Endovascular versus 'fast-track' abdominal aortic aneurysm repair
Abularrage C J, Sheridan M J, Mukherjee D

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.

Health technology
This study compared fast-track abdominal aortic aneurysm (AAA) with endovascular abdominal aortic aneurysm repair (EVAR). Fast-track AAA repair combined a retroperitoneal approach with a patient care pathway that included a gastric promotility agent and patient-controlled pain analgesia. A selective policy for postoperative admission to the intensive care unit was followed. Intravenous metaclopramide (10 mg) was given every 8 hours in the immediate postoperative period. Patient-controlled pain relief was achieved through epidural means during the first 2 days post-operation and then by the use of a fentanyl patch combined with oral oxycodone. Subcutaneous heparin was prescribed to prevent deep vein thrombosis. Patients were discharged with oxycodone or an alternative pain reliever. EVAR involved all patients undergoing a computer tomography scan. The operation was performed under general anaesthesia.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised all patients who underwent either fast-track or endovascular AAA repair at Inova Fairfax Hospital between April 14, 2000 and July 12, 2002. Patients who had juxtarenal aneurysms, inadequate neck or excessively small or angulated iliac arteries were not eligible for EVAR.

Setting
The setting was secondary care. The economic study was carried out in Falls Church (VA), USA.

Dates to which data relate
The effectiveness and resource use data referred to patients treated between April 2000 and July 2002. The price year was not explicitly specified.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. The sample comprised all patients who underwent either
Eighty-three per cent of the patients who received fast-track AAA were male. The mean age was 68 (+/- 1.4) years. Thirteen per cent had iliac artery aneurysm; 80% had hypertension; 67% had hypercholesterolaemia; 47% had coronary artery disease; 27% had had myocardial infarction; 17% had had a coronary artery bypass graft; 17% had carotid disease; 13% had diabetes mellitus; 13% had chronic renal insufficiency; 77% smoked tobacco; 33% had chronic obstructive pulmonary disease; 13% were obese; and 23% had had previous abdominal surgery. In terms of America Society of Anesthesia Class (ASA), 7% were Class 2, 83% were Class 3, and 10% were Class 4. The mean AAA size was 6.1 (+/- 0.17) cm.

Ninety-six per cent of the patients who underwent EVAR were male. The mean age was 72 (+/- 1.8) years. Twenty-one per cent had an iliac artery aneurysm; 79% had hypertension; 64% had hypercholesterolaemia; 68% had coronary artery disease; 43% had myocardial infarction; 36% had had coronary artery bypass graft; 7% had carotid disease; 29% had diabetes mellitus; 18% had chronic renal insufficiency; 89% smoked tobacco; 32% had chronic obstructive pulmonary disease; 11% were obese; and 29% had had previous abdominal surgery. None of the patients were ASA Class 2, 39% were Class 3 and 61% were Class 4. The average size of the AAA was 5.5 (+/- 0.13) cm.

Study design
This was a retrospective, single-centred, cohort study, in which both groups were differentiated in terms of the intervention received. The duration of follow-up was not reported. There was no indication of blinding.

Analysis of effectiveness
All of the patients included in the initial study sample were considered in the analysis of effectiveness. The primary health outcome measures were intraoperative, perioperative and postoperative complications, and mortality. The secondary outcomes were estimated blood loss, units of packed red blood cells transfused, colloid and crystalloid volumes, operation time, and number of days before regular diet was resumed. The patient groups were generally comparable in terms of the preoperative risk factors. The EVAR group was slightly older, (p=0.04), had slightly smaller average aneurysm size, (p=0.008), and had more patients designated ASA Class 4, (p<0.0001).

Effectiveness results
There were no statistically significant differences in the number of intraoperative complications (fast-track 7% versus EVAR 4%; p=1) or postoperative complications (fast-track 13% versus EVAR 32%; p=0.22), and mortality (fast-track 3% versus EVAR 0%; p=1).

Patients who underwent fast-track repair had a longer operation (216 +/- 7.4 minutes versus 158 +/- 6.8 minutes; p<0.0001). They also required a greater volume of blood (1.8 +/- 0.29 units versus 0.32 +/- 0.24 units; p=0.0005), colloid (565 +/- 89 cm3 versus 32 +/- 22 cm3; p<0.0001) and crystalloid transfusions (4,625 +/- 252 cm3 versus 2,627 +/- 170 cm3; p<0.0001).

EVAR patients resumed a regular diet earlier (0.21 +/- 0.08 days versus 1.8 +/- 0.11 days; p<0.0001).

Clinical conclusions
The authors stated that the fast-track method of AAA repair is a viable alternative to the traditional open repair and endovascular technique of repair, and has equivalent complication rates. Compared with EVAR, fast-track AAA increased transfusions of blood and intravenous fluids, but resulted in equivalent lengths of hospital stay.

Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was used in the economic analysis. The authors assumed that the interventions were equivalent in terms of primary health outcomes. Therefore, this was a cost-
minimisation analysis.

**Direct costs**
The costs were not discounted because of the short timeframe of the analysis. The quantities and the costs were reported separately. The quantities measured were the length of hospital stay, the intensive care unit stay, the operating room time, and the number of units of blood transfused. The quantity/cost boundary adopted was that of the hospital. The quantities were estimated from actual data, retrospectively collected from hospital charts between April 2000 and July 2002. There was little information on how the costs were measured. Both the total hospital costs and reimbursement costs were provided by the hospital financial records. No price year was given.

**Statistical analysis of costs**
The costs were treated stochastically.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was not carried out.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The mean total cost of fast-track AAA was $10,205 (+/- 736), compared with $20,640 (+/- 1,206) for EVAR. This difference was statistically significant, \( p<0.0001 \).

Total hospital reimbursement was lower in the fast-track group, but the difference was not statistically significant ($16,346 +/- 1,623 versus $20,747 +/- 1,712; \( p=0.07 \)).

Overall hospital earnings were higher in the fast-track group ($6,141 +/- 1,280 versus 107 +/- 1,940; \( p=0.01 \)).

**Synthesis of costs and benefits**
The costs and benefits were not combined as a cost-minimisation study was conducted.

**Authors’ conclusions**
Fast-track abdominal aortic aneurysm (AAA) repair was a viable alternative to endovascular abdominal aortic aneurysm repair (EVAR). EVAR was found to cost significantly more than fast-track AAA repair, leading to greater overall hospital earnings.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the choice of the comparator. EVAR is increasingly advocated as a method for repairing AAAs. You should consider whether it is an appropriate intervention in your own setting.
Validity of estimate of measure of effectiveness
The internal validity of the effectiveness results cannot reasonably be guaranteed, given the retrospective nature of the study design and the relatively small sample size. The authors acknowledged that the main drawbacks of the study were that the patients were not randomised, and those who underwent fast-track repair might not have been candidates for EVAR and vice-versa. Further, the study groups were not comparable in terms of preoperative risk factors such as age, size of aneurysm and designated ASA Class. The study sample seems to have been representative of the study population since all patients who underwent either intervention were reviewed. However, more information on the exclusion criteria would have been useful.

Validity of estimate of measure of benefit
The authors did not derive a measure of health benefit. The authors assumed that the interventions were equivalent in terms of primary health outcomes. Therefore, this was a cost-minimisation study.

Validity of estimate of costs
The authors did not state the perspective from which the costs were estimated. It seems that costs relevant to the hospital perspective have been considered. The use of a broader perspective and the inclusion of the indirect costs would have been interesting. The costs and the quantities were reported separately, thus limiting the reproducibility of the study in other settings. There was very limited information on the actual costs collected, thus it was unclear whether all the relevant costs were included in the analysis. No statistical analysis was performed on the cost or quantity data. Discounting was not applied, which was appropriate given that the cost analysis was conducted over one year. Although unclear, costs rather than charges appear to have been used. The price year was not specified, hence impeding any future reflation exercises. The authors commented that it would have been useful to have had preoperative costs as well as 5- or 10-year follow-up costs.

Other issues
The authors acknowledged that, in view of the retrospective nature of the study design and its small sample size and lack of sensitivity analysis, some degree of caution may be required in the interpretation of the study results. The issue of generalisability to other settings or countries was not addressed, although there were some comparisons with other studies. The authors did not present their results selectively and their conclusions reflected the scope of the analysis. One limitation was reported. The authors commented that secondary procedures are common after EVAR and, as the cost comparison did not include the costs of secondary procedures, the cost-advantage of fast-track AAA might have been underestimated.

Implications of the study
The authors indicated that a study with a longer follow-up period would be useful to compare the costs of secondary procedures, conversion to open repair and mortality rates.

Source of funding
None stated.

Bibliographic details

PubMedID
15920651
Subject indexing assigned by NLM

MeSH
Aged; Analgesia, Patient-Controlled; Aortic Aneurysm, Abdominal /radiography /surgery; Blood Transfusion /statistics & numerical data; Colloids /administration & dosage; Female; Hospital Costs /statistics & numerical data; Humans; Isotonic Solutions; Length of Stay /statistics & numerical data; Male; Minimally Invasive Surgical Procedures /economics /methods; Outcome and Process Assessment (Health Care); Plasma Substitutes /administration & dosage; Retrospective Studies; Risk Factors; Time Factors; Vascular Surgical Procedures /economics /methods

AccessionNumber
22005000891

Date bibliographic record published
31/05/2006

Date abstract record published
31/05/2006