Cost-effective appendectomy: open or laparoscopic? A prospective randomized study
Heikkinen T J, Haukipuro K, Hulkko A

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
Laparoscopic appendectomy (LA) in patients with suspected appendicitis. The LA patients were operated on through three reusable ports. All grasping and dissecting instruments were reusable. The mesoappendix and the appendix were separated with titanium clips, absorbable clips, or EndoGIA, depending on the circumstances.

Type of intervention
Diagnosis and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of patients with suspected appendicitis. All patients had to be over 14 years of age and suitable for general anaesthesia and laparoscopy. Patients with suspected perforation and peritonitis were excluded. The other exclusion criteria included pregnancy, and the patient's reluctance to give informed consent.

Setting
Hospital. The economic analysis was carried out in Finland.

Dates to which data relate
Effectiveness and resource use data corresponded to the period between 6 February to 26 September 1996. The price year appears to have been 1994.

Source of effectiveness data
The evidence for the final outcomes was based on a single study.

Link between effectiveness and cost data
Costing appears to have been performed 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. A total of 40 patients were randomised to either the LA group (n=19, median age 34 years (range: 15 - 72)) or to the OA group (n=21, median age 37 years (range: 15 - 59). All the laparoscopic operations were carried out by a surgical resident with a special interest and substantial experience in laparoscopic and open appendectomies. Open appendectomies were performed, either by the same surgical resident, or by a surgical specialist.
Study design
This was a randomised controlled study, carried out in a single centre. The duration of the follow-up appears to have been 1-2 months after operation. There was one conversion (5%) in the LA group because of a gangrenous retrocecal appendix, but none were lost to follow-up. The randomisation was performed via a sealed envelope. A single dose (500 mg) of metronidazole was used at the induction of anaesthesia. Capsules of ketoprofen (100 mg) were prescribed as postoperative analgesics for use at home, while oxycodonechloride and ketoprofen were used at the hospital.

Analysis of effectiveness
The principle used in the analysis of effectiveness appears to have been intention to treat. The clinical outcomes were operative times, postoperative pain and fatigue, postoperative complications, use of analgesia, convalescence - return to normal life, re-admissions, patient satisfaction, and the number of patients in whom the diagnosis was classified as unknown. The patients received specific questionnaires recording the postoperative pain and fatigue scores (visual analogue scale (VAS) from 1 to 10) and the consumption of analgesics for 3 weeks. Questionnaires about the process of recovery were distributed to the patients to be returned after 1-2 months. The two study groups were comparable in terms of baseline clinical characteristics.

Effectiveness results
The effectiveness results were as follows:

Median operative times were 31.5 minutes (range: 16 - 100) for the LA group and 41 minutes (range: 14 - 101) for the OA group, (non significant).

The total operation room times were 91 minutes (range: 53 - 172) for the LA group and 82 minutes (range: 50 - 166) for the OA group, (non significant).

Neither the postoperative pain and fatigue scores nor the consumption of analgesics differed significantly between the two groups.

The complications in both groups were minor, and there was no need for operative intervention.

There were two re-admissions in the LA group because of prolonged fever and urinary difficulties requiring conservative therapy. There were 4 re-admissions in the OA group because of wound pain in one, wound infection in one, prolonged fever in one, and urinary infection in one patient.

Convalescence was significantly faster in the LA group, (p<0.05); the median time to return to normal life was 14 days (range: 3 - 31) in the LA group and 26.5 days (range: 5 - 46) in the OA group, (p<0.05).

Patient satisfaction did not differ between the two study groups.

In two patients in the OA group the diagnosis was classified as unknown, compared with none in the LA group.

Clinical conclusions
The diagnosis accuracy in this study was better with laparoscopy than with standard appendectomy incision. In 95% of the patients in the LA group, diagnosis was made at the laparoscopy. Hence, laparoscopy should play a more important role among fertile women presenting with acute right lower abdominal pain. The complication rate in this study did not differ significantly between the groups.

Measure of benefits used in the economic analysis
No summary benefit measure was identified in the economic analysis, and only individual clinical outcomes were reported (see effectiveness results above).
**Direct costs**

Costs were not discounted due to the short time frame of the cost analysis. Some quantities were reported separately from the costs and the cost breakdown was reported separately. Cost analysis covered the operative costs, taking into account the operative, anaesthesia and total operation room times, staff, type of operation (including type of instrumentation and costs of sterilisation, etc.), and type of anaesthesia, recovery room, and additional expenses (maintenance, administration, cleaning, etc.). The costs of the overnight stays were also included. The ward costs were divided into three subgroups, depending on the nursing, medication, examinations etc., required by each patient. The perspective adopted in the direct cost analysis was that of the hospital. A computer program (Medicost, Mediconsult Co., Helsinki, Finland) was used to calculate the operative and ward costs. The computer program also automatically added the amortisation costs of all instruments. The price year appears to have been 1994.

**Statistical analysis of costs**

Mann-Whitney U-test was used to compare the groups in terms of costs.

**Indirect Costs**

Indirect costs were not discounted due to the short time frame of the cost analysis. Quantities of time to return to work (expressed in days) were reported separately from the costs and cost items were reported separately. Cost analysis covered the costs associated with loss of productivity due to lost work days. It was reported that according to the Finnish Confederation of Industry and Employers, the employer's and community's total cost for sick-leave are approximately three times the patient's salary. This figure consists of the patient's salary and such extras as the salary for the worker's substitute, health insurance expenses, overtime work, production losses, quality impairment, delays, administrative expenses, etc. The perspective adopted in the cost analysis was that of society. The cost calculation was based on the average salary in Finland. The price year was 1994.

**Currency**

Finnish marks (FIM). The 1996 average middle exchange rate was US$1 = FIM 4.6.

**Sensitivity analysis**

No sensitivity analysis was carried out.

**Estimated benefits used in the economic analysis**

See effectiveness results above.

**Cost results**

The median hospital costs per patient were FIM 8,538 in the LA group and FIM 6,788 in the OA group, resulting in FIM 1,750 more costs in the LA group, (p<0.05). The total costs among working patients were lower in the LA group (FIM 20,963 and FIM 27,778) due to faster return to work.

**Synthesis of costs and benefits**

Costs and benefits were not combined.

**Authors' conclusions**

The authors concluded that laparoscopic appendectomy is as safe as open appendectomy. The hospital costs are higher, but LA offers significant cost savings to the payer for working patients.

**CRD COMMENTARY - Selection of comparators**
The strategy of OA using a standard right lower abdominal muscle-splitting incision, as the standard treatment in the context in question, was regarded as the comparator. You, as a database user, should consider whether this is a widely used health technology in your own setting.

**Validity of estimate of measure of effectiveness**
The internal validity of the effectiveness results cannot be guaranteed despite the randomised nature of the study design; this is due to the relatively small sample size and the fact the sample size was not justified through power calculations; the authors stated that the study sample (n=40) was thought to be sufficient for an economic comparison of a typical appendicitis patient with an uncomplicated disease. The two study groups were comparable in terms of baseline clinical characteristics. The study sample appears to have been representative of the study population (a typical appendicitis patient with an uncomplicated disease).

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. The analysis was therefore of cost-consequences design.

**Validity of estimate of costs**
The following features help to enhance the validity of the cost results: some quantities were reported separately from the costs; details of methods of cost estimation were given; the conversion rate and perspective adopted in the cost analysis were specified; statistical analysis was performed on resource use and cost data; and the effects of the two therapeutic modalities on indirect costs (productivity loss) were addressed. Furthermore, based on the comments made by the authors, it appears that the cost analysis was based on true costs rather than charges. However, the cost results may not be generalisable outside the study setting, and the price year does not appear to match that in which the resource use data were collected, while the conversion year does match it; finally, no adjustments appear to have been made for inflation between 1994 and 1996.

**Other issues**
Given the limitations of the study and the lack of sensitivity analysis, some degree of caution may need to be exercised in interpreting the study results. The issue of generalisability to other settings or countries was partially addressed by noting that the economic parameters in this study could not be shifted directly to another hospital in a different health care system. Appropriate comparisons were made with other studies. The issue of the degree to which the study sample was representative of the study population was implicitly addressed in the authors' comments.

**Implications of the study**
A randomised trial with a greater sample size, justified by power analysis, may help to address some of the limitations of this study.

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None stated.

**Bibliographic details**

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