

WHAM Evidence summary: Pressure injuries: Active support surfaces for preventing and treating pressure injuries

Emily Haesler, PhD, P Grad Dip Adv Nurs (Gerontics), BN, Fellow Wounds Australia^{1,2,3}



1. Adjunct Professor, Curtin Health Innovation Research Institute, Wound Healing and Management (WHAM) Collaborative, Curtin University, Perth, Australia
2. Adjunct Associate Professor, Australian Centre for Evidence Based Aged Care, La Trobe University, Melbourne, Australia
3. Honorary Senior Lecturer, Australian National University Medical School, Australian National University, Canberra, Australia

Consider using an alternating pressure support surface for individuals at high risk of developing a PI, particularly when regular repositioning is not possible. (Grade B)

Consider using an active support surface for individuals with a full thickness PI, particularly when regular repositioning is not possible. (Grade B)

CLINICAL QUESTIONS

What is the best available evidence on active support surfaces to reduce the risk of pressure injuries (PIs)?

What is the best available evidence on active support surfaces to promote healing for existing PIs?

SUMMARY

Active support surfaces are technologically advanced mattress or bed systems designed to promote pressure redistribution and microclimate control, thereby reducing the risk of PIs, or promoting healing in existing PIs. There is good evidence that an alternating pressure mattress is superior to a standard hospital mattress¹ (*Level 1*). There is also evidence that alternating pressure mattresses and other types of active support surfaces are not inferior to high specification foam mattresses and other reactive support surfaces for preventing PIs¹ (*Level 1*). Some evidence suggests existing PIs may have faster healing rates on an active support surface²⁻⁵ (*Level 1*).

CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context:

SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute.¹²⁻¹⁴ This evidence summary is based on a structured database search combining search terms that describe pressure injuries with search terms related to support surfaces. Searches were conducted in EMBASE, PubMed, Medline, Scopus and the Cochrane Library. Evidence published up to June 2017 in English was considered for inclusion.

BACKGROUND

Active support surfaces are support surfaces that provide a high technology option for mattress and bed system design.^{1,6} An active support surface is a powered surface that alternates the anatomical area sustaining the highest applied pressure loads.⁶ This category of support surfaces includes alternating pressure mattresses, low air loss beds and air-fluidised beds. In contrast, a reactive support surface only changes the pressure distribution in reaction to the applied load.⁶

Table 1: Sources of evidence and the level

Level 1 Evidence	Level 2 Evidence	Level 3 Evidence	Level 4 Evidence	Level 5 Evidence
Experimental Designs	Quasi-experimental Designs	Observational – Analytic Designs	Observational –Descriptive Studies	Expert Opinion/ Bench Research
1.a systematic review ^{1,6} 1.c RCTs ^{2, 3, 4, 5, 8, 11}	None	3.e observational study without control group ⁹	4.b Cross sectional study with case studies ¹⁰	5.b Expert consensus ^{6, 7}

Alternating air pressure mattresses are designed with air cells of various number and size that inflate and deflate on programmed cycles, alternating the anatomical region subjected to the highest interface pressures. While evidence in the past suggested that air mattresses with smaller cells were insufficient in achieving adequate reduction in interface pressure,⁶ this guidance is not relevant to modern alternating pressure mattresses that are more advanced than early models.⁷ An air-fluidised support surface is a fluid-like surface achieved by forcing air into beads and a low air loss surface has a continuous flow of air. These surfaces are designed to increase immersion and envelopment,⁷ and many also have features that control microclimate.⁶

CLINICAL EVIDENCE

Alternating pressure mattresses compared with standard foam mattresses

A Cochrane review¹ reported a meta-analysis of two small randomised controlled trials (RCTs) comparing alternating pressure air mattress and standard hospital mattresses in individuals with high PI. Pooled findings indicated that alternating pressure mattresses were associated with a lower risk of developing any PI (relative risk [RR] 0.31, 95% confidence interval [CI] 0.17 to 0.58, $p < 0.0001$)¹ (Level 1).

Alternating pressure mattresses compared with other reactive support surfaces

The Cochrane review¹ reported nine RCTs that compared an alternating pressure mattress to a reactive support surface, including water mattresses, static air mattresses and high specification viscoelastic foam mattresses. None of these individual studies identified differences in PI rates¹ (Level 1).

The review presented a meta-analysis of four RCTs comparing alternating pressure mattresses to high specification foam mattress overlays, which showed no significant difference in PI risk (relative risk [RR] 0.91 95%, CI 0.72 to 1.16)¹ (Level 1).

However, one recent RCT⁸ ($n = 76$) comparing an alternating pressure air mattress with a high specification viscoelastic foam mattress found an effect for the alternating pressure mattress. Rate of PIs was higher using the high specification foam mattress (35.1% versus 5.1%), translating to a 7 to 8 times lower risk of experiencing a PI if an alternating pressure mattress was used (hazard ratio 7.57, 95% CI 1.67 to 34.38, $p = 0.009$).

The participants were older adults in long term aged care and had been assessed as being at high risk of a PI (Braden scale score ≤ 14), but without an existing PI. In this trial, concurrent preventive strategies including regular repositioning were performed infrequently,⁸ which may have contributed to the findings (Level 1).

Lower level evidence reporting outcomes for older adults at high risk of PI reported effectiveness of alternating pressure mattresses in preventing new PI development or preventing worsening of skin condition. These studies were conducted over up to three months and had no comparator groups^{9, 10} (Level 3 and 4).

Low air loss beds and air fluidised beds

The evidence on low air loss beds and air fluidised beds reports effectiveness of these products in promoting superior outcomes for individuals with existing Category 2 or greater PIs compared with other active support surfaces and standard hospital mattresses²⁻⁵ (Level 1). Improved likelihood of reaching full healing⁵ and faster PI healing rates²⁻⁴ have been reported (Level 1). Reduced rate of PI-related hospital admissions¹¹ and healthcare resources^{4, 11} have also been reported when air fluidised beds were used to manage individuals with existing PIs (Level 1).

Most of the available evidence on these types of support surfaces was published over 20 years ago and report dated technologies and comparator support surfaces. There is no recent evidence comparing low air loss beds and air fluidised beds with contemporary high specification foam mattresses.

CONSIDERATIONS FOR USE

The following recommended practices should be considered when using active support surfaces⁶ (Level 5):

- Regularly evaluate PI risk and skin condition and re-evaluate the support surface if pressure redistribution is inadequate for the individual's needs.
- Regularly reposition individuals where possible, avoiding positioning on an existing PI.
- Check that the support surface does not bottom out in any bed configuration (i.e. inclined or flat).
- Ensure that active support surfaces are maintained according to manufacturer's instructions.

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

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ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in

Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, *Worldviews Evid Based Nurs*. 2015;12(3):131-8.

Methods are provided in detail in resources published by the Joanna Briggs Institute as cited in this evidence summary. WHAM evidence summaries undergo peer-review by an international review panel. More information is available on the WHAM website: <https://www.whamwounds.com/>.

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

PUBLICATION

This evidence summary has been published in *Wound Practice and Research*:

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