Cost-effectiveness of bariatric surgery for severely obese adults with diabetes

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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 investigated the cost-effectiveness of gastric bypass or gastric banding surgery, compared with the usual care, for adult diabetic patients who were severely obese. The authors concluded that gastric bypass or banding appeared to be cost-effective in reducing mortality and diabetes complications. There were some limitations in the reporting of the methods and results, in the main article, but details were available in an online appendix, which should be consulted to fully assess the authors’ conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
The aim was to examine the costs and health outcomes of gastric bypass or gastric banding surgery for adult diabetic patients who were severely obese, with a body mass index (BMI) of 35 kg/m$^2$ or more.

Interventions
Gastric bypass or gastric banding surgery was compared with the usual care for diabetes, with no surgery, but tight glycaemic control. Two diabetic populations were studied; those who had been diagnosed within the previous five years and those with established diabetes, diagnosed 10 years or more previously.

Location/setting
USA/secondary care.

Methods
Analytical approach:
A published Markov model (Hoerger, et al. 2009, see ‘Other Publications of Related Interest’ below for bibliographic details) was used to synthesise the evidence from a selection of relevant published studies. Patients were followed-up from diagnosis until either they died or they reached 95 years. The authors did not state the perspective.

Effectiveness data:
The clinical outcomes included occurrences of nephropathy, neuropathy, retinopathy, coronary heart disease, stroke, and death. The patient’s BMI, blood pressure, and cholesterol levels, and diabetes remission and relapse rates were considered. A published 10-year Swedish epidemiological follow-up study and a meta-analysis were used for many of the outcome variables.

Monetary benefit and utility valuations:
The utilities were based on the mean utility improvement per unit decrease in the BMI.

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs) and these were discounted at 3% per annum. Life-years were reported.

Cost data:
The direct medical costs included those of bypass and banding surgery and complications in the first year, follow-up visits, nutritional supplements, long-term complications, revision surgery, and band removal. These costs were from an unpublished analysis of Medstat claims in 2008. They were presented in US dollars ($), for the price year 2005, and
were adjusted for inflation, using the medical care component of the US Consumer Price Index. They were discounted at 3% per annum.

**Analysis of uncertainty:**
The uncertainty surrounding the key model estimates was examined in one-way and probabilistic sensitivity analyses. The 95% confidence intervals from published studies were used in the one-way analyses, where available, and the results were presented in tornado diagrams. The probabilistic sensitivity analysis results were illustrated in cost-effectiveness acceptability curves, presented in an online appendix.

**Results**
For diabetic patients who were newly diagnosed, the total discounted costs were $86,665 for bypass surgery, $89,029 for banding surgery, and $71,130 for usual care. The discounted QALYs were 11.76 for bypass surgery, 11.12 for banding surgery, and 9.55 for usual care.

For patients with established diabetes, the total discounted costs were $99,944 for bypass surgery, $96,921 for banding surgery, and $79,618 for usual care. The discounted QALYs were 9.38 for bypass surgery, 9.02 for banding surgery, and 7.68 for usual care.

Compared with usual care, the incremental cost per QALY gained was $7,000 for bypass surgery, and $11,000 for banding surgery, in newly diagnosed patients. It was $12,000 for bypass surgery, and $13,000 for banding surgery, in patients with established diabetes.

In the probabilistic sensitivity analysis, the median cost per QALY gained, for newly diagnosed patients aged 45 to 54 years, was $6,000 (95% UI -2,000 to 23,000) for gastric bypass, and $10,000 (95% UI zero to 30,000) for gastric banding.

The utility improvement per unit of BMI improvement had the greatest impact on the results. They were also sensitive to the cost of tight glycaemic control, follow-up visits, and surgery, and the patient's BMI before surgery.

**Authors' conclusions**
The authors concluded that both gastric bypass and gastric banding surgery appeared to be cost-effective in reducing mortality and diabetes complications in severely obese adults with diabetes.

**CRD commentary**

**Interventions:**
The three strategies were not described and the usual care, without surgery, might have differed across settings and populations. The three strategies might be reasonable options and approved for use in other settings.

**Effectiveness/benefits:**
The details of the clinical sources were not provided, which makes it difficult to assess the quality of the clinical estimates. These sources should be consulted to assess their internal validity. Details of the derivation of the parameters for the model were given in an online appendix. These parameters and those for the sensitivity analyses were clearly reported. Relevant available studies were used, but there was no randomised controlled trial directly comparing the two surgical strategies in the population of interest. QALYs were an appropriate measure of benefit, but the sources of the utility values and the approach used to derive them were not described.

**Costs:**
The perspective was not explicitly stated, making it unclear whether all the relevant costs were included. The yearly costs were clearly reported, but the individual cost items were not and the resource quantities were not presented separately from their unit costs. The reduction in costs due to clinical improvements, such as diabetes remission and reduced antidiabetic medications, was based on two small studies and their references were given. These studies should be checked to assess their validity.

**Analysis and results:**
The authors did not find cost savings, but the procedures were cost-effective. They discussed these findings compared with those of other similar studies, which found cost savings with gastric bypass or banding surgery. Some important limitations were discussed, such as that patients receiving bypass surgery often had a higher initial BMI and more comorbidities than those receiving banding surgery; the lack of direct trial evidence for the two surgeries; and that the data estimates, in the key meta-analysis, were from extremely obese patients (BMI 47.9). The results of the one-way sensitivity analyses were well illustrated, showing the impact of changes in the key variables.

Concluding remarks:
Some of the data sources and results were not fully and transparently reported, in the main article, making it difficult to assess the conclusions reached by the authors. They stated that their online appendix provided details on the methods, data sources, and results, and these should be consulted for a full assessment.

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