Pressure ulcer treatment strategies: a systematic comparative effectiveness review
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CRD summary
The authors concluded that moderate-strength evidence showed that healing of pressure ulcers in adults was improved with use of air-fluidised beds, protein supplementation, radiant heat dressings and electrical stimulation. There was insufficient or no evidence of a favourable effect for any of the interventions on complete wound healing. The authors’ conclusion is likely to be reliable.

Authors’ objectives
To compare the effectiveness and safety of treatment strategies for adults with pressure ulcers.

Searching
MEDLINE, EMBASE, CINAHL, EBM Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews, DARE and HTA Database were searched without language restrictions. The authors referred to an available search strategy in the full report. Grey literature, scientific information packets and reference lists were scanned. Search dates ranged from 1985 to October 2012.

Study selection
Eligible studies were randomised controlled trials and comparative observational studies of treatments for adults with pressure ulcers in any care setting. Non-comparative intervention series (with more than 50 participants) of surgical interventions were also eligible. Systematic reviews were eligible as background information. Studies in hospice care settings were included if complete wound healing was a measured outcome. Outcomes of interest included complete wound healing (primary outcome), healing time, reduced wound size, pain, prevention of serious infection-related complications and treatment harms.

The included studies were highly variable. Interventions included support surfaces, nutritional supplements, local wound applications (dressings, topical therapies and biological agents), surgery and adjunctive therapies. Comparators included standard wound care, placebo, sham therapy and alternative treatment options. Most studies included older hospitalised patients and long-term care residents with stage II to IV pressure ulcers.

At least two reviewers independently selected studies for inclusion. Disagreements were resolved by consensus or with the involvement of a third reviewer.

Assessment of study quality
Strength of evidence was assessed using an adapted version of criteria from the Agency for Healthcare Research and Quality and rated as high, moderate, low or insufficient.

At least one reviewer carried out the quality assessment and this was checked by at least one other reviewer. Disagreements were resolved by consensus.

Data extraction
Data were extracted on the direction of effect for the various outcomes of interest. Ulcer stage or grade was standardised across the included studies using definitions from the National Pressure Ulcer Advisory Panel. Data for complete wound healing were extracted to enable calculation of relative risk (RR).

Data extraction was carried out by one reviewer and checked by a second reviewer.

Methods of synthesis
Meta-analysis (using random-effects and fixed-effect models) was carried out for the primary outcome (complete wound healing). A narrative synthesis was presented for other outcomes. Statistical heterogeneity was assessed using the I² statistic and X² test.
Sensitivity analysis was carried out to explore the impact of study quality. Meta-regression was used to demonstrate the association of study duration with effect estimates.

**Results of the review**
The review included 174 studies. The quality of trials and observational studies was generally fair or poor with small sample sizes and follow-up that was largely insufficient to assess complete wound healing (measured in 92 studies).

There was insufficient or no evidence of a favourable effect for any of the interventions on complete wound healing.

Moderate-quality evidence was found for wound improvements with air-fluidised beds (five studies; 908 participants; low heterogeneity), reductions in wound size following protein-containing nutritional supplements (12 studies; 562 participants; low heterogeneity), rapid reduction in ulcer size following radiant heat dressings (four studies; 160 participants; moderate heterogeneity) and improved healing rate after electrical stimulation (nine studies; 397 participants; moderate heterogeneity).

Limited low-strength evidence was found for healing improvements following alternating pressure surfaces, platelet-derived growth factor, hydrocolloid dressings and light therapy. No studies measured pain or prevention of serious complications. Evidence about treatment harms was limited (reported in the review).

Exploration of heterogeneity was considered by the authors to be limited by the small number of studies in each intervention category. Further results were reported in the paper and the associated report.

**Authors' conclusions**
Moderate-strength evidence showed that healing of pressure ulcers in adults was improved with use of air-fluidised beds, protein supplementation, radiant heat dressings and electrical stimulation.

**CRD commentary**
The review question and inclusion criteria were clear and potentially reproducible. Several relevant data sources were searched. Attempts were made to minimise language and publication biases. The review process was conducted with sufficient effort to reduce error and bias. Suitable quality assessment criteria were applied to the included studies and the results of this were fully reported and considered in the findings. The chosen method of synthesis was appropriate given the variable study characteristics.

The authors' conclusion reflects the evidence presented and is likely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that further research should comprise larger methodologically rigorous studies with information about cointerventions, standardised comparators and longer follow-up of clinically meaningful outcome measures including complete wound healing. Studies should attempt to determine the applicability of different interventions to specific patients and contexts and report findings according to ulcer stage.

**Funding**
Agency for Healthcare Research and Quality, USA; United States Department of Veterans Affairs.

**Bibliographic details**

**PubMedID**
23817703

**DOI**
10.7326/0003-4819-159-1-201307020-00007
Original Paper URL
http://annals.org/article.aspx?articleid=1700644

Additional Data URL
http://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&
amp;productid=1492

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Bandages; Beds; Comparative Effectiveness Research; Dermatologic Agents /therapeutic use; Dietary Supplements; Electric Stimulation Therapy; Humans; Pressure Ulcer /therapy; Surgical Flaps; Wound Healing

AccessionNumber
12013036175

Date bibliographic record published
02/07/2013

Date abstract record published
11/07/2013

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.