Cost-utility and value-of-information analysis of early versus delayed laparoscopic cholecystectomy for acute cholecystitis

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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 estimate the cost-effectiveness of early compared with delayed laparoscopic cholecystectomy for patients presenting with acute cholecystitis. The authors concluded that early surgery was less costly and produced better quality of life than delayed surgery and future research into the quality-of-life estimates would be worthwhile. The methods appear to have been appropriate and were clearly and transparently reported. The conclusions seem to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to estimate the cost-effectiveness of early compared with delayed laparoscopic cholecystectomy for patients presenting with acute cholecystitis.

Interventions
Early laparoscopic cholecystectomy was defined as operating within the acute phase of cholecystitis. This was compared with delayed surgery after the acute phase of cholecystitis had resolved.

Location/setting
UK/secondary care.

Methods
Analytical approach:
A decision tree was used to synthesise the data on effectiveness, complications, and costs from a variety of sources. The time horizon was one year. The authors stated that the perspective was that of the UK NHS.

Effectiveness data:
The main clinical effectiveness estimates were the probabilities of: conversion from laparoscopic to open cholecystectomy; complications following surgery; and the development of symptoms (including biliary colic, acute cholecystitis, obstructive jaundice, and pancreatitis). These data were from a published Cochrane review and meta-analysis (Gurusamy, et al. 2006, and Gurusamy, et al. 2009, see ‘Other Publications of Related Interest’ below for bibliographic details), and other published studies. The annual risk of developing symptoms following acute cholecystitis was the midpoint of rates reported in the literature. In the absence of further information, the mortality from severe pancreatitis was assumed to be higher (25%) than rates published for acute pancreatitis (10 to 21%).

Monetary benefit and utility valuations:
The utility values were from four relevant studies. The Harvard cost-effectiveness registry and reference lists were searched to identify these studies. Preference was given to utilities that were measured using the standard gamble or time trade-off approaches, rather than by expert opinion. Where more than one estimate was available, these were combined using inverse variance meta-analysis.

Measure of benefit:
The primary measure of benefit was quality-adjusted life-years (QALYs).
Cost data:
The cost categories were the costs of complicated and uncomplicated surgery, increased hospital stay, increased operation time, complications, conversion to open cholecystectomy, endoscopic retrograde cholangiopancreatography, general practitioner consultations, and treatment of pancreatitis. The increase in hospital stay with delayed surgery was 4.12 days, based on the Cochrane review. The unit costs were from standard sources, including NHS Reference Costs. The costs were reported in UK pounds sterling (£) and the price year was 2006.

Analysis of uncertainty:
The uncertainty was explored using one-way sensitivity analysis, threshold analysis, probabilistic sensitivity analysis (with 5,000 iterations), and value-of-information analysis (based on 13,000 laparoscopic cholecystectomies per annum, a time horizon of 10 years, and a discount rate of 3.5% per annum). The results were presented on the incremental cost-effectiveness plane, as a cost-effectiveness acceptability curve, as the population expected value of perfect information, and as the expected value of perfect parameter information.

Results
The total cost for a hypothetical 1,000 patients was £2,574,457 for early and £3,395,997 for delayed laparoscopic cholecystectomy. The total QALYs were 876.48 for early and 825.05 for delayed surgery.

Early treatment dominated delayed treatment, as it was more effective and less costly. The cost-effectiveness acceptability curve showed a 70.9% probability that early treatment would be more cost-effective than delayed treatment at a willingness-to-pay threshold of £20,000, and a 61.6% probability at a threshold of £30,000.

The expected value of perfect information was estimated to be £18.8million at a willingness-to-pay threshold of £20,000, and £39.5million at a threshold of £30,000. The expected value of perfect parameter information analysis showed that it was only worthwhile to reduce the uncertainty in the utility estimates at these two thresholds.

Authors’ conclusions
The authors concluded that early surgery was less costly and resulted in a better quality of life than delayed surgery, while future research into the quality-of-life estimates would be worthwhile.

CRD commentary
Interventions:
The interventions were well described and appropriately compared against each other. They are likely to be relevant in other settings.

Effectiveness/benefits:
The probabilities of events were from a Cochrane review, which was a systematic literature review, and a meta-analysis of this data, which appears to have been appropriate. A systematic review was conducted to estimate the utilities. The sources were reported and the methods used to estimate the utilities were well described and appropriate. QALYs were the most appropriate benefit measure, given the impact of the disease on quality of life. The benefits were not discounted as the time horizon was one year.

Costs:
The perspective was stated and the cost categories appear to have been appropriate. Standard sources were used to estimate the unit costs. A detailed breakdown of the cost categories was given. The costs were appropriately adjusted for inflation and were not discounted due to the one-year time horizon.

Analysis and results:
The use of a decision tree to synthesise the data was appropriate. The model was well described and presented in a diagram. The incremental analysis was appropriate for determining the cost-effectiveness of the treatments. The results were well reported in a table and the uncertainty was comprehensively explored, using a variety of methods. Some limitations were acknowledged and discussed by the authors.

Concluding remarks:
The methods appear to have been appropriate and were clearly and transparently reported. The conclusions seem to be appropriate.

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