



## The cost of ignoring acute cholecystectomy

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### ABSTRACT

**INTRODUCTION** Biliary symptoms whilst awaiting elective cholecystectomy are common, resulting in hospital admission, further investigation and increased hospital costs. Immediate cholecystectomy during the first admission is safe and effective, even when performed laparoscopically, but acute laparoscopic cholecystectomy has only recently become increasingly commonplace in the UK. This study was designed to quantify this problem in our hospital and its cost implications.

**PATIENTS AND METHODS** The case notes of all patients undergoing laparoscopic cholecystectomy in our hospital between January 2004 and June 2005 were examined for details of hospital admissions with biliary symptoms or complications whilst waiting for elective cholecystectomy. Additional bed occupancy and radiological investigations were recorded and these costs to the trust calculated. We compared the potential tariff income to the hospital trust for the actual management of these patients and if a policy of acute laparoscopic cholecystectomy on first admission were in place.

**RESULTS** In the 18-month study period, 259 patients (202 females) underwent laparoscopic cholecystectomy. Of these, 147 presented as out-patients and only 11% required hospital admission because of biliary symptoms whilst waiting for elective surgery. There were 112 patients who initially presented acutely and were managed conservatively. Twenty-four patients were re-admitted 37 times, which utilised 231 hospital bed-days and repeat investigations costing over £40,000. There would have been a marginal increase in tariff income if a policy of acute laparoscopic cholecystectomy had been in place.

**CONCLUSIONS** Adoption of a policy of acute laparoscopic cholecystectomy on the index admission would result in substantial cost savings to the trust, reduce elective cholecystectomy waiting times and increase tariff income.

### KEYWORDS

Acute laparoscopic cholecystectomy – Emergency – Cost – Cholelithiasis

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One-fifth of Western adults will develop gallstones, with women three times more commonly affected than men; approximately 20% will become symptomatic.<sup>1</sup> The treatment of choice for symptomatic cholelithiasis remains cholecystectomy. The traditional open approach has now largely been replaced by laparoscopic cholecystectomy which was first introduced into the UK in 1990. Whilst waiting for elective cholecystectomy, approximately 70% of patients will suffer on-going biliary symptoms<sup>2</sup> and up to 50% will require admission.<sup>5</sup> Repeated hospital admissions increase costs and utilise beds unnecessarily. Traditionally, patients admitted with biliary symptoms have been treated conservatively with intravenous fluids, analgesia and antibiotics in cholecystitis to allow the inflammation to settle followed by delayed cholecystectomy.<sup>4</sup> In the early years of laparoscopic cholecystectomy, surgery for acute cholecystitis was eschewed because of increased rates of bile duct injury;<sup>5</sup> however, as it has entered routine practice, it has become clear that there is no increase in complications

associated with surgery in the acute setting.<sup>6</sup> Acute laparoscopic cholecystectomy during the index hospital admission is associated with decreased overall hospital stay.<sup>7,8</sup>

Seven of the nine general surgeons in our hospital performed elective laparoscopic cholecystectomy during the study period, but none performed acute laparoscopic cholecystectomy. Patients admitted with acute biliary symptoms were managed conservatively and cholecystectomy scheduled for a second admission. This study was designed to identify the number of patients admitted with acute biliary symptoms once the decision to perform cholecystectomy had been made; the cost of additional or repeated investigations during these admissions and the cost implications for the trust in terms of tariff income were estimated.

### Patients and Methods

All patients undergoing cholecystectomy between January 2004 and June 2005 were identified from theatre records

and their hospital notes examined. Demographic data were recorded including the date on which the decision was made to list them for cholecystectomy and whether this was made at an out-patient consultation or after acute hospital admission. All subsequent hospital admissions with gallstone-related symptoms were analysed and investigations noted. The business manager for the surgical directorate provided the tariffs by which the trust received income for managing biliary disease and the radiology business manager provided approximate costs of biliary investigations.

## Results

A total of 259 patients (202 females; overall median age, 52 years; range, 18–82 years) underwent cholecystectomy during the 18-month study period. Group 1 consisted of 147 patients (56.7%) who were initially seen as out-patients; the remaining 112 (Group 2) presented as acute hospital admissions. The 131 patients (89%) in Group 1 proceeded uneventfully to elective cholecystectomy after a median wait of 17 weeks; 8 cases (6.2%) were converted from laparoscopic to open procedures because of difficult perihepatic adhesions or unclear anatomy. Six out of the eight conversions were performed by designated upper gastrointestinal surgeons. The remaining 16 cases (11%) were admitted whilst waiting for the cholecystectomy because of acute pancreatitis (6 cases), acute cholecystitis (5 cases) and biliary colic (5 cases). These cases required an additional 16 investigations.

In Group 2, 88 of 112 (78.5%) were managed successfully by conservative means and underwent delayed laparoscopic cholecystectomy a mean of 11 weeks later. Six (6.9%) cases were converted to open operations with the three surgeons who performed most cholecystectomies in our hospital converting two each. The remaining 24 patients necessitated 37 re-admissions; four patients were re-admitted twice, three patients thrice and one patient was re-admitted four times. The indication for re-admission was biliary colic (25 cases), acute pancreatitis (6), obstructive jaundice (4) and acute cholecystitis (4). They utilised 231 hospital bed-days and one day in the high dependency unit (HDU) as a result of acute severe pancreatitis. Table 1 details the investigations (and their costs) undertaken during these re-admissions. Delayed, planned, laparoscopic cholecystectomy was performed a median of 11 weeks (range, 2–28 weeks) after the final acute admission in all cases with a 12.5% conversion rate to open cholecystectomy. One-third of patients admitted with gallstone pancreatitis underwent cholecystectomy within 4 weeks.

Using the primary care trusts' tariffs (Table 2), approximate incomes for the hospital trust can be calculated for both groups comparing the income from their actual management with potential income if all acute biliary admis-

**Table 1 Additional investigations and costs for patients re-admitted with recurrent symptomatic cholelithiasis**

Item	No.	Costs per unit (£)	Total additional costs (£)
Ward bed occupancy/day	231	160	36,960
HDU occupancy/day	1	500	500
USS	19	35	665
MRCP	8	175	1,400
ERCP	7	220	1,540
OGD	1	160	160
Total			41,225

sions had been managed by acute laparoscopic cholecystectomy (Table 3).

## Discussion

Acute laparoscopic cholecystectomy is a safe and efficient way to manage acute symptomatic cholelithiasis on the index admission.<sup>9</sup> It is surprising, therefore, that only 11% of UK surgeons perform acute laparoscopic cholecystectomy during the first admission.<sup>10</sup> The problems of timely radiological imaging and availability of a surgeon happy to perform acute laparoscopic cholecystectomy, as well as adequate access to theatre have been highlighted.<sup>10</sup> At the time of this study, elective laparoscopic cholecystectomy was performed by seven of the nine general surgeons in the department, but three surgeons performed less than 10 cholecystectomies each in 18 months and two have since stopped performing the procedure. Of the cholecystectomies, 60% were performed by upper gastrointestinal surgeons; if an acute laparoscopic cholecystectomy service were introduced, it is likely that it would be limited to these

**Table 2 Tariff of primary care trust fees**

Tariff	Item	Fee
A	Biliary colic/cholecystitis managed as in-patient	£1,122
B	Jaundice/pancreatitis managed as an emergency	£1,918
C	Elective cholecystectomy without complications	£1,741
D	Emergency cholecystectomy without complications	£3,329

**Table 3** Approximate cost comparison of traditional management with acute laparoscopic cholecystectomy

	Actual Management		With acute laparoscopic cholecystectomy for acute biliary admissions		
	Number × tariff*	Income (£)		Number × tariff*	Income (£)
<b>Group 1</b>					
Routine elective LC	131 × C	228,071	Routine elective LC	131 × C	228,071
Admitted (P/OJ)	6 × B	11,508	Admitted + ALC	16 × D	53,264
Admitted (BC/AC)	10 × A	11,220			
Subsequent elective LC	16 × C	27,856			
<b>Subtotals</b>		<b>278,655</b>			<b>281,335</b>
<b>Group 2</b>					
Successful initial management of AC/BC	60 × A	67,320	Initial ALC	112 × D	372,848
Successful initial management of P/OJ	28 × B	53,704			
Elective LC after single admission	88 × C	153,208			
Total re-admissions with AC/BC	27 × A	30,294			
Total re-admissions with P/OJ	10 × B	19,180			
Eventual elective LC	24 × C	41,784			
<b>Subtotals</b>		<b>365,490</b>			<b>372,848</b>
<b>Total</b>		<b>644,145</b>			<b>654,183</b>

\*Tariffs taken from Table 2.

AC, acute cholecystitis; BC, biliary colic; P, pancreatitis; OJ, obstructive jaundice; (A)LC, (acute) laparoscopic cholecystectomy.

two surgeons, as it would seem inappropriate for acute laparoscopic cholecystectomy to be undertaken by 'low-volume operators'. Although the hospital does have a 24-h CEPOD theatre, it is utilised by other specialities and timely access could not be guaranteed for acute laparoscopic cholecystectomy. Therefore, dedicated day-time access to theatre outside of the CEPOD list would probably be required for an effective acute laparoscopic cholecystectomy service.

The guidelines of the British Society of Gastroenterologists for the management of acute pancreatitis published in 1998<sup>11</sup> recommended that cases of gallstone pancreatitis should undergo cholecystectomy ideally within 2 weeks of admission but definitely within 4 weeks, as long as the acute pancreatitis has settled. It is disappointing that only one-third of our cases were treated within these guidelines, although no-one was re-admitted with a further attack of pancreatitis whilst waiting for their cholecystectomy. The guidelines have subsequently changed to recommend cholecystectomy during the same admission if possible.<sup>12</sup>

Earlier studies identified a 72–96-h window after which complication and conversion rates were higher when acute laparoscopic cholecystectomy was performed.<sup>6,13,14</sup> Many hospitals found it difficult to comply with such a timescale

and provided the rationale for not pursuing a policy of acute laparoscopic cholecystectomy. More recent randomised studies suggest that, with increasing experience of acute laparoscopic cholecystectomy, the 96-h watershed is no longer justified.<sup>15,16</sup> Wang *et al.*<sup>15</sup> performed 112 acute laparoscopic cholecystectomies in a 1-year period, with three conversions in the 76 procedures performed within 96 h compared to one conversion in the 36 patients operated on after the 96-h point. There were no bile duct injuries in either group.<sup>15</sup> Similarly, Tzovaras *et al.*<sup>16</sup> analysed 129 acute laparoscopic cholecystectomies in three groups according to timing of operation in relation to presentation – before 3 days, 4–7 days, or after 7 days. There were no significant differences in the rates of complication or conversion rates between groups.

The conversion rate of approximately 6% for elective cases is higher than generally reported,<sup>17</sup> but does not seem to be an effect of the 'low-volume operators' as nearly all conversions were by upper gastrointestinal surgeons; the occasional operators may have only operated on what were perceived to be straight-forward cases and referred on those that would potentially have increased risks of conversion. An alternative to conversion, which was not used in our hospital, is laparoscopic placement of a cholecystostomy tube,

which allows gallbladder inflammation to settle sufficiently to permit later, successful laparoscopic cholecystectomy.<sup>18</sup>

The costs savings for an NHS trust would be significant with potential decreases in re-admission and re-investigation costs exceeding £40,000 during our 18-month study. This would have been coupled with a 1.5% potential increase in tariff income from primary care. In addition, these patients also spent a mean of 11 weeks on the elective waiting list. Index admission surgery for them would have reduced the elective cholecystectomy waiting list by approximately 10%, but acute laparoscopic cholecystectomy for all those initially admitted with cholecystitis, pancreatitis or jaundice (75 patients in this study) would reduce the waiting list for elective cholecystectomy by nearly one-third. A policy of acute laparoscopic cholecystectomy could introduce the potential for patients to be admitted with non-urgent biliary symptoms, simply to expedite their management, although there is currently no evidence that this has happened elsewhere. Our study only takes account of re-admissions at our own hospital and there is clearly the potential for patients to be admitted elsewhere whilst waiting elective cholecystectomy thus underestimating the scale of the problem in our trust. In addition, we did not collect data on patient presentations to their general practitioner (GP) or the emergency department whilst awaiting surgery, although it is known that 65% of patients awaiting cholecystectomy attend their GP and 42% attend the emergency department with continuing symptoms, whilst nearly half take time off work because of biliary symptoms.<sup>19</sup> Our cost calculations are limited to those for our hospital trust alone and underestimate the overall costs of delaying cholecystectomy. It has been suggested that any cost savings would be negligible compared to the costs of litigation for any inadvertent bile duct injury during acute laparoscopic cholecystectomy, but the increasing weight of evidence suggesting that this approach is both safe and appropriate when performed by appropriately trained specialists<sup>9,20,21</sup> negates such an argument.

## Conclusions

Performing acute laparoscopic cholecystectomy on the index admission for acutely symptomatic cholelithiasis would reduce unnecessary repeated investigation, reduce the risk of life-threatening disease (such as acute pancreatitis) and save money without exposing patients to increased risks of operative morbidity. It would also reduce elective waiting times for cholecystectomy without decreasing hospital trust income.

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