Lifetime cost-effectiveness of skin cancer prevention through promotion of daily sunscreen use

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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.

CRD summary
The objective was to evaluate, from a societal perspective, the cost-effectiveness of a programme to provide sun screen and to promote its daily use. The authors concluded that the programme was likely to be cost-effective in the long term. The evidence used was of reasonable quality and appropriate for Australia. The model was well constructed and the authors' conclusions appear to be accurate, but there was significant uncertainty in the results.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of a programme to provide sun screen and to promote its daily use.

Interventions
Daily use of sun screen, with instruction on its proper use and the provision of free sun protection factor 15 or more sun screen, was compared with discretionary use of sun screen alone. All patients were examined by a dermatologist every two years.

Location/setting
Australia/out-patient care.

Methods
Analytical approach:
The cost-effectiveness analysis was based on a seven-state Markov model of the ongoing risk of melanoma, progression, and death, over a lifetime. The authors stated that they took a societal perspective.

Effectiveness data:
The key effectiveness measures were the hazard ratio for invasive melanoma and the relative risk of squamous cell carcinoma. These were from the Nambour Skin Cancer Prevention Trial (NSCPT), a randomised controlled trial. An intention-to-treat analysis, with Cox proportional regression, was used to generate the hazard ratio. Each patient received a dermatological evaluation at the start of the trial in 1992 and then again in 1994 and 1996. The events that were included in the analysis were the incidences of basal cell carcinoma, squamous-cell carcinoma, and melanoma. Follow-up data on potentially cancerous skin lesions was obtained from medical records up to 2006 and synthesised with the trial data.

Monetary benefit and utility valuations:
The utility weights for different stages of melanoma were from standard gamble surveys, time trade-off surveys, or expert opinion.

Measure of benefit:
Quality-adjusted life-years (QALYs) gained were the summary measure of benefit. The benefits were discounted at 5% annually.

Cost data:
The costs included those of the health care provider and the household. The health care provider costs included monitoring, sunscreen, and subsequent health care costs. The household costs included time, out-of-pocket payments for sun screen, and the discounted lifetime cost of a melanoma diagnosis. The costs were from an analysis of data from the NSCPT and from other published Australian studies. All costs were inflated to 2010 Australian dollars (AUD) and they were discounted at 5% annually.

Analysis of uncertainty:
A sensitivity analysis included the effects of treatment on squamous-cell carcinoma. One-way sensitivity analyses were conducted on each of the model parameters over a range of plausible values. Threshold analysis was conducted for the key parameters to determine the parameter value at which the programme became cost-effective. Probabilistic sensitivity analysis was performed to assess the overall uncertainty in all the model parameters and the results were displayed on a cost-effectiveness plane and a cost-effectiveness ellipse.

Results
The lifetime costs of the daily sun screen programme were AUD 1,031 higher than with discretionary use. The QALYs gained with daily use were 0.02 more than with discretionary use. The incremental cost-effectiveness ratio was AUD 42,614 per QALY gained.

When including the protective effect of daily sun screen use against squamous-cell carcinoma, the incremental cost-effectiveness ratio decreased to AUD 40,890 per QALY gained. The programme prevented 168 squamous-cell carcinomas, 33 melanomas, and four melanoma-related deaths at an additional cost of AUD 808,000.

In the probabilistic sensitivity analysis, the intervention was cost-effective in 64% of simulations at a threshold of AUD 50,000 per QALY gained.

Authors' conclusions
The authors concluded that the promotion of sun screen use was likely to be cost-effective, from a government and household perspective, over the long term.

CRD commentary
Interventions:
The interventions were appropriate. There were advertising campaigns in Australia to promote increased sun screen use, which were the only instructions for patients receiving standard care. This was equivalent to the discretionary use advice given to patients in the NSCPT.

Effectiveness/benefits:
The effectiveness data were from a well-conducted randomised controlled trial, with a long follow-up, in an Australian setting. The effectiveness results should be reliable. The utility values were from published studies, which were referenced, but the populations questioned were not described. Expert opinion was used in one study, but its methods were not reported. Uncertainty in the utility estimates was investigated in the probabilistic sensitivity analysis. There was no discussion of the appropriateness of different utility estimation methods.

Costs:
The costs appear to have been appropriate for the perspective, but were only reported at a total level. They were from the primary study as well as studies that were appropriate for Australia. It was unclear how the distributions for the costs were derived for the probabilistic analysis. The authors acknowledged that some costs might not be incurred in real practice and that it was unlikely that the government would provide free sun screen. It was uncertain whether patients would spend money on their own sun screen, which left some uncertainty in the costs.

Analysis and results:
The incremental cost-effectiveness results were appropriately reported. A thorough evaluation of uncertainty was conducted, using appropriate distributions. The authors assumed that the standard deviation was 15% of the mean, where data were not available, and this was tested in the sensitivity analysis. The authors did not report which parameters needed this assumption, and it was unclear if the uncertainty was accurately captured.
Concluding remarks:
The model was well constructed, using appropriate data, and the authors’ conclusions appear to be accurate, but there was significant uncertainty in the results.

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