Modelling the cost implications of using carboxymethylcellulose dressing compared with gauze in the management of surgical wounds healing by secondary intention in the US and UK

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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
Two strategies for the treatment of surgical wounds by secondary intention were examined. These were traditional gauze-based dressings and carboxymethylcellulose dressings (CMCDs).

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of patients with surgical wounds.

Setting
The setting was a hospital. The economic study was carried out in the USA and UK.

Dates to which data relate
The effectiveness data were derived from studies published from 1979 to 1998. The dates to which the resource use data (that were based on expert opinion) referred were not reported. The prices used to estimate the costs referred to 2002/2003.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of completed studies and authors' opinions.

Modelling
A decision model was constructed to estimate the costs associated with the two treatment strategies in a hypothetical cohort of patients with surgical wounds over an 8-week period. The model depicted the probability of healing and not healing at two-weekly intervals. Two separate cases were considered in order to reflect the treatment of an abscess and other wound healing by secondary intention. A graphical representation of the decision tree was provided.

Outcomes assessed in the review
The outcomes estimated from the literature were the rates of healing associated with traditional gauzes and CMCDs at different intervals (2, 4 and 6 weeks).
Study designs and other criteria for inclusion in the review
A systematic review of the literature was undertaken to identify relevant primary studies. Only studies published in the English language were considered. There were no other limitations to the search. No information on the design of the primary studies included in the review was provided.

Sources searched to identify primary studies
MEDLINE, EMBASE, HealthSTAR, Current Contents, NHS EED and Cochrane databases were searched for papers on the healing of surgical wounds by secondary intention. A manual literature search was also undertaken, based on citations in the published papers.

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

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

Number of primary studies included
Eight primary studies were included in the review.

Methods of combining primary studies
The primary estimates derived from each study were pooled. Further details on the method of combination were not reported.

Investigation of differences between primary studies
Not stated.

Results of the review
The probability of healing with traditional gauzes was 0.220 at 2 weeks.

Patients unhealed at 2 weeks had a probability of 0.077 to be healed at 4 weeks.

Patients unhealed at 4 weeks had a probability of 0.403 to be healed at 6 weeks.

No data on healing rates with CMCDs were found in the literature.

Methods used to derive estimates of effectiveness
The healing rates with CMCDs were based on a conservative assumption made by the authors.

Estimates of effectiveness and key assumptions
It was assumed that the healing rates with CMCDs were the same as those with traditional gauzes. All patients were assumed to heal at 8 weeks.

Measure of benefits used in the economic analysis
No summary benefit measure was used in the economic analysis because of the equal effectiveness of the two treatments. Thus, a cost-minimisation analysis was carried out.
Direct costs
Discounting was not relevant because of the short time horizon of the study. The unit costs were reported for all categories of costs and the quantities of resources used were provided in detail. The health services included in the economic evaluation were drugs and dressings, practice or office-based nurse visits, domiciliary nurse visit, hospital outpatient visit, hospitalisation, transitional care and debridement. The cost/resource boundary adopted was that of the third-party payer (hospital and community sector) for the USA and that of the NHS for the UK. The resource use data were estimated from a panel of experts (10 in each country) who had relevant experience of treating surgical wounds. Semi-structured interviews were used to derive treatment patterns. The costs came from Medicare reimbursement rates and other sources in the public domain for the USA, and from the British National Formulary and PSSRU for the UK. The costs were expressed using 2002/2003 prices.

Statistical analysis of costs
The costs were treated deterministically in the base-case.

Indirect Costs
The indirect costs were not included because they were not relevant to the perspectives adopted.

Currency
US dollars ($) and UK pounds sterling (€).

Sensitivity analysis
Probabilistic sensitivity analyses were carried out using a Monte Carlo simulation with 1,000 iterations. The probabilities were varied randomly according to a beta distribution between the upper and lower 95% confidence limits, while resource use estimates were varied randomly according to a log normal distribution by assuming a 20% standard deviation around the mean. Further, a univariate sensitivity analysis was performed to assess the impact of individual model inputs.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
For abscesses, the expected total costs per patient after 8 weeks' treatment were:

- in the USA, $5,677.28 with CMCDs and $5,924.27 with gauzes (difference $247); and
- in the UK, 1,332.67 with CMCDs and 1,906.80 with gauzes (difference 574).

The main category of costs was transitional care in the USA and hospitalisation in the UK.

For other surgical wounds, the expected total costs per patient after 8 weeks' treatment were:

- in the USA, $13,243.30 with CMCDs and $13,750.78 with gauzes (difference $507); and
- in the UK, 4,340.10 with CMCDs and 4,921.39 with gauzes (difference 581).

The main cost driver was hospitalisation for both countries. The cost of the dressings accounted for less than 5% of the total costs in both countries.

The Monte Carlo simulation showed that the cost of using CMCDs was always lower than the cost of using gauzes in
the USA and UK, in both the treatment of abscesses and other surgical wounds by secondary intention.

The univariate sensitivity analyses showed that changes in the probability of healing had a negligible impact on the cost-differences. However, the results of the analysis were sensitive to the daily number of dressing changes, although relevant variation from base-case values was required for traditional gauzes to be cheaper (an increase of 67% in the daily number of dressing changes for the treatment of abscesses and 40% for the treatment of other surgical wounds).

**Synthesis of costs and benefits**
A synthesis of the costs and benefits was not relevant since a cost-minimisation analysis was performed.

**Authors’ conclusions**
Under the conservative assumption of equal effectiveness for carboxymethylcellulose dressings (CMCDs) and traditional gauzes, the use of CMCDs was cost-saving from the perspective of the payer in the USA and UK.

**CRD COMMENTARY - Selection of comparators**
The authors justified the choice of the comparators, with traditional gauzes representing the standard approach and CMCDs being the new treatment option. You should decide whether they are valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness data came from a systematic review of the literature. Limited information on the methods and conduct of the review was provided. For example, the search criteria were reported. However, no details of the design and study sample of the primary studies were given. Thus, it was not possible to examine the validity of the primary sources. Further, the effectiveness of CMCDs was based on the authors’ opinions and they provided no justification for their conservative assumption. Uncertainty around all clinical inputs was extensively investigated in the sensitivity analysis. However, it would appear that although the healing rates were varied in absolute terms, they were kept identical between the two strategies in all sensitivity analyses.

**Validity of estimate of measure of benefit**
No summary benefit measure was used in the analysis because a cost-minimisation analysis was conducted. Please refer to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

**Validity of estimate of costs**
The inclusion of costs was consistent with the perspective adopted in the study. Typical sources were used to estimate the unit costs, which were reported for all items, and this aids replication of the study in other settings. The assessment of resource use data was based on expert opinion and extensive information on the quantities of resources used was provided. The costs were treated deterministically in the base-case, but probabilistic distributions were assigned to all economic inputs. Further, some key estimates were varied in the univariate sensitivity analysis. This should ensure the robustness of the final cost estimates. The price year was reported, which aids reflation exercises in other time periods.

**Other issues**
The authors stated that their results were consistent with those from a recently formed Professional Select Committee on Wound Care, which suggested that despite the lack of robust research on many aspects of wound care, the use of modern wound dressings, as opposed to traditional impregnated or plain gauze dressings, in the healing of surgical wounds by secondary intention conferred significant patient benefit. The issue of the generalisability of the study results to other settings was not explicitly addressed, although extensive sensitivity analyses were carried out. Also, it is interesting to notice that although the two countries differed substantially in terms of unit costs and resource use, the final results were very similar, thus enforcing the transferability of the findings.
The authors noted that the main limitation of their analysis was the lack of published evidence on the clinical treatment of surgical wounds. Thus, assumptions were made and the results were not stratified by factors such as age, gender, or specific types of surgery. Other benefits in terms of the patient’s quality of life were not modelled, which would have further favoured the CMCD option. Finally, the authors stated that the impact of recurrent abscesses and fistulas was not considered in the model because of the negligible impact on the total costs.

Implications of the study
The study results supported the use of CMCDs for the treatment of surgical wounds and suggested that the purchase price of a wound dressing should not be used as an indication of the cost-effectiveness of a given method of surgical wound care. The authors stated that prospective trials directly comparing traditional gauzes and CMCDs should be undertaken.

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Other publications of related interest


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