

NEANN

LONG BOARD COMFORT STUDIES



Unpadded Flat Long Spine Board (LSB) Studies:

- Immobilisation to **flat unpadded LSB** causes spinal misalignment, pressure sore development, and pain¹⁻⁹.
- The single paper that led many organisations stating LSBs are uncomfortable and cause pressures sores within as little as 30 minutes is the following study

Ann Emerg Med 1994 Jan;23(1):48-51

The effect of spinal immobilization on healthy volunteers.

Chan D, Goldberg R, Tascone A, Harmon S, Chan L.

Department of Emergency Medicine, Los Angeles County/University of Southern California Medical Center.

STUDY OBJECTIVE: To determine the effects of standard spinal immobilization on a group of healthy volunteers with respect to induced pain and discomfort. **DESIGN:** Prospective study. **SETTING:** University teaching hospital. **TYPE OF PARTICIPANTS:** **Twenty-one healthy volunteers** with no history of back disease. **INTERVENTIONS:** Subjects were placed on a **standard flat unpadded backboard immobilized for a 30-minute period**. Number and severity of immediate and delayed symptoms were determined. **MEASUREMENTS AND MAIN RESULTS:** **One hundred percent** of subjects **developed pain** within the immediate observation period. **Occipital headache and sacral, lumbar, and mandibular pain** were the most frequent symptoms. **Fifty-five percent of subjects graded their symptoms as moderate to severe**. Twenty nine percent of subjects developed additional symptoms over the next 48 hours. **CONCLUSION:** **Standard spinal immobilization on an unpadded flat Board may be a cause of pain** in an otherwise healthy subject.

1. Patterson RP, *et al* Phys Rehabil 1988;67:123-7. Risk factors for early occurring pressure ulcers following spinal cord injury.
2. Delbridge TR, *et al* Prehosp Disast Med 1993;8 Discomfort in healthy volunteers immobilized on wooden backboards and vacuum mattress splints.
3. Lovell *et al* Injury. 1994 Apr;25(3):179-80. A comparison of the spinal board and the vacuum stretcher, spinal stability and interface pressure.
4. Chan D, *et al* Ann Emerg Med 1994 Jan;23(1):48-51 The effect of spinal immobilization on healthy volunteers.
5. Chan D, *et al*. J Emerg Med 1996 May-Jun;14(3):293-8 Backboard versus mattress splint immobilization: a comparison of symptoms generated.
6. Hamilton RS, *et al* J Emerg Med 1996 Sep-Oct;14(5):553-9 The efficacy and comfort of full-body vacuum splints for cervical-spine immobilization.
7. Lerner EB, *et al* Prehosp Emerg Care 1998 Apr-Jun;2(2):112-6 The effects of neutral positioning with & without padding on spinal immobilization of healthy subjects.
8. Cross DA, *et al* Prehosp Emerg Care 2001 Jul-Sep;5(3):270-4 Comparison of perceived pain with different immobilization techniques.
9. Vickery *et al* Emerg Med J 2001;18:51-54 doi:10.1136/emj.18.1.51 The use of the spinal board after the pre-hospital phase of trauma management

BOARD SHAPE

Two studies on the following pages examine shape comparing the flat LSB vs devices with $\geq 25^\circ$ of side curvature

- Krell JM, McCoy MS, Sparto PJ, Fisher GL, Stoy WA, Hostler DP.
Comparison of the Ferno Scoop Stretcher with the flat long backboard for spinal immobilization.
Prehosp Emerg Care. 2006 Jan-Mar;10(1):46-51.
- Darren Lee
Preparation For The Research & Development Of A New Generation Long Spine Board
Deakin University Victoria 2007



BOARD SHAPE STUDIES

Prehosp Emerg Care. 2006 Jan-Mar;10(1):46-51.

Comparison of the Ferno Scoop Stretcher with the flat long backboard for spinal immobilization.

Krell JM, McCoy MS, Sparto PJ, Fisher GL, Stoy WA, Hostler DP.

Department of Emergency Medicine, University of Pittsburgh, Pittsburgh, PA, USA.

OBJECTIVES: Spinal immobilization is essential in reducing risk of further spinal injuries in trauma patients. The authors compared the traditional **flat long backboard (LBB)** with **the Ferno Scoop Stretcher (FSS) (Model 65-EXL)**. They hypothesized no difference in movement during application and immobilization between the FSS and the LBB. **METHODS:** **Thirty-one adult subjects** had **electromagnetic sensors** secured over the nasion (forehead) and the C3 and T12 spinous processes and were placed in a rigid cervical collar, with movement recorded by a goniometer (a motion analysis system). Subjects were tested on both the FSS and the LBB. The sagittal flexion, lateral flexion, and axial rotation were recorded during each of four phases: 1) baseline, 2) application (logroll onto the LBB or placement of the FSS around the patient), 3) secured logroll, and 4) lifting. **Comfort** and **perceived security** also were **assessed on a visual analog scale**. **RESULTS:** There was approximately 6-8 degrees greater motion in the sagittal, lateral, and axial planes during the application of the LBB compared with the FSS (both $p < 0.001$). No difference was found during a secured logroll maneuver. The FSS induced more sagittal flexion during the lift than the LBB ($p < 0.001$)

CONCLUSION: The **FSS demonstrated superior comfort and perceived security**. The FSS caused significantly less movement on application and increased comfort levels. Decreased movement using the FSS may reduce the risk of further spinal cord injury.

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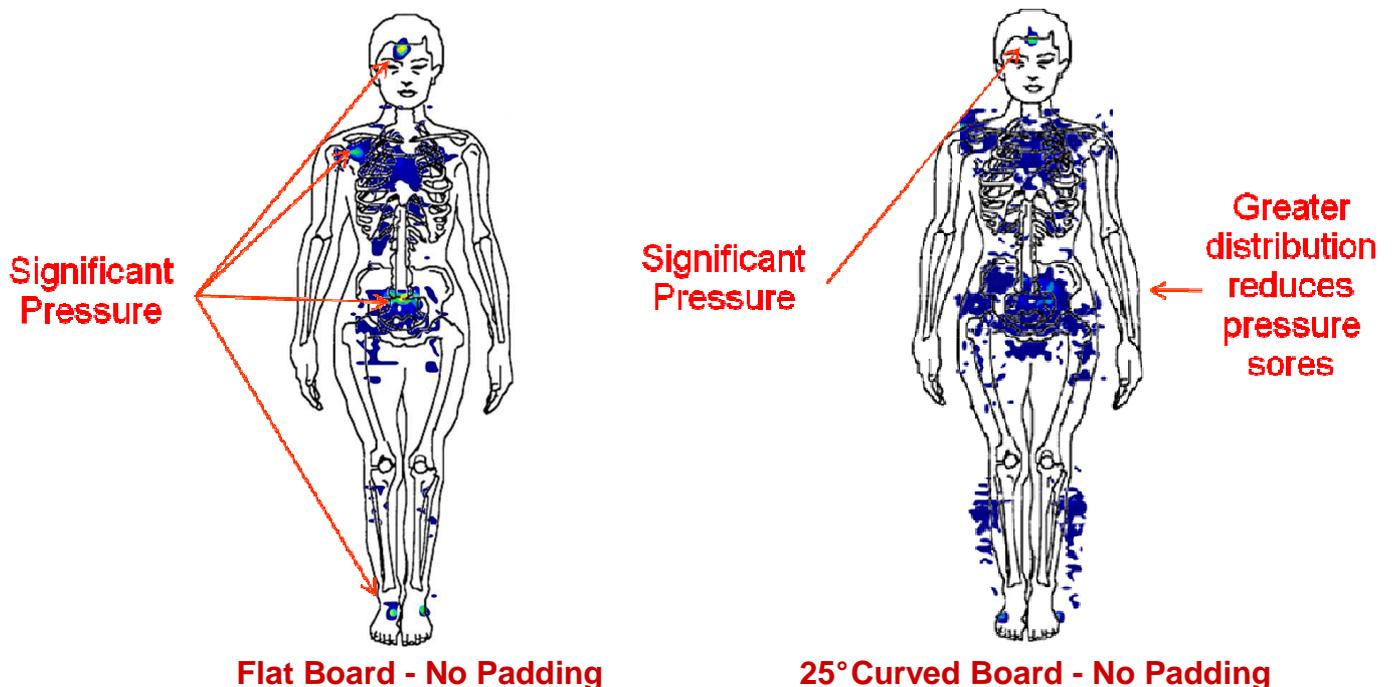
BOARD SHAPE STUDIES

Darren Lee

Preparation For The Research & Development Of A New Generation Long Spine Board

Deakin University Victoria 2007

Laerdal BaxStrap Flat Long Board vs NEANN's Curved Long Board Using Computerised Pressure Mats



Severe pressure areas (red and green zones) are seen on flat LSBs at the occiput, scapula, lumbar and heels, which also leads to significant discomfort.¹

Side curvature of the LSB results in greater spread of pressure is seen, reducing pressure sore development. Green zones are reduced to the occiput only. Mild pressure areas (blue zones) are present throughout the rest of the body including the scapula, lumbar and heels.

Light colors (red & green) represent significant pressure points, blue represents mild pressure only.

The greater the blue areas, the greater the spread of pressure & reduction in potential pressure sores.

1. Chan D, et al The effect of spinal immobilization on healthy volunteers. Ann Emerg Med 1994 Jan;23(1):48-51

BOARD PADDING

Padded Board Studies:

- Eight padded LSB studies¹⁻⁸ currently exist.
- All studies confirm that when the LSB is padded, comfort significantly improves and/or pressure sore development reduces.
- These eight studies are presented on the following pages ...



1. Lee Preparation For The Research & Development Of A New Generation Long Spine Board Deakin University Victoria 2007
2. Walton *et al* Padded vs unpadded spine board for cervical spine immobilization *Acad Emerg Med* 1995 Aug;2(8):725-8
3. Cordell *et al* Pain and tissue-interface pressures during board immobilization *Ann Emerg Med* 1995 Jul;26(1):31-6
4. Treseder *et al* Efficacy of Simulated Spinal Immobilisation Of An Inflatable Spine Board Padding Device In Reducing Pain *Annals of Emerg Med* Vol 44, Issue 4, Pages S62-S63,
5. Hann Long Spine Board: Does It Cause Discomfort *Response* Volume 33 2006
6. Sheerin *et al* The occipital and sacral pressures experienced by healthy volunteers under spinal immobilization: a trial of three surfaces. *J Emerg Nurs.* 2007 Oct;33(5):447-50.
7. Hemmes *et al* Reduced Tissue-Interface Pressure & Increased Comfort on a Newly Developed Soft-Layered Long Spineboard *Journal of Trauma: Injury, Infection, & Critical Care: Mar2010 - Vol 68 - Issue 3 - 593*
8. Edlich *et al* Revolutionary advances in enhancing patient comfort on patients transported on a backboard. *Am J Emerg Med.* 2010 Mar 24.

BOARD PADDING STUDIES

Acad Emerg Med 1995 Aug;2(8):725-8

Padded vs unpadded spine board for cervical spine immobilization.

Walton R, DeSalvo JF, Ernst AA, Shahane A

Department of Medicine, Louisiana State University, New Orleans, USA.

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 randomised, 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 randomised 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.

BOARD PADDING STUDIES

Ann Emerg Med 1995 Jul;26(1):31-6

Pain and tissue-interface pressures during board immobilization.

Cordell *et al*

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 cross-over study. **SETTING:** Emergency department of Methodist Hospital of 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 randomised. 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.

BOARD PADDING STUDIES

Annals of Emergency Medicine Volume 44, Issue 4, Pages S62-S63, October 2004

Efficacy Of An Inflatable Spine Board Padding Device In Reducing Pain During Simulated Spinal Immobilisation

Jamie Treseder, MD and Steven M. Joyce, MD

STUDY OBJECTIVES: Prolonged Long Board immobilization has been shown to cause pain, which may prompt unnecessary x-rays. Padding devices have been shown to decrease pain in immobilized volunteers. The use of a verbal analog scale to rate pain has been validated. This study investigated the efficacy of a commercially available, disposable, inflatable spine-board padding device (IPD) in reducing pain due to spinal immobilization in normal healthy volunteers. **DESIGN:** Prospective randomized crossover study. **SETTING:** Nonclinical, EMS laboratory setting. **PARTICIPANTS:** Twenty-five healthy adult volunteers without acute or chronic back pain and not having used analgesics in the preceding 24 hours. **METHODS/INTERVENTIONS:** Two trials were performed on each subject, with and without the IPD (BackRaft™, MedicTech Inc.), with each subject acting as his/her own control. Volunteers were immobilized using rigid cervical collars, spine boards, head immobilizers and straps. Immobilization was performed by experienced paramedics and the investigators, using standardized methods and the manufacturer's instructions for application of the IPD. The order of the two trials was randomized, and timed at least 48 hours apart. Volunteers were immobilized for 60 minutes. A verbal analog scale (VAS) was used to assess pain, with subjects asked to rate their pain on a scale of 0 to 10, with 10 being most severe. A pain assessment was obtained immediately pre-immobilization and every 15 minutes until 15 minutes after immobilization was discontinued. The difference between pain ratings with and without the IPD was calculated for each participant at each time interval. The mean difference in pain ratings for each time interval was then compared to zero using a paired two tailed t- test. Results were considered statistically significant at $p < 0.05$. Research suggests that a difference of >1.3 units on a 0-10 unit VAS indicates clinically significant pain relief.⁶ Mean differences with lower 95% confidence intervals > 1.3 were thus considered clinically significant. Subjects were examined for physical injury 15 minutes after immobilization was discontinued. **Reductions in mean pain scores with the IPD at 15 through 60 minutes were statistically significant.** Mean scores at 45 and 60 minutes met the criterion for clinical significance. None of the victims had significant physical injury. **CONCLUSIONS:** Healthy volunteers reported **statistically significant reduction in pain** at 15 through 60 minutes when an IPD was used during spinal immobilization. Using a criterion of >1.3 units on a VAS, reduction in pain at 45 and 60 minutes was also clinically significant. The **IPD was effective in decreasing discomfort** during spinal immobilization in healthy volunteers. Clinical studies in immobilized trauma victims are indicated.

BOARD PADDING STUDIES

Response Volume 33 2006

Long Spine Board: Does It Cause Discomfort

Anthony Hann - MICA Paramedic

Ambulance Officers Training Centre Victoria Australia

BACKGROUND: In recent times, the flat Long Spine Board (FLSB) has come under increasing scrutiny due to the potential discomfort and pressure area development of the FLSB to the patient when the patient is immobilised without body, head or lumbar padding. Additionally respiratory compromise due to the strapping techniques in use have also been quoted. It has been suggested by some studies however that the addition of appropriate padding under the patient can improve comfort and reduce tissue interface pressures. The Victorian Ambulance Service introduced the **DHS curved Long Spine Board (CLSB)** into use in 1995, and since then, there have been no studies within the Service to support or discredit previous overseas studies on the FLSB discomfort, pressure area development or respiratory compromise. **DESIGN AND STUDY:** To resolve this question, **a study was carried out at the Ambulance Officers Training College in Victoria** to determine if the CLSB and methods being taught by the Victorian Ambulance Service resolved previous discomfort findings. **Method:** In this study, **16 healthy subjects (Stage 1 Ambulance Students) without a previous history of back injury and no current back pain were placed onto the fiberglass CLSB for a period of 60 minutes with padding as per the Victorian Ambulance Service's teaching standards (Worksheet Instructions WI 5.1.11)** **Results:** subjects stated the CLSB padded as per the Victorian Ambulance Service's teaching (Worksheet Instructions WI 5.1.11) to be **comfortable** to lay on for a **period of 1 hour, twice** the period stated in the Chan study where no padding was applied. **Symptoms generated by the Chan study were significantly reduced in this study.** Headaches and pressure areas as stated in Chan study did not develop. Subjects further stated **head discomfort was related to the cervical collar**, which was agreed by subjects to be the **major cause of the overall discomfort rating.** **Conclusion: The CLSB with correct padding and immobilisation techniques** as currently being taught by the Victorian Ambulance Service's teaching standards **using Worksheet Instructions WI 5.1.11 is comfortable for at least 1 hour on the healthy subject.**

BOARD PADDING STUDIES

J Emerg Nurs. 2007 Oct;33(5):447-50.

The occipital and sacral pressures experienced by healthy volunteers under spinal immobilization: a trial of three surfaces.

Sheerin *et al*

School of Nursing and Midwifery Studies, University of Dublin, Trinity College, Dublin, Ireland.

BACKGROUND: The development of a [pressure ulcer](#) is of great significance to the life-long rehabilitative management of the person with a spinal cord injury, and may indeed delay and repeatedly interfere with that process. That the period preceding admission to the specialized spinal injury unit is crucial with regard to pressure ulcer development is evident in the professional literature. Both anecdotal and empirical evidence indicates that a significant number of pressure ulcers occur as a result of management provided prior to admission, and that such ulcers are more likely to occur in those patients who have undergone a transfer process from a hospital distal to the specialist unit on a hard spinal board. **AIM:** In consideration of this and of the fact that, in Ireland, the interhospital transfer of spinal injured patients has usually involved the employment of such spinal boards to achieve immobilization, this study sought to identify whether or not the pressure experienced by individuals at two anatomical locations was dependent on the support surface employed. **METHODOLOGY:** [Pressure under the occiput and sacrum](#) of [three healthy volunteers](#) immobilized on three support surfaces was [measured using air-filled pressure-measuring sacks](#). The surfaces employed were an [unpadded spinal board](#); a [spinal board with inflatable raft device](#); and a [full-body vacuum splint](#). **DISCUSSION:** [Marked reductions in pressure](#) were measured when using the [inflatable raft](#) and the vacuum mattress. The results of this study will provide a basis for a larger study and, through that, the formulation of recommendations for standardized practice along a national care pathway

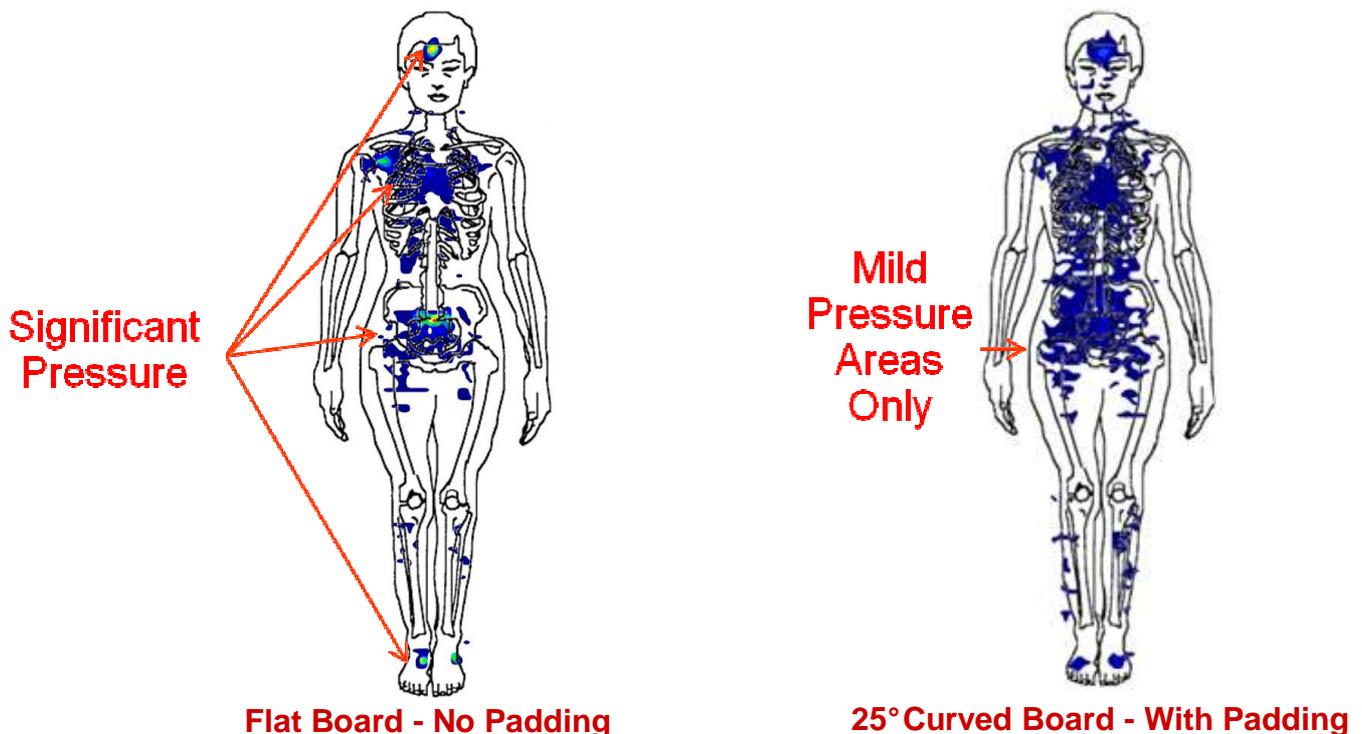
BOARD PADDING STUDIES

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Deakin University Victoria 2007

Laerdal BaxStrap Flat Long Board vs NEANN's Curved Long Board Using Computerised Pressure Mats



Severe pressure areas (red and green zones) are seen on flat LSBs at the occiput, scapula, lumbar and heels, which also leads to significant discomfort.¹

Side curvature of the LSB results in greater spread of pressure is seen, reducing pressure sore development. With LSB padding only mild pressure areas (blue zones) are present throughout the whole the body including the occiput, scapula, lumbar and heels.

Light colors (red & green) represent significant pressure points, blue represents mild pressure only

The greater the blue areas, the greater the spread of pressure & reduction in potential pressure sores

1. Chan D, *et al* The effect of spinal immobilization on healthy volunteers. Ann Emerg Med 1994 Jan;23(1):48-51

BOARD PADDING STUDIES

Am J Emerg Med. 2010 Mar 24.

Revolutionary advances in enhancing patient comfort on patients transported on a backboard.

Edlich RF, Mason SS, Vissers RJ, Gubler KD, Thacker JG, Pharr P, Anderson M, Long WB 3rd.

Plastic Surgery, Biomedical Engineering and Emergency Medicine, University of Virginia Health System, Charlottesville, VA 22903-3363, USA.

BACKGROUND: Patients with suspected spinal cord injuries are immobilized to a backboard during ambulance and helicopter air transport. It has been well documented that patients who are immobilized to a backboard experience discomfort and eventually become susceptible to pressure ulcer formation. Because the patient lying on a backboard is subjected to high skin interface pressures, it is imperative to improve patient comfort and prevent pressure ulcer formation. **OBJECTIVE:** Realizing the dangers of the potentially preventable pressure ulcers, our team of scientists, surgeons, and trauma nurses performed a [comprehensive study of the Back Raft system](#) that was designed to reduce patient discomfort and skin interface pressure. **METHODS:** [Pressure under the occipital, scapula, and sacral regions of the back was measured](#) using the Tactilus pressure analyzer of [10 healthy volunteers immobilized on a backboard and a backboard with a Back Raft air mattress system](#). Discomfort levels of each volunteer were measured using a Visual Analog Scale. **RESULTS:** Data from this study indicated that the Back Raft **significantly reduces discomfort as well as tissue interface pressure in the occipital, scapula, and sacral regions of the back.** **CONCLUSIONS:** The implementation of an air mattress system analogous to the Back Raft would facilitate the **prevention of pressure ulcer formation during prehospital care and transportation.** In 2008, The Centers for Medicare and Medicaid Services enacted a policy in which the Centers for Medicare and Medicaid Services can refuse payment for hospital-acquired conditions. Pressure ulcers were among the hospital-acquired conditions within the final rule.

BOARD PADDING STUDIES

The Journal of Trauma: Injury, Infection, and Critical Care: March 2010 - Vol 68 - Issue 3 - 593-598

Reduced Tissue-Interface Pressure and Increased Comfort on a Newly Developed Soft-Layered Long Spineboard

Hemmes, Baukje MSc; Poeze, Martijn MD, PhD; Brink, Peter R. G. MD, PhD

Background: Immobilization of the spine in patients with trauma at risk of spinal damage is performed using a rigid long spineboard or vacuum mattress both during prehospital and in-hospital care. However, disadvantages of these immobilization devices in terms of discomfort and tissue-interface pressures have guided the development of a new soft-layered long spineboard. We compared tissue-interface pressure and degree of discomfort during immobilization on a rigid spineboard, a vacuum mattress, and a newly developed soft-layered long spineboard. **Methods:** In this randomized crossover trial, 30 volunteers were immobilized sequentially on all three devices for 15 minutes per device. Tissue-interface pressures were measured using an Xsensor pressure mapping device, including the peak pressure and the Peak Pressure Index (PPI). Discomfort was rated on a Visual Analog Scale after 1 minute and after 15 minutes of immobilization. **Results:** Tissue-interface pressures were significantly higher on the standard long spineboard and the vacuum mattress than on the soft-layered long spineboard. PPI for the sacrum was close to peak pressure on both the spineboard and the vacuum mattress. PPI for the sacrum on the soft-layered long spineboard was significantly lower, with an average PPI close to normal diastolic blood pressures. The participants reported significantly less discomfort on the soft layered long spineboard compared with the rigid long spineboard, both after 1 minute and 15 minutes ($p < 0.0001$). **Conclusions:** This study revealed a relevant reduction in tissue-interface pressures and discomfort when using a soft-layered long spineboard compared with using a standard rigid long spine board or a vacuum mattress. Emergency care providers should consider the use of the soft-layered long spineboard to reduce the discomfort and potential tissue damage caused by immobilization and transport on a rigid long spineboard or vacuum mattress.

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CONCLUSION

- There is **scientific evidence** that **failing to pad** a LSB leads to **pain and pressure sore** development within as little as **30 minutes**¹.
- **Two studies**²⁻³ reviewing device curvature conclude that high side **angles $\geq 25^\circ$ improve comfort** over flat devices.
- All **eight studies**³⁻¹⁰ that have reviewed LSB padding, unanimously conclude that when **padding** is placed on LSBs, **pressure sore development is reduced** and / or **comfort is improved** for long periods.



1. Chan D, *et al* The effect of spinal immobilization on healthy volunteers. *Ann Emerg Med* 1994 Jan;23(1):48-51
2. Krell JM, *et al* Comparison of the Ferno Scoop Stretcher with the flat long backboard for spinal immobilization. *Prehosp Emerg Care.* 2006 Jan-Mar;10(1):46-51.
3. Lee Preparation For The Research & Development Of A New Generation Long Spine Board. Deakin University Victoria 2007
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NEANN LONG BOARD MATTRESS

The Neann Long Board Mattress (LBM) is the most advanced designed Board Mattress on the market, offering many features including:

- ☛ *Conforms to body shape to significantly improve board comfort for extended periods.*
- ☛ *Significantly reduces pressure sore development.*
- ☛ *Provides insulation under the patient to help prevent hypothermia.*
- ☛ *Designed to slide easily on the Long Board to allow the person to be correctly centred for immobilisation. Pull handles further ease the mattress's movement.*
- ☛ *Eases the removal of the patient off the Long Board either longitudinally or laterally.*
- ☛ *Provides lumbar support thus reducing the need to additionally pad the lumbar spine.*
- ☛ *Stores in all current Australian Ambulances.*
- ☛ *Attachments allow the Mattress to secure to the Long Board for storage & carrying.*
- ☛ *Specialised outer material repels water for easy cleaning.*



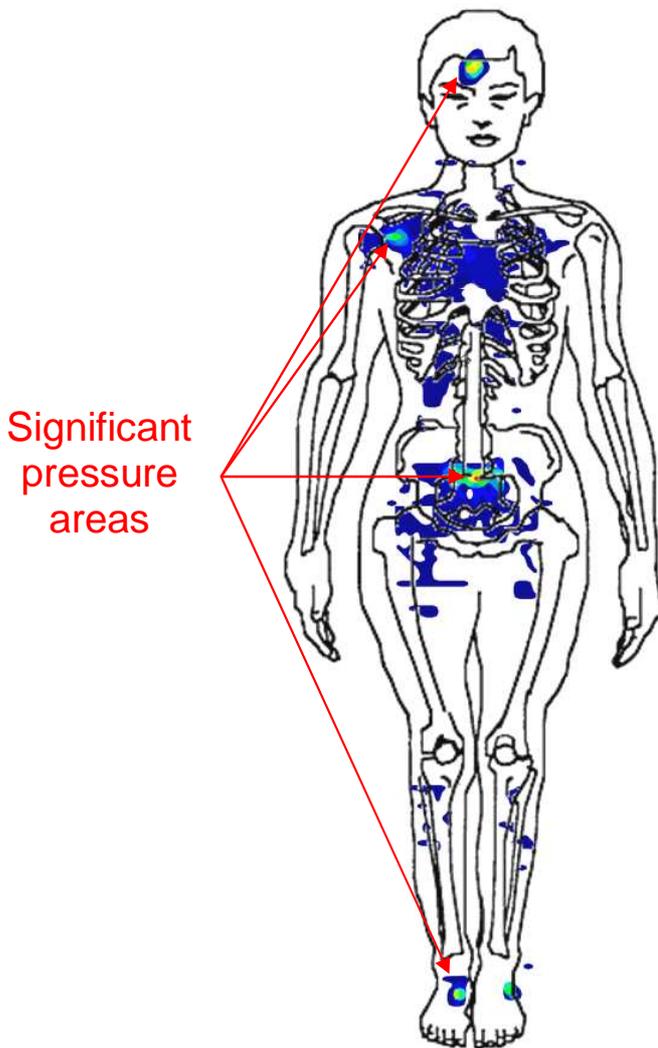
Board Attachment



Vehicle Storage

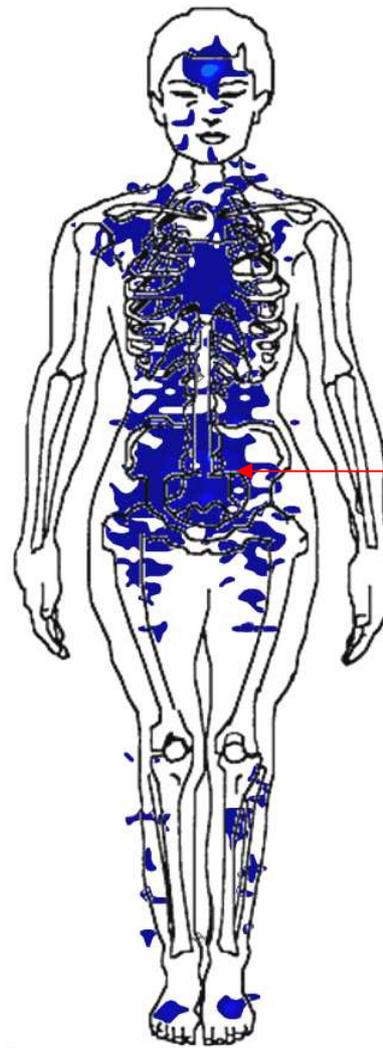
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NEANN LONG BOARD MATTRESS



Flat Board Without Padding¹

Severe pressure areas (red and green zones) are noted when no padding is applied to the Board at the occiput, scapula, lumbar and heels, which also leads to significant discomfort²



Flat Board With NEANN Board Pad¹

Greater spread of pressure is noted, reducing pressure sore development. No red or green zones are seen when the Pad is applied. A small number of light blue zones are present at the occiput, lumbar and heels, with most areas dark blue (minor pressure). Padding has been shown in multiple studies³⁻⁹ to improve comfort significantly for long periods.

References:

1. Lee Preparation For The Research & Development Of A New Generation Long Spine Board
 2. Chan D, *et al* The effects of spinal immobilisation on the healthy volunteers
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