Cost-effectiveness of screening for hepatocellular carcinoma among subjects at different levels of risk

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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
This study examined the cost-effectiveness of screening for hepatocellular carcinoma in two high-risk populations; patients with early-stage cirrhosis, and carriers of chronic hepatitis B virus (HBV) without cirrhosis. The authors concluded that screening was more cost-effective for those with early stage cirrhosis than for those with chronic HBV without cirrhosis. The methods were valid, but the data sources were poorly described. The authors’ conclusions should be treated with caution.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of screening for hepatocellular carcinoma, compared with no screening, in two cohorts of high-risk individuals; those with early stage cirrhosis, and those with chronic hepatitis B virus (HBV) and no cirrhosis.

Interventions
Hepatocellular carcinoma screening was compared with no screening. In the screening strategy, chronic HBV carriers and patients with cirrhosis underwent repeated abdominal ultrasound screening at intervals of 12 months, for HBV carriers, or three months, for those with early cirrhosis. Those with a positive result underwent liver biopsy to confirm the presence of hepatocellular carcinoma.

Location/setting
Taiwan/secondary care.

Methods
Analytical approach:
Decision modelling was conducted to simulate disease development and management, in hypothetical cohorts of 50-year-old patients, who were followed-up for 25 years. Two models were used, one for chronic HBV carriers and the other for patients with cirrhosis before the onset of varices and ascites. Each model compared hepatocellular carcinoma screening against no screening. The authors stated that the analysis was conducted from the perspective of the insurer, which was the Bureau of National Health Insurance.

Effectiveness data:
The clinical data were from a selection of sources. All-cause mortality was based on Taiwanese life tables for 2007. The disease progression rates were the key inputs for the model. Some assumptions were made, such as 100% compliance for both screening options.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
Life-years were the summary benefit measure and a 3% annual discount rate was applied.
Cost data:
The economic analysis included the costs of ultrasound, biopsy, partial hepatectomy, radiofrequency ablation, and transplantation. The treatment costs were presented as category totals. They were from the fee-for-service reimbursement rates of the Bureau of National Health Insurance, in Taiwan. The resource quantities were from published sources. All costs were in Taiwan dollars, converted to and presented in US dollars ($). They were discounted at an annual rate of 3%.

Analysis of uncertainty:
A probabilistic sensitivity analysis was carried out using a two-dimensional simulation and various sequences of micro-simulations. The sensitivity analyses focused on the tumour growth, the hepatocellular carcinoma incidence in each cohort, the sensitivity of abdominal ultrasound, and the probability of being diagnosed with hepatocellular carcinoma without screening and without symptoms. A probability distribution was assigned to each of these inputs.

Results
In chronic HBV carriers, the costs per person were $557.10 with no screening and $5,912.37 with screening. The life-years per person were 13.53 with no screening and 13.78 with screening. The incremental cost per life-year gained with screening was $20,856.25.

In patients with early cirrhosis, the costs per person were $2,220.53 with no screening and $12,327.89 with screening. The life-years were 8.56 with no screening and 9.16 with screening. The incremental cost per life-year gained with screening was $16,719.00.

The sensitivity analysis showed that the hepatocellular carcinoma incidence had the strongest impact on the cost-effectiveness results. As the incidence increased the cost-effectiveness of both screening strategies increased. The accuracy of the ultrasound did not substantially affect the model results.

Authors' conclusions
The authors concluded that screening people at high risk of hepatocellular carcinoma could prolong their survival. Screening was more cost-effective for those with early stage cirrhosis than for those with chronic HBV without cirrhosis.

CRD commentary
Interventions:
The selection of the comparators was appropriate as screening for hepatocellular carcinoma in the two high-risk cohorts was recommended by the practice guidelines for the management of hepatocellular carcinoma, published by the American Association for the Study of Liver Disease in 2005. A clear description of the screening strategy was provided.

Effectiveness/benefits:
The authors did not report the methods and conduct of a literature review, and relevant data sources might not have been considered. No information on the methods of the sources was provided, which prevents an objective assessment of the quality of the clinical evidence. The epidemiological data are likely to have been from Taiwanese studies. Life-years were a valid benefit measure as survival is the key outcome for cancer screening programmes. They also allow comparisons to be made with the benefits of other health care interventions.

Costs:
The cost categories and the data sources were consistent with the perspective adopted. Except for the ultrasound and biopsy costs, the treatment costs were not broken down into individual items. The unit costs were from standard Taiwanese sources, but few details of the resource quantities were reported. Reflation exercises for other time periods might be difficult as the price year was not reported. The purchasing power parity conversion rates for the Taiwan dollar to the US dollar were for the years 2005 to 2009. The cost estimates were not varied in the analysis of uncertainty.
The results were extensively presented, with both average and incremental ratios reported for the two cohorts. Discounted and undiscounted findings were provided. The model was clearly described and a diagram was provided. A valid approach was used to assess the uncertainty, but this was restricted to four inputs for the model. The results were specific to the authors’ context and might be difficult to transfer to other developed countries.

Concluding remarks:
The methods were valid, but the data sources were poorly described. The authors’ conclusions should be treated with caution.

**Funding**
Support received from the Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR), USA.

**Bibliographic details**

**PubMedID**
20874834

**DOI**
10.1111/j.1365-2753.2010.01432.x

**Original Paper URL**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Aged; Carcinoma, Hepatocellular /diagnosis; Cohort Studies; Cost-Benefit Analysis; Early Diagnosis; Female; Hepatitis B; Hepatitis B virus /isolation & purification; Humans; Liver Neoplasms /diagnosis; Male; Markov Chains; Mass Screening /economics; Middle Aged; Risk Assessment; Taiwan

**AccessionNumber**
22011000692

**Date abstract record published**
13/07/2011