Comparison of preoperative skin preparation products
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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
The comparison of four pre-operative skin preparation products.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis (cost-consequences analysis).

Study population
The study population comprised operating room personnel and patient volunteers. Individuals in both groups were at least 18 years of age and were free of any known hypersensitivity to povidone iodine or alcohol. They were also free of rashes, open sores, and pre-existing skin conditions of the lower extremities. Operating room personnel had at least 6 months' experience assisting in pre-operative patient preparation.

Setting
The setting was hospital. The economic analysis was carried out in the USA.

Dates to which data relate
The dates to which effectiveness, resource use and cost data relate were not reported. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was carried out prospectively on the same sample as that used in the effectiveness analysis.

Study sample
Twenty-five operating room personnel and 25 patient volunteers participated. No power calculations were reported. Each staff member was paired with a volunteer, and two of the products (one per leg) were applied at any one time and removed.

Study design
This was a cross-over study carried out in a single centre. There were no operating room personnel or patient volunteers lost to follow-up.
Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. The primary outcomes assessed were:

- application;
- drying and removal times;
- user satisfaction;
- the importance attached to flammability;
- the time taken to apply the product;
- the time for the product to dry;
- the time taken to prepare the patient before applying the product;
- patient comfort after removing the product; and
- product odour.

The authors reported baseline characteristics.

Effectiveness results
User satisfaction was measured using a 5-point Likert scale to assess the following characteristics: ease of application; drying speed; ease of removal; adaptability of the product to different surgical sites; fireproof characteristics; the ability of the product to conform to the contours of leg; and even application to the skin.

The application, drying and removal times for the different products were presented as the mean time (in seconds) plus or minus the standard deviation (SD):

- Povidone: application 228.0 (SD=42.6); drying 117.8 (SD=54.9); removal 54.4 (SD=25.1).
- Duraprep: application 82.8 (SD=20.2); drying 86.0 (SD=37.3); removal 80.9 (SD=32.5).
- Prevail: application 42.2 (SD=11.6); drying 63.8 (SD=33.3); removal 42.4 (SD=21.9).
- LiquiDrape: application 54.1 (SD=21.4); drying 92.5 (SD=60.8); removal 74.0 (SD=45.8).

Statistical significance (p<0.05) was reached for all application time comparisons except for Prevail versus LiquiDrape. In terms of drying times, the only statistically-significant difference was for Prevail versus LiquiDrape. In terms of removal times, there were statistically-significant differences for Povidone versus Duraprep, Prevail versus Duraprep and Prevail versus LiquiDrape.

The overall ranking of the products, in terms of the mean score, was 1.8 (SD=1.01) for Povidone, 2.1 (SD=0.83) for Prevail, 3.8 (SD=1.0) for LiquiDrape, and 3.1 (SD=1.05) for Duraprep.

The results of user satisfaction were summarised as follows:

Povidone ranked highest for ease of application (mean 1.84, SD=0.69), ease of removal (mean 2.16, SD=0.69), adaptability (mean 2.12, SD=0.53) and fireproof characteristics (mean 1.84, SD=0.69). Statistical significance was only reached for Povidone when compared to Duraprep and LiquiDrape in terms of adaptability.

The product characteristics deemed to be the most important were flammability (mean 1.5, SD=1.08) and application time (mean 2.8, SD=1.38). Patient comfort was ranked 3.6 (SD=1.63).
Clinical conclusions
Operating room personnel preferred povidone iodine for pre-operative skin preparation even though it had statistically-significant longer application and drying times. LiquiDrape, with its quick drying time and favourable safety profile, is a reasonable alternative for pre-operative preparation of patients.

Measure of benefits used in the economic analysis
The authors conducted a cost-minimisation analysis even though the four products differed in measures of effectiveness. The study actually constituted a cost-consequences analysis.

Direct costs
The direct costs were not discounted due to the short timeframe (less than 1 year) of the study. The quantities and unit costs were reported separately. The direct costs were operating room costs per unit time, based on application and drying times. The quantity/cost boundary adopted was that of the hospital. The product unit costs were based on average wholesale prices. The operating room costs were estimated using published cost analysis data. The price year was not reported.

Statistical analysis of costs
No statistical analysis of costs was reported.

Indirect Costs
Indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
See effectiveness results reported above.

Cost results
The total costs were $43.56 for povidone iodine, $40.33 for Duraprep-Ioban, $22.92 for Prevail, and $50.23 for LiquiDrape, based on an operating room cost of $6.26 per minute.

Synthesis of costs and benefits
Not applicable.

Authors' conclusions
Povidone iodine took longer to apply and to dry, but was the agent that operating room personnel preferred. Using the quicker drying Prevail (which contained alcohol) may decrease operating room costs. LiquiDrape has a quicker drying item and a favourable safety profile and is a reasonable alternative for pre-operative preparation.
CRD COMMENTARY - Selection of comparators
A justification was given for the comparators used in that certain attributes of various combinations of antimicrobial and water or alcohol in the products required investigation. It would have been more informative to have known how the precise products were selected. You, as a user of this database, should decide if these health technologies are relevant to your setting.

Validity of estimate of measure of effectiveness
The analysis was based on a cross-over study, which seems appropriate for the short term effectiveness measures used. The design minimised confounding by applying each product to the same patient, although the order was not stated, and ideally should have been randomised. Also, there was no evidence of blinding. The authors reported the baseline characteristics of the study sample, which may help the reader to examine whether the study sample was representative of the study population. The authors framed the study as cost minimisation, which implies equal effectiveness. In fact their effectiveness measures did not show equal effectiveness. In terms of adopting health technologies, one would want to examine the health implications of the product. One might assume, as the authors do, the therapeutic equivalence of these products, but the evidence was not presented here. The measures of effectiveness were largely based on opinion, although this information could be valuable to practitioners considering these products.

Validity of estimate of measure of benefit
Not applicable.

Validity of estimate of costs
A good feature of the cost analysis was that the quantities and unit costs were reported separately. However, no statistical or sensitivity analyses were reported on costs, and the price year was not reported; this makes reflation exercises in other settings more difficult. Ultimately, if therapeutic equivalence cannot be assumed, further differential costs might be incurred, for example, due to different rates of infection.

Other issues
The authors did not make comparisons of their findings with those from other studies, but did address the issue of generalisability to other settings in terms of the product familiarity of staff. The authors do not appear to have presented their results selectively. The study considered operating room personnel and patients, and this was reflected in the authors' conclusions. The study may have suffered from a small sample size. The dates to which effectiveness, resource use and cost data relate were also not reported.

The authors also noted other limitations in their study: varying familiarity with the product influenced the results on drying time; there were no data to estimate the effect of fire in the operating room, secondary to alcohol-containing topical products; the operating room personnel were from the same institution; and there was no comparison of antimicrobial activity among products.

Implications of the study
As the authors noted, any cost-savings must be weighed against any increase in the risk of fire or decrease in effectiveness. Further research including health consequences and the risk of fire and its consequences would be warranted.

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