Cost-effectiveness analysis of variceal ligation vs beta-blockers for primary prevention of variceal bleeding

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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 study assessed the cost-effectiveness of two preventive strategies for variceal bleeding (beta-blockade and endoscopic variceal ligation) in patients with cirrhosis and moderate-to-large oesophageal varices. The analysis demonstrated that beta-blockade was the preferred option in the cost-effectiveness framework and ligation the preferred option in the cost-utility analysis, owing to the impact of the interventions on quality of life. The study methodology was good, although it might be difficult to assess the authors’ conclusions given the poor reporting of sources of clinical and economic data.

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

Study objective
The primary objective of the study was to assess the cost-effectiveness of two preventive strategies for variceal bleeding in patients with cirrhosis (Child A or B) and moderate-to-large oesophageal varices. The two strategies were beta-blockade (BB) and endoscopic variceal ligation (EVL).

Interventions
The study examined the initial use of BB or EVL for the primary prevention of variceal bleeding. Patients who did not tolerate initial BB therapy were assumed to subsequently undergo EVL.

Location/setting
USA. Secondary care/hospital.

Methods
Analytical approach:
This economic evaluation used a Markov model to simulate the clinical and economic impact of the two strategies under examination on the basis of published evidence. The time horizon of the analysis was 5 years. The authors stated that the perspective of the health care system was adopted.

Effectiveness data:
The authors stated that the clinical data were derived from the available literature, but details of the method used to obtain these estimates and the characteristics of the primary sources were not given. It was stated that both randomised clinical trials (RCTs) and meta-analyses were performed to compare BB with EVL, but it was not clear whether the treatment effect for this analysis was taken from those studies. The key clinical end point was the rate of re-bleeding with BB or EVL.

Monetary benefit and utility valuations:
Utility values were derived from the literature. The approach used to derive them was not described, although the authors stated that they could not be obtained from a large sample of patients representative of the disease under analysis.

Measure of benefit:
The summary benefit measures used were the life-years (LYs) and quality-adjusted life-years (QALYs). These were
estimated using the decision model. Both benefits were discounted at an annual rate of 3%.

Cost data:
The analysis included the costs of BB, ligation, endoscopic surveillance and treatment of bleeding episodes (with or without transjugular intrahepatic portosystemic shunt). A breakdown of the cost items was not provided. The costs were derived from Medicare allowable reimbursement. The source of the resource use data was not explicitly reported. An annual discount rate of 3% was applied, which was appropriate given the 5-year time horizon. The costs were in US dollars ($).

Analysis of uncertainty:
A one-way sensitivity analysis was undertaken on all model inputs. Those parameters with the greatest impact on the model results were further varied in a two-way sensitivity analysis. Threshold values were presented for the key model parameters. The ranges of values were derived from the literature. Finally, a probabilistic sensitivity analysis was also carried out by assigning probabilistic distributions to all 27 model inputs and generating cost-effectiveness acceptability curves.

Results
The expected LYs were 3.150 with BB and 3.177 with EVL, while the expected QALYs were 2.67 and 2.77, respectively.

The total costs per patient were $6,745 with BB and $9,402 with EVL.

The incremental cost per LY gained with EVL over BB was $98,407, while the incremental cost per QALY gained was $25,548. Thus, EVL became cost-effective only when quality of life was included in the analysis.

The sensitivity analysis suggested that the model results were stable to changes in most variables when a benchmark of $50,000 per LY or QALY gained was considered. In general, BB remained the preferred option in the cost-effectiveness framework, while ligation was the preferred option in the cost-utility analysis. This conclusion was also reflected in the probabilistic sensitivity analysis. When considering LY alone, BB was more cost-effective than EVL at least 75% of the time when the willingness-to-pay was $60,000 or less. However, when QALYs were considered, ligation was cost-effective more than 92% of the time when the willingness-to-pay was $50,000 per QALY, and almost 100% of the time when it was $100,000.

Authors’ conclusions
The authors concluded that the impact of the interventions on quality of life was the determinant of the analysis, as BB for the prevention of variceal bleeding in patients with cirrhosis and moderate-to-large oesophageal varices was the preferred strategy in the cost-effectiveness framework, while ligation was the preferred strategy in the cost-utility analysis. The authors stated that further studies will be needed to corroborate the current findings.

CRD commentary
Interventions:
The authors justified the choice of the two preventive strategies, which were appropriately selected and relevant in the authors’ setting. They also appear to be relevant in other contexts.

Effectiveness/benefits:
The approach used to derive the clinical estimates was not described. The authors did not report the details of a systematic review of the literature, thus the primary studies might have been identified selectively. Furthermore, there was no information on the design and other characteristics of the primary sources. It is therefore not possible to judge the validity of the clinical data. The use of extensive sensitivity analysis and the robustness of the study results only partially mitigated this drawback of the study. There was also no information on the sources of utility values used to derive the QALYs.

Costs:
The categories of costs included in the analysis appear to have been consistent with the perspective of the study. The
authors presented costs as macro-categories and did not provide a detailed breakdown of the cost items. This may have been due to the accounting approach adopted in the Medicare system. However, it will limit the possibility of replicating the analysis in other settings. The source of the information on resource use data was unclear. Other details such as the price year and discounting were reported.

Analysis and results:
The synthesis of the costs and benefits was appropriate as the whole evaluation made a distinction between the cost-effectiveness and cost-utility analyses, demonstrating the importance of quality of life. The issue of uncertainty was extensively addressed in the sensitivity analysis. The results of the analysis and the sensitivity analyses were well presented. The authors noted some limitations of their analysis, such as the fact that severe complications from interventions were not considered and the non-inclusion of adherence to treatment in the model. Finally, it was noted that the model did not include the costs and benefits of liver transplantation or the development of hepatocellular cancer.

Concluding remarks:
The study methodology was sound and the results were well presented, although it is difficult to assess the authors’ conclusions given the poor reporting of sources of clinical and economic data. However, the results of the analysis were robust to the wide variations considered in the sensitivity analysis.

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Bibliographic details

Other publications of related interest


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