Case-matched comparison of clinical and financial outcome after laparoscopic or open colorectal surgery


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
The use of laparoscopic colectomy (LAC) versus open colectomy (OC) for the treatment of colorectal disorders.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with benign or malignant colorectal disorders that underwent colectomy by either the laparoscopic or the open approach during a 2-year period. To be included in the study, the patients in the two groups needed to be matched for age, gender, diagnosis based on disease-related group (DRG) coding, and operation procedure. Patients in the OC group were excluded from the study if they had already undergone open abdominal surgery (other than cholecystectomy, hysterectomy, salpingo-oophorectomy, appendectomy, or tubal ligation), as this might be an exclusion criterion for undergoing LAC. Colectomy involved procedures such as ileocaecal resection, anterior resection, right or left hemicolecotomy, and sigmoid or subtotal colectomy.

Setting
The setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and cost data referred to cases treated between January 2000 and December 2001. Some of the results might also refer to a short time later, depending on the patients' length of stay and the readmission rates within 30 days after initial discharge. The year to which the prices referred was not stated, but 2000 to 2001 prices were probably used.

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

Link between effectiveness and cost data
The costing was carried out on the same sample to which the effectiveness data referred. Patients in the LAC group were chosen from a prospective hospital database, thus the cost data may have been collected prospectively or retrospectively. The cost data for the OC group were collected retrospectively.
Study sample
All participants were chosen from patients treated in one hospital in the USA. The sample was unselected. The size of the study sample was defined by the number of eligible patients that underwent laparoscopic colorectal surgery during the study period (2 years) and could be matched to patients that underwent open surgery, rather than power calculations. Patients in the LAC group were identified from an institutional laparoscopic database. A total of 234 patients underwent colorectal surgery by the laparoscopic approach during the study period. Those who had not undergone colectomy were excluded from the study. In addition, patients who could not be matched (for baseline characteristics) with patients that underwent open surgery during the same time were also excluded. Thus, 150 patients formed the LAC group. During the same period, 2,293 patients underwent open surgery. Of these, 150 were matched with patients in the LAC group and were included in the study. There was no evidence that the study sample was appropriate for the clinical study question.

Study design
The basis of the analysis was a cohort study. The two groups underwent treatment within the same time period (2 years). However, the data for the LAC group were collected prospectively, whereas the data for the OC group were collected retrospectively by chart review. The study took place in one hospital. The patients were followed up for 30 days after discharge from the hospital. It was not reported whether there was any loss to follow-up.

Analysis of effectiveness
The analysis of the study was conducted on an intention to treat basis. Thus, patients in the LAC group who underwent conversion to OC remained in the LAC group when the results were analysed. The health outcomes evaluated were:

the operating time,

the length of stay,

postoperative complications, and

the number of readmissions within 30 days of discharge.

To eliminate potential confounders, the patients in the two groups were matched one-by-one for age, gender, DRG and operation procedure. In addition, the patients in the two groups were shown to be comparable in characteristics that could potentially confound the results. For example, the body mass index, the American Society of Anaesthesiologists’ classification, and the type of diagnosis (benign or malignant).

Effectiveness results
The average length of stay was 3 days (range: 1 - 65) for the LAC group and 6 days (range: 2 - 59) for the OC group, (p<0.0001).

Complications were reported for 17 patients in the LAC and 27 patients in the OC group, (p=0.1413).

There were 18 readmissions within 30 days of discharge in the LAC and 13 in the OC group, (p=0.4485).

The results for operating time in the two groups were not provided.

Clinical conclusions
There was no significant difference between the two groups in the number of complications and readmissions within 30 days of discharge. The LAC group had significantly shorter operating time and length of stay than the OC group.

Measure of benefits used in the economic analysis
No summary outcome measure was used in the economic analysis. The clinical outcomes were left disaggregated,
although it was shown that overall they favoured the LAC approach. Thus, in effect, a cost-consequences analysis was performed.

**Direct costs**
The study perspective was that of a hospital. Hospital expenses, rather than billed costs, were used in the analysis. All the costs relevant to the perspective adopted were included. The costs were estimated for all of the resources used. These covered the operating room (labour, equipment and consumables), anaesthesia, pharmacy, laboratory, radiology, ward nursing (intensive care and routine), medical therapy (e.g. physiotherapy, respiratory therapy) and emergency services. Professional costs were excluded from the analysis. The quantities and the costs were not reported separately. All the costs were derived from actual data, using the Stanford's integrated hospital cost system and decision software. Discounting was not carried out. This was appropriate since all the costs for every patient were incurred during less than one year. Resource use referred to the years 2000 to 2001. The prices apparently related to the same time, although this was not explicitly stated.

**Statistical analysis of costs**
The costs were treated stochastically. The median values and the interquartile range (IQR) were presented for all cost components included in the analysis. In the cases where the IQR was zero, the whole range of costs was provided. The Wilcoxon matched-pairs test for non parametric data was used to estimate p-values when comparing the costs between the two groups.

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was carried out.

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

**Cost results**
The total direct cost was $3,208.5 per case (IQR: 2,798.8 - 4,034) for the LAC group and $3,654.5 (IQR: 2,922.3 - 4,787) for the OC group. The difference was statistically significant different, (p=0.0034).

The incremental cost for the LAC group was approximately -$450.

**Synthesis of costs and benefits**
The benefits and costs were not combined since no summary benefit measure was chosen for the purpose of the analysis. However, the effectiveness analysis showed that the outcomes of the LAC group were similar to (in the case of complications and readmission rates) or better than (in the case of operating time and length of stay) those of the OC group. In addition, the total costs were lower for the LAC group. Thus, although this was not explicitly stated, LAC proved to be the dominant strategy in comparison with the OC approach.

**Authors' conclusions**
Laparoscopic colectomy (LAC) resulted in significantly lower direct costs than open colectomy (OC) for carefully matched patients.

**CRD COMMENTARY - Selection of comparators**
There was no explicit justification for the comparators used. However, both interventions represented alternative methods of current practice for the treatment of colorectal disorders. As reported in the paper, OC basically reflected routine practice, while LAC was slowly gaining acceptance as a treatment option.

**Validity of estimate of measure of effectiveness**
The basis of the analysis was a cohort study. This study design is not ideal for the study question, as it may be subject to biases and potential confounding. To be included in the study, the participants in the two groups needed to be matched one-by-one in terms of baseline characteristics. This increased the power of the study, as it ensured the comparability of the two groups for the characteristics examined (for matching), but it might also have introduced selection biases. For example, this might have happened if patients with specific characteristics that underwent one of the procedures could not be matched with patients that received the alternative treatment, and were therefore excluded from the study. In this case, the study sample might not be representative of the study population. The generalisability of the results would thus be limited to patients with characteristics that could be matched in the two groups.

The patients received treatment during the same study period. However, the data for the LAC group were collected prospectively whereas the data for the OC group were collected retrospectively. The latter might introduce selection bias (in relation to the matching procedure) and assessment bias. Besides matching, the patients were shown to be comparable for other baseline characteristics. Appropriate statistical analyses were undertaken to account for biases and confounding.

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. In effect, a cost-consequences analysis was performed.

**Validity of estimate of costs**
The study perspective was stated and all the relevant categories of costs were included in the analysis. The costs and the quantities were not reported separately. A statistical analysis of the costs was performed. The costs reflected actual resource use and not charges to the patients. Discounting was not carried out, which was appropriate since the costs for each case were incurred during less than one year. The price year was not explicitly stated, but could be presumed since the years during which the study took place were reported.

**Other issues**
The authors made appropriate comparisons of their findings with those of other studies. The issue of the generalisability of the results to other settings was addressed in relation to the technical skills of surgeons who perform laparoscopy. The study recruited surgeons with equivalent technical expertise to perform the two procedures (LAC and OC), and this was reflected in the results. According to the authors, a variation in laparoscopic skills (as opposed to open surgery expertise) in other centres would tend to skew the results towards greater operating room time, complication rates and overall costs for the LAC group. In general, the authors appeared to present their results fully, and their conclusions reflected the scope of the study.

**Implications of the study**
The authors expressed the opinion that adopting LAC for the treatment of colorectal disorders would reduce the direct institutional costs, and might cause a decrease of several times more in charges to the patients. Moreover, they suggested that the reduction in bed-days required for patients treated by LAC would allow either for new patients to be admitted to the hospital without any increase in fixed costs, or for the closure of bed spaces and reductions in staff
requirement. These both translate into financial benefits from a hospital perspective.

Source of funding
None stated.

Bibliographic details

PubMedID
12832967

DOI
10.1097/01.sla.0000074967.53451.22

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Colectomy /economics /methods; Diagnosis-Related Groups; Female; Health Care Costs; Humans; Laparoscopy /economics; Male; Middle Aged; Treatment Outcome; United States

AccessionNumber
22003001371

Date bibliographic record published
31/07/2004

Date abstract record published
31/07/2004