Beds and Mattresses for Back Pain

Plain language summary

Back pain is a common problem. Many adults suffer from low back pain at some time in their lives.

Back pain is caused by accidents, injuries or lifestyle factors. Sometimes back pain goes away after a short time. For some people it takes longer, or never completely goes away. This is called chronic back pain.

There are many treatments for chronic back pain. Some believe that sleeping on a particular type of bed or mattress can help back pain. The studies that have been done to test this do not give a clear answer. More high quality studies are needed to tell us if special beds or mattresses help with back pain.

Beds and mattresses for back pain

Evidence summary

Overview
Overall, one EBG and five primary studies were identified. The EBG only included two of the five primary studies, therefore, the five studies were synthesised to form the basis of this report. A narrative synthesis of the primary studies was conducted. It was found that due to variations in interventions used, trial settings and quality, studies could not be pooled and their results should not be generalized.
In what spinal pain conditions are beds and/or mattresses an effective treatment?
Not reported.
What is the effectiveness of beds and/or mattresses on spinal pain in these conditions?
The evidence to answer this question is inconclusive.
What is the effect of beds and/or mattresses on function, quality of life, return to work, medication use and healthcare utilisation in people suffering from persistent spinal pain? Are they cost-effective?
The evidence to answer this question is inconclusive.
What is the cost-effectiveness of this intervention for spinal pain?
Not reported.
Are there any potential risks or harms from the use of particular beds and/or mattresses?
Not reported.
Are there any spinal pain conditions which can be made worse by the use of particular beds and/or mattresses?
Not reported.

Glossary of Findings	
Inconclusive evidence	Evidence exists regarding this question, but conclusions cannot be drawn from the results.
Not reported	This question was not addressed by the studies identified.

Transport Accident Commission & WorkSafe Victoria

Evidence Service

Beds and mattresses for back pain

Evidence Review

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CONTENTS

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BACKGROUND

Musculoskeletal conditions are defined as conditions of the bones, muscles and their attachments, and include joint problems such as arthritis, osteoarthritis and back pain.[1] In 2004–05, 31% (6 million) of the population reported having a long-term disease of the musculoskeletal system and connective tissue, of which 15% reported some form of back problem.[2] A common type of back pain is low back pain (LBP).

Numerous evidence-based treatment guidelines focusing on the management of LBP (e.g. therapeutic exercise, steroid therapies etc.), have been established[3] alongside commonly held beliefs by consumers about "therapeutic lifestyle choices" such as mattress types (i.e. soft, medium, and firm). Market branding by manufacturers seem to infer that firmer mattresses are better for recovery. Combining consumer sentiment and manufacturer production, there is a widespread belief that sleeping on a poor quality mattress may lead to improper support and spinal alignment, poor blood circulation and poor pressure point relief; which in turn could contribute to persistent LBP as well other painful aetiologies such as shoulder and neck pain.

Many community-wide beliefs held about lifestyle treatment choices have been challenged by clinicians because of poorly designed studies along with the absence of strong statistical significance findings.[4] In order to develop a series of policy recommendations about which type of mattress is effective for back pain, the Transport Accident Commission and Work Safe Victoria (TAC/WSV) Health Services Group requested a review examining the relative impact and effect of beds and mattresses on the clinical course of back pain.

QUESTIONS

This Evidence Review sought to find the most up-to-date, high quality source of evidence to answer the following questions regarding beds and mattresses for back pain:

- In what spinal pain conditions are beds and/or mattresses an effective treatment?
- What is the effectiveness of beds and/or mattresses on spinal pain in these conditions?
- What is the effect of beds and/or mattresses on function, quality of life, return to work, medication use and healthcare utilisation in people suffering from persistent spinal pain?
- What is the cost-effectiveness of beds and/or mattresses for spinal pain?
- Are there any potential risks or harms from the use of particular beds and/or mattresses?
- Are there any spinal pain conditions which can be made worse by the use of particular beds and/or mattresses?

METHODS

Methods are outlined briefly below. More detailed information about the methodology used to produce this report is available in Appendices 1 and 2. All appendices are located in the Technical Report accompanying this document.

A comprehensive search of Medline, Embase, the Cochrane Library, All EBM, and CINAHL was undertaken in February 2012 to identify relevant synthesised research (i.e. evidence-based guidelines (EBGs), systematic reviews (SRs), health technology assessments (HTAs)) and any relevant randomised controlled trials (RCTs) and controlled clinical trials (CCTs). A comprehensive search of the internet, relevant websites and electronic health databases was also undertaken (see Appendix 2, Tables A2.2-A2.4 for search details). Reference lists of included studies were also scanned to identify relevant references.

Studies identified by the searches were screened for inclusion by two reviewers (ED & JW) using specific selection criteria (see Appendix 2, Table A2.1). Any discrepancies in study selection decisions were discussed and resolved. Synthesised evidence (EBGs, SRs and HTAs) that met the selection criteria were reviewed to identify the most up-to-date and comprehensive source of evidence, which was then critically appraised to determine whether it was of high quality. This process was repeated for additional sources of evidence, if necessary, until the most recent, comprehensive and high quality source of evidence was identified. Findings from the best available source of evidence were compared to other evidence sources for consistency of included references and findings.

The available evidence was mapped (see Table 2), and the algorithm in Table 1 was followed to determine the next steps necessary to answer the clinical questions.

Table 1. Further action required to answer clinical questions

<table>
<tr><th colspan="5">Is there any synthesised research available? (e.g. EBGs, HTAs, SRs)</th></tr>
<tr><th colspan="3">Yes</th><th colspan="2">No</th></tr>
<tr><th colspan="3">Is this good quality research?</th><th colspan="2">Are RCTs available?</th></tr>
<tr><th colspan="2">Yes</th><th>No</th><th>Yes</th><th>No</th></tr>
<tr><th colspan="2">Is it current (within 2 years)?</th><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><th>Yes</th><th>No</th></tr>
<tr><td>No further action</td><td>Update existing SR</td><td>Undertake new SR</td><td>Undertake new SR</td><td>Consider looking for lower levels of evidence</td></tr>
</table>

Data on characteristics of all included studies were extracted and summarised (see Appendix 4).

SEARCH RESULTS

In total six studies were identified (see Table 2).

Searches of Medline, Embase, the Cochrane Library, All EBM, and CINAHL resulted in 285 potentially relevant references. After screening using specific selection criteria (see Appendix 2, Table A2.1), five primary studies were identified; four RCTs[4-7] and one CCT[8] (see Table 2). Screening of results from searches of the internet, relevant websites and electronic health databases identified one synthesised study, an EBG[9] (see Table 2).

Table 2. Evidence map of identified studies by study-type

Synthesised Studies		Primary studies	TOTAL
EBGs	SRs & HTAs		
1	0	4 RCTs, 1 CCT	6

The EBG only included two [4, 7] of the five identified studies. For completeness we have decided to exclude the EBG from this review and base our results and discussion on the five primary studies.

STUDY RESULTS

A summary of the included studies (including the population, intervention and comparators, outcomes and results) can be found in Table 3, and in greater detail in the Technical Report (Tables A 6.1-6.5).

Description of studies

Five primary studies published between 1981 and 2008 were identified (4 RCTs[4-7] and 1 CCT[8]), three of these were crossover studies.[5, 6, 8] The number of patients included ranged from 9 to 313, with a combined total of 527 patients. Each study was conducted in a different country, including: Denmark,[7] Spain,[4] South Africa,[8] UK,[5] and USA.[6]

Population

All studies included patients with low back pain (see Table 2). Four studies included patients with chronic pain (two studies defined this as for at least 6 months,[5, 7] one study for at least 3 months,[6] and one stated that patients had chronic pain, but did not specify a minimum time period for this[4]), the remaining study did not specify chronic pain or set out a time period.[8] All studies were of adults, but specific age ranges of included patients were not reported for most studies. One study only included younger adults (18-30 years).[8]

Intervention and comparators

Two studies compared firmness of different mattress,[4, 8] one was a home based comparison,[4] and the other conducted in a sleep-lab.[8]

Two studies compared different types of mattresses.[5, 7] Both were home-based studies. One compared a foam mattress, waterbed and futon,[7] and the other compared a soft mattress with an isometric mattress (a foam mattress with moveable inserts to customize areas of support).[5]

The final study was a sleep clinic-based study that compared both different types and firmness of mattress (hard vs. soft vs. waterbed vs. hybrid bed – a combination water-foam flotation system mattress).[6]

Outcomes

Four of the five studies[4-7] examined objective outcomes, such as range of movement and straight leg raising tests. All five studies examined subjective measures such as patient self-reported pain, sleep, mood and comfort.

The time point at which outcomes were measured was different for all studies (e.g. 2 days,[8] 14 days,[5, 6] 1 month,[7] and 90 days).[4]

Results

The studies had inconsistent findings regarding which type of mattress was best for low back pain.

Mattress firmness

Hard/firm mattresses

Two studies found a hard/firm mattress to be a better option than its comparators: Dubb[8] found a hard mattress to be better than a medium or soft mattress for sleep quality ($p<0.04$) and backache ($p<0.02$); and Garfin[6] found a hard bed to be better than a waterbed, a soft bed, and a hybrid bed for outcomes of pain and straight leg raising (p-values were not reported for this study).

Conversely, two studies found a hard/firm mattress to have worse results than its comparators: Kovacs[4] found a medium-firm mattress to be superior to a firm mattress for improvement in disability ($p=0.008$) and pain on rising ($p=0.008$); and Bergholdt[7] found a waterbed and a foam mattress to be slightly better than a firm mattress for back symptoms ($p=0.001$), function ($p=0.003$) and sleep ($p<0.001$).

Medium mattresses

One study (Kovacs[4]) found that a medium-firm mattress was more effective than a firm mattress (see above), while another (Dubb[8]) found the opposite (see above).

Soft mattresses

Of the three studies[5, 6, 8] looking at soft mattresses, none found them to be superior to their comparators for any outcomes.

Mattress type

Three studies looked at different types of mattresses (Garfin[6], Bergholdt[7], and Atherton[5]). Mattress types included: a waterbed, a body-contouring foam mattress, a hard bed, a soft innerspring mattress, an isometric mattress, and a hybrid bed.

Garfin[6] found the hard bed best and the waterbed next best for pain and straight leg raising; the soft bed and the hybrid bed had the least favourable results (p-values were not reported for this study). Bergholdt[7] found no difference between the waterbed and foam mattress, and that these two options were slightly better than a hard mattress for back symptoms (p=0.001), function (p=0.003) and sleep (p<0.001). Atherton[5] found better results for patients under 40 years of age sleeping on an isometric mattress when compared to a soft innerspring mattress for sleep, stiffness on rising, and pain (p-values were not reported for this study).

Quality

The five included studies had varying quality ratings (see Table 4). Only one study (Kovacs) [4] was found to have a low risk of bias. Bergholdt's study[7] was also well conducted, but had a low to moderate risk of bias due to a high drop-out rate, meaning that the small differences found in the study should be interpreted with caution. Atherton's study[5] had a moderate risk of bias due to selective outcome reporting, In addition to this, limited information about methods or similarity of groups at baseline mean these results should not be generalised. The remaining two studies[6, 8] did not provide sufficient information to adequately assess their quality. For more detailed quality assessment results, see the Technical Report (Tables A5.1–5.5)

Table 3. Description of Studies

Study	*Patient*	*Intervention/Comparator*	*Outcomes*	*Results*
Bergholdt (2008) Design: RCT Size: n=160 Country: Denmark Setting: patient's home	Adults (<60 years) with daily LBP for >6 months	- Water Bed - Foam mattress - Hard mattress	ROM Pain on movement COBRA LBP levels Daily function assessment Hours slept per night (Measured at baseline and one month)	Waterbed and foam mattress slightly better than hard mattress No difference between waterbed and foam mattress
Kovacs (2003) Design: RCT Size: n=313 Country: Spain Setting: patient's home	Adults with chronic non-specific LBP	- Firm mattress - Medium-firm mattress	General pain (in bed or on rising) Degree of disability LBP (in bed or on rising) Side effects (complaints of pain in bed from participants' partners) (Measured at baseline and 90 days)	Medium firm mattress better than firm mattress for: - LBP on rising (63.3% vs. 77.2%, p=0.008) - improvement in disability (RMQ) [median (range)]: 4.0 (-14 to 19) vs. 3.0 (-10 to 19), p=0.008
Dubb (1993) Design: crossover CCT Size: n=9 Country: South Africa Setting: sleep lab	Healthy volunteers, 18-30 years with LBP	- Hard mattress - Medium mattress - Soft mattress	Evening agitation, evening discomfort, sleep quality, morning vigilance Backache, discomfort, mood Strength of mind (decisiveness) Vitality, irritability, concentration, need for sleep (Measured each evening before bed and in the morning for 2 nights on each mattress)	Firmer mattress resulted in improvement in perceived sleep quality and well-being; LBP was reduced for the hard mattress compared to the soft mattress
Atherton (1983) Design: crossover RCT Size: n=30 Country: UK Setting: patient's home	Patients with LBP for at least the previous six months	- Isometric mattress - Soft interior sprung mattress	ROM lumbar spine Pain-free range of passive SLR Pain Comfort of mattress Average time taken to get to sleep (Measured at baseline and after 2 weeks on each mattress)	56% of patients (who were generally under-40 years old) found better sleep, less stiffness on rising, and decreased pain after sleeping on the isometric mattress
Garfin (1981) Design: crossover RCT Size: n=15 Country: USA Setting: back clinic	Patients with chronic LBP (at least 3 months) attending a back clinic	- Hard bed - Soft bed - Waterbed - Hybrid bed	Sleep Pain SLR MMPI (Measured at baseline and at various times during the 2 weeks on each bed)	Hard bed and waterbed better than soft bed and hybrid bed

COBRA = a Danish questionnaire related to pain and function; ROM = range of motion; LBP = low back pain; SLR = straight leg raise; MMPI = Minnesota Multiphasic Personality Inventories; RMQ = Roland Morris Questionnaire

Table 4. Quality appraisal results summary

Study	*Quality appraisal results*
Bergholdt 2008	This was a well-conducted study with a low to moderate risk of bias. However, the high drop-out rate means that the small differences found between groups should be interpreted with caution.
Kovacs 2003	This was a well conducted study with a low risk of bias. However, even though this is a high quality study with an adequate sample size, it is not sufficient on its own to draw firm conclusions; further high quality studies with similar findings are needed before these results can be generalised.
Dubb 1993	Insufficient information was provided on methodological quality to be able to determine risk of bias. In addition to this, the small sample size (n=9), and potential conflict of interest (funding was from a bedding company and the trial was run in a sleep lab with the same name as the bedding company) means that the results of this study should not be generalised.
Atherton 1983	This is a small study with a moderate risk of bias, some of the limitations included: - No details about randomisation method; - No information regarding whether groups were similar at baseline; - Selective outcome reporting.
Garfin 1981	This paper provided insufficient information to assess methodological quality. However, due to the small sample size and selective outcome reporting, the results of this study should not be generalised.

Table 5. Key information from narrative synthesis of included primary studies

Citation	
In what spinal pain conditions are beds and/or mattresses an effective treatment?	Not reported
What is the effectiveness of beds and/or mattresses on spinal pain in these conditions?	The evidence to answer this question is inconclusive
What is the effect of beds and/or mattresses on function, quality of life, return to work, medication use and healthcare utilisation in people suffering from persistent spinal pain?	The evidence to answer this question is inconclusive
Cost-effectiveness of beds and/or mattresses for back pain	Not reported
Are there any potential risks or harms from the use of particular beds and/or mattresses?	Not reported
Are there any spinal pain conditions which can be made worse by the use of particular beds and/or mattresses?	Not reported
Conclusion/Recommendation	The evidence of effectiveness of beds and mattresses for back pain is inconclusive, therefore results of the included studies should not be generalized.

Findings

The evidence to determine the effectiveness of beds and mattresses for back pain is inconclusive.

DISCUSSION & CONCLUSION

Overall, the evidence to determine the effectiveness of beds and mattresses for back pain is inconclusive. It was difficult to make any consistent conclusions regarding which type of mattress was most effective for back pain as there was wide variation regarding the interventions that were investigated (see Table 3).

Between studies there was no clarity with regards to how mattress standards (e.g. hard, medium-firm, firm) was defined, with the exception of Garfin 1981, and it is unclear whether this would be consistent among different mattress manufacturers or across the different countries in which the studies were conducted. Furthermore, it is unclear whether the mattresses used in the earlier studies e.g. Garfin 1981, Atherton, 1983 and Dubb 1993, could be generalised to those manufactured today.

The settings where these studies took place were also varied and included relatively controlled environments such as sleep labs and back clinics to uncontrolled environments such as the patients' homes, where other environmental factors may affect the results.

The quality of the studies was unclear as three of the five studies did not provide sufficient information to make an assessment. Two of the studies (Kovacs[4] and Bergholdt[7]) had low to moderate risks of bias, however the results of these studies could not be compared or pooled as they investigated different interventions. Overall further high quality studies comparing similar mattress types are needed to determine whether firmness or mattress type is effective in the treatment of chronic back pain.

DISCLAIMER

CONFLICT OF INTEREST

The TAC/WSV Evidence Service is provided by the National Trauma Research Institute. The NTRI does not accept funding from pharmaceutical or biotechnology companies or other commercial entities with potential vested interest in the outcomes of systematic reviews.

The TAC/WSV Health Services Group has engaged the NTRI for their objectivity and independence and recognise that any materials developed must be free of influence from parties with vested interests. The Evidence Service has full editorial control.

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