CRD summary
This review assessed the effectiveness of interventions to prevent pressure ulcers. The authors concluded that using support surfaces, repositioning patients, optimising nutritional status and moisturising sacral skin are appropriate strategies, but that well-designed trials are needed. The lack of methodological details and the low quality of the included trials mean that the authors' conclusions may not be reliable.

Authors' objectives
To assess the effectiveness of interventions to prevent pressure ulcers.

Searching
The authors searched MEDLINE, EMBASE and CINAHL (all from inception to June 2006), the Cochrane CENTRAL Register (Issue 1, 2006), UMI ProQuest Digital Dissertations, ISI Web of Science and Cambridge Scientific Abstracts; the search terms were reported. The reference lists of identified articles were also checked. No language restrictions were applied.

Study selection

Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Whilst explicit inclusion criteria were not described, it was clear that interventions to prevent pressure ulcers were eligible for inclusion. There was no restriction on setting. The interventions that addressed impairments in mobility were support surfaces, repositioning, and exercise and treatment of incontinence. The interventions that addressed impairments in nutrition were mixed nutritional supplements. The interventions that addressed impairments in skin health were specific topical agents.

Participants included in the review
Whilst explicit inclusion criteria were not stated, it was clear that patients at risk of pressure ulcers were eligible for inclusion. The majority of the patients were in an acute care setting; no other patient characteristics were described.

Outcomes assessed in the review
Studies that reported objective, clinically relevant outcomes (such as the incidence of pressure ulcers) were eligible for inclusion. The included studies reported the incidence of pressure ulcers. Where given, the review also reported risk factors for the development of pressure ulcers.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection. [A: One reviewer performed the study assessments.]

Assessment of study quality
The authors assessed the quality of the included trials using the following six elements of the CLEAR NPT checklist for evaluating non-pharmacological trials (reference given): adequate generation of allocation sequence, concealed treatment allocation, adequate participant blinding (where feasible), adequate outcome assessor blinding, consistent follow-up schedule and intention-to-treat analysis.

The authors did not state how many reviewers performed the quality assessment. [A: One reviewer performed the study assessment.]
assessments.]

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. [A: One reviewer performed the study assessments.]

The authors extracted the length of follow-up, data on whether the incidence of pressure ulcers was reduced, and whether statistical significance was reported in the included studies.

Methods of synthesis
How were the studies combined?
A narrative synthesis was presented.

How were differences between studies investigated?
The studies were grouped by type of intervention. The interventions were categorised according to whether they addressed impairments in mobility, nutrition or skin health. Impairment in mobility studies were further ordered according to the type of intervention and comparator.

Results of the review
Fifty-nine RCTs (n=13,845) were included in the review.

Interventions targeting impaired mobility (51 RCTs, n=11,551).

The quality of the RCTs was generally poor: 25 adequately described randomisation procedures, while only 14 gave information that indicated that patients were randomly allocated with concealed allocation; only 10 RCTs described having a blinded outcome assessment.

Support surfaces.

Forty-eight RCTs assessed the role of support surfaces in preventing pressure ulcers. Out of 16 studies investigating a static support surface, eight showed a reduction in pressure ulcer incidence compared with a standard support surface.

Fourteen RCTs compared dynamic and static support surfaces. Only three found that dynamic support surfaces were better than static support surfaces (one of which did not report the statistical significance).

Three RCTs compared beds that turn and rotate the patient with standard hospital beds or standard intensive care unit beds. Rotating beds offered no advantage in reducing pressure ulcer incidences.

Repositioning.

Two RCTs assessed the role of repositioning in preventing pressure ulcers. One poor-quality RCT found that turning patients every 4 hours combined with the use of specialised foam mattresses reduced the incidence of pressure ulcers compared with turning every 2 hours on standard hospital mattresses. The other RCT compared patients lying at a 30 degree tilt position with standard patient positioning (90 degree side lying), but found no significant difference between the two groups.

Incontinence exercises and treatment.

One RCT assessed the role of exercise and treatment of incontinence on preventing pressure ulcers. No difference was found between the exercise and incontinence care group and the usual care group.

Interventions targeting impaired nutrition (5 RCTs, n=1,475).
The quality of the RCTs was poor: none gave information that indicated that patients were randomly allocated with concealed allocation; only one described blinding of the patients and outcome assessors.

The largest trial found that nutritional supplementation was beneficial for the prevention of pressure ulcers. Four smaller, poorer quality trials found no benefit.

Interventions targeting impaired skin health (3 RCTs, n=819).

The quality of the RCTs was poor: none indicated that patients were randomly allocated with concealed allocation. However, all three described blinding of the patients and outcome assessors.

Hyperoxygenated fatty acid compound (1 RCT) and hexachlorophene, squalene and allantoin-containing lotion (1 RCT) were both found to be superior to placebo for reducing the incidence of pressure ulcers. Topical nicotinate-containing lotion was not found to reduce the incidence of pressure ulcers compared with hexachlorophene, squalene and allantoin-containing lotion (1 RCT).

Cost information
The authors reported that an economic evaluation conducted alongside one of the included RCTs suggested that dynamic support surface mattresses may be more cost-effective than dynamic support surface mattress overlays.

Authors' conclusions
Support surfaces, repositioning patients, optimising nutritional status and moisturising sacral skin are appropriate strategies for the prevention of pressure ulcers. Many RCTs evaluating preventive strategies for pressure ulcers have important methodological limitations; well designed and reported RCTs that provide cost-effectiveness data are needed.

CRD commentary
The review question was clear, although inclusion criteria were not explicitly stated in relation to the participants and interventions. Several relevant electronic databases were searched and the subject headings used in the search strategy were reported. No language restrictions were applied, thereby reducing the potential for language bias. The authors made limited attempts to identify unpublished data, thus increasing the potential for publication bias, which was not assessed. The review procedures for the study selection, data extraction and quality assessment were not described, therefore the potential for reviewer bias and error cannot be assessed. The studies were assessed for quality using appropriate criteria. The included studies were generally of poor quality, and some had small sample sizes; this reduces the validity of the review findings.

Very few details of the included studies were presented. The authors only reported whether the incidence of pressure ulcers was reduced, no actual outcome data (such as effect sizes or confidence intervals) were reported. A narrative synthesis was presented. For most interventions, conflicting evidence was found but not further discussed.

Owing to the lack of methodological details reported and the low quality of the included trials, the authors' conclusions about appropriate strategies for the prevention of pressure ulcers may not be reliable. However, their conclusions that many of the RCTs had important methodological limitations and that well designed and reported RCTs are needed seem appropriate.

Implications of the review for practice and research
Practice: The authors stated that mattress overlays on operating tables may decrease the incidence of post-operative pressure ulcers. In addition, the choice may be different for hospital in-patients and costs may be an important factor to consider when choosing between different support surface strategies. The authors also stated that it seems reasonable to recommend consultation with a dietician for patients at risk of developing pressure ulcers to ensure adequate general nutrition, and that moisturising skin would be a reasonable strategy to implement to prevent pressure ulcers.

Research: The authors stated that well-designed RCTs that follow standard criteria for reporting non-pharmacological
interventions and provide data on cost-effectiveness are needed. Future studies should also attempt to define the interventions required to prevent pressure ulcers specifically among high-risk populations.

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