Outcomes of 4 methods of debridement using a decision analysis methodology
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Four methods of debridement were considered for the management of pressure ulcers. These were autolysis (autolytic debridement), wet-to-dry saline dressings (mechanical debridement), collagenase and fibrinolysin (both enzymatic debridement tools).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised elderly women with a full-thickness pressure ulcer. The pressure ulcer was characterised by mild odour, minimal draining, no undermining, and intact periulcer skin.

Setting
The setting was long-term care. The economic study was carried in the USA.

Dates to which data relate
The dates during which the effectiveness evidence and resource use data were collected were not reported. The price year was 1995.

Source of effectiveness data
The effectiveness evidence was derived from a review of published studies and from the opinions of experts.

Modelling
A decision analytic model was used to estimate the costs and clinical outcomes of the various debridement strategies for a hypothetical patient. The model made the assumption that the patient was a woman aged 78 years, who was resident in a long-term care facility for a 28-day treatment period. Four identical decision trees were constructed for each debridement technique, based on input parameters derived from the literature and experts' assumptions.

Outcomes assessed in the review
The outcomes assessed in the review were used as input parameters in the model. These were the infection rates, the probability of death, and the probability of switch from one debridement strategy to another.
Study designs and other criteria for inclusion in the review
Not reported.

Sources searched to identify primary studies
MEDLINE was searched from 1985 to 1995 using a combination of the following keywords: "pressure ulcer", "decubitus", "economics" and "outcome".

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
More than 100 articles were used to support the development of the clinical assumptions.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The best effectiveness estimates for each input parameter were selected using a panel of clinical experts, given the wide range of values obtained from the literature.

Methods used to derive estimates of effectiveness
The estimates of effectiveness were derived using a multidisciplinary panel of 9 independent clinical experts. This panel consisted of 5 nurses, 2 physicians, 1 pharmacist, and 1 physical therapist, who were all specialists in geriatric care and familiar with the four debridement methods used in the model. A survey questionnaire with more than 200 questions about the care of the hypothetical patient in the decision model was given to each panellist. Following their response, each panellist was given the opportunity to review the average responses of other panellists. In addition, they were allowed to confirm or change their probability estimates. Finally, the median values in the questionnaire were used as probabilities in the decision model.

Estimates of effectiveness and key assumptions
The probability of a 2-week clean wound bed was 0.70 with collagenase, 0.58 with fibrinolysin, 0.50 with autolysis, 0.30 with wet-to-dry dressings, and 0.90 after surgery.

The probability of a 4-week clean wound bed was 0.90 with collagenase, 0.85 with fibrinolysin, 0.75 with autolysis, and 0.75 with wet-to-dry dressings.

The probability of infection was 0.05 with collagenase, 0.05 with fibrinolysin, 0.20 with autolysis, and 0.15 with wet-to-dry dressings.

The probability of switch was 0.70 with collagenase, 0.58 with fibrinolysin, 0.50 with autolysis, and 0.30 with wet-to-
Pain was also assessed, but was not used in the model. The probability of pain was 8.9% with autolysis, 12.2% with collagenase, 24.5% with fibrinolysin, 67.8% with wet-to-dry dressings and 75.6% after surgical debridement.

**Measure of benefits used in the economic analysis**
The benefit measure used in the economic analysis was the probability of obtaining a clean wound bed for each 28-day treatment of the hypothetical patient. This was calculated as the final outcome of the decision tree.

**Direct costs**
Discounting was irrelevant given that the costs were incurred over a 28-day treatment period. The quantities and costs were not reported separately. The resource/cost boundary adopted in the analysis was that of the payer (Medicare). The direct costs included the costs of:

- the drugs;
- the dressing and irrigation supply;
- physician visits;
- ancillary services, such as outpatient laboratory tests and other diagnosis procedures;
- hospitalisation, in terms of the number of inpatient days, professional consultations, diagnostic tests, and drug therapy; and
- surgical debridement.

The costs were estimated using the average wholesale prices, and the third-party prevailing reimbursement rate in Rhode Island. The total costs of each treatment were calculated using the decision tree. The dates during which resource use data were collected were not reported. The price year was 1995.

**Statistical analysis of costs**
No statistical analysis of costs in terms of difference was reported. However, the costs were treated stochastically to give the expected costs, which the authors referred to as “probability weighted”.

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were carried out to investigate the uncertainty of some parameters in the model. All inputs were varied by plus or minus 5%. The type of analysis used, in terms of the extent of covariance of the estimates, was not specified.

**Estimated benefits used in the economic analysis**
The probability of a clean wound bed was 0.887 for collagenase, 0.641 for autolysis, 0.376 for wet-to-dry dressings, and 0.449 for fibrinolysin.
Cost results
The total (probability-weighted) cost per patient for 28 days was $610.96 for collagenase, $920.73 for autolysis, $986.38 for fibrinolysin, and $1,008.72 for the wet-to-dry treatment.

Synthesis of costs and benefits
The costs and benefits of each treatment were combined by performing a cost-effectiveness analysis. The collagenase-based treatment was dominant over the other alternatives; in other words, it was more effective and less costly. The sensitivity analyses indicated that the model results were robust, even after variation of plus or minus 10% in the model parameters.

Authors' conclusions
The authors concluded that collagenase represented the most cost-effective treatment for the management of pressure ulcer in elderly long-term-care residents. Not only were the costs lower and the effectiveness higher when compared with other strategies, but the probability of pain was also "relatively low".

CRD COMMENTARY - Selection of comparators
The technologies selected were recommended by official guidelines and were widely used in clinical practice. However, the authors did not justify the exclusion of other debridement strategies, which were identified but not included in the comparison.

Validity of estimate of measure of effectiveness
The effectiveness measure was mainly derived from experts’ assumptions, following a review of the literature. However, both of these steps entailed problems. Firstly, there was insufficient detail on the review process, and there was no information about the characteristics of the primary studies. Secondly, as the authors acknowledged, there were concerns relating to the modified Delphi approach used to derive experts' opinions; in particular, the high variability in the data, the presence of non-random data, the small number of experts, and the fact that the probability data were not normally distributed.

Validity of estimate of measure of benefit
The benefit measure was derived from the probabilities in the model. It would have been interesting to have constructed a measure eliciting patient’s preferences, given that the interventions were likely to affect the patient’s health states in terms of pain, functional status, and other consequences requiring a trade-off in terms of value.

Validity of estimate of costs
All categories of costs relative to the perspective adopted were included in the analysis. However, although some sensitivity analyses were carried out, the cost estimates were fairly specific to the Medicare reimbursement system. There was a lack of data on the resources used, thus preventing the results from being generalised to other settings. In addition, statistical analyses were not carried out on the quantities.

Other issues
The authors did not make appropriate comparisons of their findings with those from other studies. The issue of generalisability was partially addressed by performing sensitivity analyses on the model parameters, but the method used was not elucidated.

Implications of the study
The collagenase-based debridement strategy realised substantial cost-savings and should be implemented in clinical
practice. The authors recommended that further research should be undertaken, based on prospective cost-effectiveness analyses and quality-of-life study designs.

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