Cost-effectiveness analysis of a two-stage screening intervention for hepatocellular carcinoma in Taiwan
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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 assess the cost-effectiveness of a two-stage intervention to screen for hepatocellular carcinoma in those born before a national hepatitis B vaccination programme was implemented. The authors concluded that screening high-risk individuals for hepatocellular carcinoma, with the two-stage screening intervention, was cost-effective provided mortality was reduced by detecting hepatocellular carcinoma by screening rather than clinically. The methods were satisfactory and the results were generally well reported. Despite some limitations, the authors’ conclusions appear to be appropriate.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of a two-stage intervention to screen for hepatocellular carcinoma in those born before a national hepatitis B vaccination programme was implemented in Taiwan.

Interventions
The two-stage intervention was introduced alongside the opportunistic screening that usually occurred. Stage one was a mass media campaign inviting the target population, who were considered to be at high risk, for testing for hepatitis B and C. Stage two was ongoing surveillance of high-risk individuals for hepatocellular carcinoma. This was compared with opportunistic screening alone, with less frequency and fewer tests than the intervention.

Location/setting
Taiwan/hospital.

Methods
Analytical approach:
A decision tree, with a one-year time horizon, and a Markov model, with a 60-year time horizon, were developed to assess the costs and outcomes for each strategy for a hypothetical cohort of 100,000 individuals. The disease states included chronic hepatitis, cirrhosis, hepatocellular carcinoma, and death. The authors reported that a government perspective was adopted.

Effectiveness data:
The effectiveness data were from various sources. A screening database of the research foundation that initiated the intervention provided the data for the screening rates and positive test rates with the intervention. A review of medical records and a questionnaire survey of one regional hospital in central Taiwan, selected from the 15 hospitals that participated in the intervention, were used for the screening rates in usual practice. Published studies were used for the annual incidence of hepatocellular carcinoma and its associated mortality. The main outcome measures were the number of hepatocellular carcinoma cases detected and the number of hepatocellular carcinoma deaths averted.

Monetary benefit and utility valuations:
The utility weights were from a published study of the burden of disease and injury in Australia. This study used Dutch weights to measure the severity of a wide range of health conditions.
Measure of benefit:
The measures of benefit were life-years and quality-adjusted life-years (QALYs) gained. These were discounted at an annual rate of 5%.

Cost data:
The analysis included the costs of screening, diagnosis, treatment, and follow-up of hepatocellular carcinoma. The unit cost estimates were from a number of national databases including the National Health Insurance Benefit Schedule and the screening programme's administrative data. The price year was 1997, and all costs were reported in Taiwan dollars (TWD). The costs were discounted at an annual rate of 5%.

Analysis of uncertainty:
One-way sensitivity analysis was performed and the results were presented in a tornado diagram. Multivariate sensitivity analysis was performed, using disease progression assumptions from previous studies. Probabilistic sensitivity analyses, with 2,000 iterations, were performed. A scenario was analysed to estimate the impact of expanding the programme to a national level.

Results
The total cost was TWD 914.73 million with the two-stage screening intervention, compared with TWD 885.04 million with opportunistic screening; an additional cost of TWD 29.70 million. The mean life-years were 343,604.20 with two-stage screening and 343,544.57 with opportunistic screening; a gain of 59.63 life-years. The QALYs were 266,928.36 with two-stage screening and 266,854.51 with opportunistic screening; a gain of 73.85 QALYs.

The incremental cost effectiveness ratio (ICER) of the two-stage screening intervention was TWD 498,000 per life-year saved or TWD 402,000 per QALY gained.

The results were most sensitive to the reduction in mortality due to hepatocellular carcinoma with two-stage screening and the hepatocellular carcinoma incidence. The scenario analysis showed that altering the screening programme to focus on the regular monitoring of high-risk individuals could achieve a more favourable ICER. Assuming stage two hepatocellular carcinoma screening identified 100% of cases and opportunistic screening remained at 28.6% (base case), the ICER was reduced to TWD 443,000 per life-year saved.

The cost-effectiveness acceptability curve suggested that 95% of the simulated ICERs were below TWD 1,070,000 per life-year saved.

Authors' conclusions
The authors concluded that screening of high-risk individuals for hepatocellular carcinoma, using the two-stage screening intervention, was cost-effective, compared with opportunistic screening, provided mortality was reduced by detecting hepatocellular carcinoma by screening rather than clinically.

CRD commentary
Interventions:
The intervention was described and the comparator was appropriate as it was the usual practice in the authors' setting.

Effectiveness/benefits:
The effectiveness data were from various sources, including published studies and databases and records from the implementation of the intervention. The baseline values and their ranges used in sensitivity analyses were provided, but details of the published studies, such as their designs were not reported. There is no indication that a systematic review was conducted, so it is unclear if the best and most relevant evidence was used. The data from the records of the intervention might not be generalisable to the total population based on the known limitations of observational studies (i.e. randomised controlled trials are regarded as the best way to determine the effect of the intervention and comparator considered in the study). The main outcome measure was QALYs, which was appropriate, given the impact of hepatocellular carcinoma on both quality and length of life. They also allow comparisons with other interventions. The authors briefly described the source for the utilities, but the methods used to elicit utilities were not reported, and were based on an Australian population which might not be appropriate for the setting of the study.
Costs:
The authors reported the perspective and the relevant costs appear to have been included. The main sources for the cost estimates were reported, but it was not clear which source was used for each cost, and the authors did not explicitly report the resource use quantities. The unit costs were reported and the authors stated that the details of their costing could be obtained from them. The price year was reported and future costs were appropriately discounted.

Analysis and results:
The model structure, including a diagram, was reported, along with the modelling assumptions. An appropriate incremental analysis was performed and discussed. The impact of uncertainty was extensively investigated in the sensitivity analysis. The distributions assigned to which of the parameters in the probabilistic sensitivity analysis were not provided. The authors reported the results from the probabilistic sensitivity analysis based on having plotted the results on a cost-effectiveness curve which was appropriate. There were a number of limitations to the analysis, some of which were identified and discussed by the authors.

Concluding remarks:
The methods were satisfactory and the results were generally well reported. Despite some limitations, the authors' conclusions appear to be appropriate.

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