randomised controlled trials (RCTs), published or unpublished, which assessed the effectiveness of beds, mattresses, mattress overlays, and seating cushions for the prevention of pressure ulcers, in any patient group, in any setting. Study selection was undertaken by at least two authors independently with a third author resolving uncertainty. RCTs were eligible for inclusion if they reported an objective, clinical outcome measure such as incidence and severity of new of pressure ulcers developed. Studies which only reported proxy outcome measures such as interface pressure were excluded. DATA COLLECTION AND ANALYSIS: Trial data were extracted by one researcher and checked by a second. The results from each study are presented as relative risk for dichotomous variables. Where deemed appropriate, similar studies were pooled in a meta analysis. MAIN RESULTS: For this second update 11 trials met the inclusion criteria bringing the total number of RCTs included in the review to 52. Foam alternatives to the standard hospital foam mattress can reduce the incidence of pressure ulcers in people at risk. The relative merits of alternating and constant low pressure devices are unclear. There is one high quality trial comparing the different alternating pressure devices for pressure ulcer prevention which suggests that alternating pressure mattresses may be more cost effective than alternating pressure overlays. Pressure-relieving overlays on the operating table have been shown to reduce postoperative pressure ulcer incidence, although two studies indicated that foam overlays resulted in adverse skin changes. Two trials indicated that Australian standard medical sheepskins prevented pressure ulcers. There is insufficient evidence to draw conclusions on the value of seat cushions, limb protectors and various constant low pressure devices as pressure ulcer prevention strategies. A study of Accident & Emergency trolley overlays did not identify a reduction in pressure ulcer incidence. There are tentative indications that foot waffle heel elevators, a particular low air loss hydrotherapy mattress and two types of operating theatre overlays are harmful. AUTHORS' CONCLUSIONS: In people at high risk of pressure ulcer development higher specification foam mattresses rather than standard hospital foam mattresses should be used. The relative merits of higher-tech constant low pressure and alternating pressure for prevention are unclear but alternating pressure mattresses may be more cost effective than alternating pressure overlays. Medical grade sheepskins are associated with a decrease in pressure ulcer development. Organisations might

consider the use of some forms of pressure relief for high risk patients in the operating theatre. Seat cushions and overlays designed for use in Accident & Emergency settings have not been adequately evaluated.

[Prehosp Emerg Care](#). 1998 Apr-Jun;2(2):112-6.[Links](#)

The effects of neutral positioning with and without padding on spinal immobilization of healthy subjects.

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OBJECTIVES: To compare the incidences and severities of pain experienced by healthy volunteers undergoing spinal immobilization in the neutral position with and without occipital padding. To compare the incidence of pain when immobilized in the neutral position with the incidence in a nonneutral position. **METHODS:** Thirty-nine healthy volunteers over the age of 18 years who had no acute pain or illness, were not pregnant, and had no history of back problems or surgery voluntarily participated in a prospective, randomized, crossover study conducted in a clinical laboratory setting. Appropriately sized rigid cervical collars were applied to the subjects, who were then immobilized on wooden backboards with their cervical spines maintained in the neutral position using towels (padded) or plywood (unpadded) under their occiputs. The subjects were secured to the board with straps, soft head blocks, and tape for 15 minutes to simulate a typical ambulance transport time. The straps, head blocks, and tape were removed, and the subjects remained on the board for an additional 45 minutes to simulate a typical emergency department experience. The subjects were then asked to identify the location(s) of any pain on anterior and posterior body outlines and to indicate the corresponding severity of pain on a 10-cm visual analog scale. The subjects were also asked questions about movement, respiratory symptoms, and strap discomfort in an attempt to distract them from the true focus of the study (i.e., pain). A similar survey was given to each participant to complete 24 hours later. The same subjects were immobilized with the alternate occipital material a minimum of two weeks later utilizing the same procedure. They again completed both surveys. **RESULTS:** Pain was reported by 76.9% of the subjects following removal from the backboard for the unpadded trial and 69.2% of the subjects following the padded trial ($p < 0.45$). Twenty-three percent (23.1%) of the subjects reported neck pain after the unpadded trial, while 38.5% reported neck pain after the padded trial ($p < 0.07$). Occipital pain was reported by 35.9% in the unpadded trial and 25.6% in the padded trial ($p < 0.29$). Twenty-four hours later, pain was reported by 17.9% of the subjects following the unpadded

trial and 23.1% of the subjects following the padded trial ($p < 0.63$). Eight percent (7.7%) reported neck pain 24 hours after the unpadded trial and 12.8% after the padded trial ($p < 0.5$). Occipital pain was reported by 7.7% of the subjects 24 hours after the unpadded trial and 2.6% after the padded trial ($p < 0.63$). This study had a power of 0.90 to detect a difference of 30% between the trials. The authors found a significantly lower incidence of pain ($p < 0.01$) and occipital pain ($p < 0.01$) in their unpadded trial compared with that reported by Chan et al., who used neither padding nor neutral positioning to immobilize subjects.

CONCLUSIONS: Pain is frequently reported by healthy volunteers following spinal immobilization. Occipital padding does not appear to significantly decrease the incidence or severity of pain. Alignment of the cervical spine in the neutral position may reduce the incidence of pain, but further studies should be conducted to substantiate this observation.