Risk assessment scales for pressure ulcer prevention: a systematic review

CRD summary
This review evaluated effectiveness of risk assessment scales (RAS) for pressure ulcer (PU) prevention. There was not enough evidence to claim using RAS in clinical practice decreased PU incidence. Use of the Norton Scale as a criterion for prevention intervention increased risk assessment effectiveness and application of early prevention interventions. However, these conclusions may not be reliable due to methodological limitations.

Authors' objectives
To evaluate the effectiveness of the use of risk assessment scales (RAS) for pressure ulcer (PU) prevention in clinical practice, degree of validation of RAS, and effectiveness of risk assessment scales as indicators of risk of developing a pressure ulcer.

Searching
Fourteen electronic databases including MEDLINE, CINAHL and the Database of Abstracts of Reviews of Effectiveness (DARE) were searched for studies in Spanish, English, French and Portuguese (1966 to 2003). Search terms were reported. The reference lists of the selected studies were also searched. In order to identify unpublished studies, research reports and conference proceedings were searched and experts were contacted.

Study selection
Controlled clinical trials and prospective cohort studies of the use of RAS for PU prevention, that gave results on PU incidence, were eligible for inclusion. In prospective cohort studies, patients were required not to have developed PU at the beginning of the study to be eligible for inclusion. The included studies were conducted in hospitals and palliative care centres. Patient follow-up had to be conducted in a systematic way, with the drop-out rate not exceeding 25%, over the specified period. Follow-up ranged from 5 days to 12 weeks. Most of the studies were evaluated using the validated Braden Scale. The Norton Scale (and modified versions) and the effect of the scale on care plans was used in the studies of clinical effectiveness. For inclusion, studies were required to offer data on the predictive values of the scales (sensitivity and specificity) or raw data for calculation of these. Different studies gave different cut-off scores for risk of developing a PU, though the scales and healthcare contexts were the same. Retrospective studies and studies that used the same data to generate the scale and establish its validity were excluded.

The authors did not state how the papers were selected for the review or how many reviewers performed the selection.

Assessment of study quality
Methodological quality of clinical trials was assessed using the CASP (Critical Appraisal Skills Programme) Guide which included evaluation of sample size, loss to follow-up and blinding. Prospective cohort studies were assessed using the critical assessment guide developed for the clinical practice guide for PU assessment and prevention.

Validity was assessed independently by two reviewers and disagreements resolved by a third reviewer.

Data extraction
Validity indicator scores (sensitivity, specificity, positive prediction value, negative prediction value, effectiveness and area under ROC curve) were recalculate where possible. If one of these indicators or the effectiveness indicator were missing in the original study, the recalculated score was used. Odds ratios (ORs) were calculated for the magnitude of effect.

Data was extracted independently by two reviewers into a data extraction sheet.

Methods of synthesis
For RASs with two or more original studies, the weighted average of validity indicators was calculated, using the inverse of variance as the method for weighting. ORs were combined in meta-analysis using a random-effects DerSimonian and Laird model. The studies were also combined in a narrative synthesis, with the studies of clinical effectiveness were shown in tables, allowing comparison between studies, and the studies of PU scale validation synthesised by type of scale used.

**Results of the review**
The number of included studies was unclear. It appeared that three studies evaluated clinical effectiveness (n=528); one controlled clinical trial (n=124); two before and after studies (n=404). Approximately 30 studies were RAS validation studies (n=15,525).

One study found a significant increase in pressure reducing mattress provision (p<0.00001) and significant decrease in PU incidence (p<0.0001) in the RAS group compared to control. Another study found significantly higher number of preventions and more precocious interventions in the RAS group compared to control. One study found no difference in PU prevalence between the RAS group and control.

The Braden Scale was a significant predictor of PU risk (16 studies, n=5847) OR 4.08 (95% CI: 2.56, 6.48), as was the Norton scale (five studies, n=2008) OR 2.16 (95% CI: 1.03, 4.54) and Waterlow scale (five studies, n=2215) OR 2.05 (95% CI: 1.11, 3.76). Clinical judgement (three studies, n=302) was not a significant predictor of PU.

The Braden Scale achieved the best validity indicator scores (20 studies), while the Norton Scale (five studies) and the Waterlow Scale (six studies) were comparable to nurses' clinical judgement (three studies). The Waterlow Scale had high sensitivity (82.5%) but low specificity (27.4%).

**Authors' conclusions**
There is not presently enough evidence to claim that use of a RAS in clinical practice decreases PU incidence. The use of the Norton Scale, as a criterion for prevention intervention, increases risk assessment effectiveness and the application of other early prevention interventions. The Braden and Norton Scales are better risk prediction tools than nurses' clinical judgement.

**CRD commentary**
The review question was well defined and the inclusion criteria were clear with regard to study design, participants, intervention and outcomes. A number of databases were searched and the authors’ sought unpublished studies. Language restrictions on the searches mean that it is possible that relevant studies could have been missed. Validity assessment and data extraction were performed by two independent reviewers. However, study selection was not described, so it is not known whether similar steps were taken to reduce the risk of bias and errors. The studies of clinical effectiveness were synthesised narratively, which was appropriate as they were poor quality primary studies, but meta-analysis of the pressure ulcer risk indicators may not have been appropriate as the studies appeared to be heterogeneous. The study details were also unclear. The authors’ conclusions may therefore not be reliable.

**Implications of the review for practice and research**
Practice: The authors stated that the Braden Scale offers the best balance between sensitivity and specificity and highest prediction capacity.

Research: The authors did not state any implications for research.

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