Cost-effectiveness analysis on the surveillance for hepatocellular carcinoma in liver cirrhosis patients using contrast-enhanced ultrasonography

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 study examined the cost-effectiveness of contrast-enhanced ultrasonography in a surveillance programme for hepatocellular carcinoma in patients with chronic liver injury. The authors concluded that contrast-enhanced ultrasonography surveillance was a cost-effective strategy compared with either ultrasonography surveillance or no surveillance. Although methodological details and data sources were not extensively described, the authors’ conclusions appear robust.

Type of economic evaluation
Cost-utility analysis

Study objective
The study examined the cost-effectiveness of contrast-enhanced ultrasonography compared with conventional ultrasonography in a surveillance programme for hepatocellular carcinoma in patients with chronic liver injury.

Interventions
Three interventions were compared: surveillance with contrast-enhanced ultrasonography using a contrast medium (Sonazoid) that allowed Kupffer imaging; surveillance with conventional ultrasonography without the contrast medium; and no surveillance.

Location/setting
Japan/secondary and tertiary care.

Methods
Analytical approach:
The analysis was based on a Markov model using a long-term time horizon. The perspective of the analysis was not clearly reported.

Effectiveness data:
Clinical inputs were taken from the published literature. Data on hepatocellular carcinoma prevalence and other epidemiological data came from Japanese studies and databases. The sensitivity and specificity of the diagnostic tests were key inputs of the model. Some assumptions were made to build and populate the decision model.

Monetary benefit and utility valuations:
Utility valuations were taken from a published meta-analysis.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used as the summary benefit measure and were discounted at an annual rate of 3%. Life-years were also reported.

Cost data:
The costs included diagnostic tests, confirmation tests, surgical procedures, and management of cancer-related conditions. All economic data were taken from published sources excluding the cost of transcatheter arterial embolisation, which was taken from reimbursement data at the authors’ institution. Costs were expressed in
ultrasonography dollars ($). A 3% annual discount rate was applied.

Analysis of uncertainty:
One-way sensitivity analyses were carried out on all model inputs. Ranges were based on published sources or authors’ opinions.

Results
For no surveillance, the projected costs were $29,142 and QALYs were 6.18. For ultrasonography surveillance, the projected costs were $58,064 and QALYs were 7.85. For contrast-enhanced ultrasonography surveillance, the projected costs were $65,726 and QALYs were 8.17.

Compared with no surveillance, the incremental cost per QALY gained was $17,296 with ultrasonography surveillance and $18,384 with contrast-enhanced ultrasonography surveillance. The incremental cost-utility ratio with contrast-enhanced ultrasonography surveillance over ultrasonography surveillance was $24,250.

The most influential inputs were the annual hepatocellular carcinoma incidence rates and the sensitivity of contrast-enhanced ultrasonography and ultrasonography. In general, the cost-effectiveness of both contrast-enhanced ultrasonography and ultrasonography surveillance remained the threshold of $50,000 per QALY. However, if the sensitivity of contrast-enhanced ultrasonography was below 75%, contrast-enhanced ultrasonography was no longer cost-effective compared with ultrasonography surveillance.

Authors’ conclusions
The authors concluded that contrast-enhanced ultrasonography surveillance was a cost-effective strategy compared with either ultrasonography surveillance or no surveillance.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. The authors pointed out that at the time of the study, the contrast medium (Sonazoid) was available only in Japan.

Effectiveness/benefits:
Limited information on sources of clinical estimates was provided, so it was difficult to judge the validity of these parameters. In general, Japanese estimates were used for epidemiological data, but it was unclear which sources were used for key data such as test accuracy. Sensitivity analyses were conducted to deal with uncertainty in clinical parameters. The use of QALYs and life years were relevant benefit measures for the disease studied. Utility weights were obtained from a meta-analysis, but this was not described.

Costs:
The viewpoint of the analysis was not explicitly stated, but only direct medical costs appear to have been included. Costs were not broken down into individual items but were presented as totals, especially costs related to the management of carcinoma stages. Limited information was also given on the sources of these costs, which reduced the transparency of the economic side of the economic evaluation. The authors stated that only Japanese data were used, so these estimates should be relevant to the authors’ setting. The price year was not reported, which limited the possibility of replicating the analysis in other time periods. The impact of variations in economic inputs was tested in the sensitivity analyses.

Analysis and results:
Expected costs and benefits were synthesised using an incremental approach, which allowed the identification of the optimal strategy using the conventional cost-effectiveness threshold of $50,000/QALY. The model results were validated using the results of a large cohort study. Uncertainty was investigated using a determinist approach, which focused on the variations in individual inputs. A more comprehensive approach would have been useful. The study results were clearly presented, but they were specific to the authors’ setting, especially as Sonazoid was available only in Japan.

Concluding remarks:
Although the methodological details and data sources of the study were not extensively described, the authors’ conclusions appear robust.

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