Timely cholecystectomy for acute gallstone disease: an ongoing challenge in a New Zealand provincial centre

Melissa J Welch, Andrew R Moot

Abstract

Aims To review the prior management of patients who underwent cholecystectomy for gallstone disease at a provincial centre over a 1-year period, with a particular focus on potentially preventable morbidity by performing index cholecystectomy (IC).

Methods Retrospective case note review was performed for patients who underwent cholecystectomy at Hawke’s Bay’s hospitals between 1 March 2009 and 1 March 2010.

Results 148 cholecystectomies were performed over the study period. Ninety-one patients (61%) were admitted acutely prior to receiving cholecystectomy. The IC rate was 15%. Seventy-seven patients who were admitted acutely could have been suitable for IC, but were discharged. These 77 patients subsequently had an additional 17 readmissions (72 bed-days), 26 ED presentations and 51 outpatient clinic (OPC) visits prior to receiving their eventual operation. Ten patients (13%) developed a complication or recurrence of their acute gallstone disease whilst awaiting surgery.

Conclusion Hawke’s Bay has a low rate of IC and fails to meet current international standards for timely surgical management of acute gallstone disease. A large proportion of those not operated on during their index admission re-present with further morbidity. There are significant barriers to improving these standards in a provincial centre with limited acute surgical resources.

Early laparoscopic cholecystectomy has been shown to be the preferred treatment for acute presentations of gallstone disease. Traditional fears of increased operative morbidity during acute episodes of gallbladder inflammation have now been allayed, with several meta-analyses demonstrating the safety of early surgery for acute cholecystitis.¹

For patients presenting with simple biliary colic, cholecystectomy performed during the index admission prevents further morbidity due to gallstone-related complications, which may otherwise occur during the waiting period for elective cholecystectomy.²

UK guidelines for the management of acute pancreatitis published in 2004 recommends cholecystectomy for acute gallstone pancreatitis during the index admission or within 2 weeks of discharge.³ Without prompt definitive treatment, there is significant risk of a further episode of acute pancreatitis, which may be life threatening.

Despite the known benefits of early cholecystectomy, it remains an international challenge to achieve this in a timely manner. Lack of resource availability and
insufficient institutional organisation have been cited as major contributors to the published low rates of IC.4

In New Zealand, significant efforts have been made in recent years to improve the timely surgical management of acute biliary pathology. Following a concentrated clinician driven change in practice, Christchurch Public Hospital improved their IC rate from 15% in 20055 to 78% in 2007.6

Provision of timely cholecystectomy for acute gallstone disease remains low in provincial hospitals however, where acute surgical services face significant challenges in resource allocation. This was demonstrated in a recent study from Nelson Hospital, who described an IC rate of only 17%.7

Hence the aim of this study was to review the prior management of patients who underwent cholecystectomy in Hawke’s Bay over a 1-year period, with a particular focus on the timing of surgery and the morbidity which may have been prevented by performing cholecystectomy during an index admission.

Methods
A retrospective case note review was performed for all patients who underwent cholecystectomy at Hawke’s Bay’s Hospitals (Hawke’s Bay Hospital Soldiers’ Memorial, and Royston Hospital) between 1 March 2009 and 1 March 2010. These patients were identified via the gallbladder specimens received by the Hawke’s Bay Hospital laboratory over this time period.

Patients who were admitted from ED to a Hawke’s Bay Hospital inpatient ward with acute gallstone-related pathology over the same time period were also identified from the Hawke’s Bay DHB patient management system. These were identified via International Classification of Diseases, 10th revision coding as follows; cholelithiasis (k80x) – including choledocholithiasis with/without cholangitis, cholecystitis (k81x) and acute biliary pancreatitis (k85.1).

Data concerning patients who met inclusion criteria were collected from the Hospital’s Electronic Clinical Application database. This included discharge summaries following inpatient admissions or ED presentations, as well as OPC letters. Basic demographic data and waiting list times were also recorded.

Indication for surgery was recorded based on standard diagnostic criteria for acute gallstone-related diseases. Biliary colic was defined as the presence of upper abdominal pain with radiological evidence of cholelithiasis. Acute cholecystitis was defined as biliary colic in addition to at least one of: temperature >37.5°C, increased white cell (>10x10^9/L) or neutrophil count (>7.5x10^9/L).

Cholecystectomy was defined as radiological evidence of at least one gallstone within the common bile duct. Cholangitis was defined as the presence of choledocholithiasis, temperature >37.5°C, increased white cell or neutrophil count and jaundice.

Gallstone pancreatitis was defined as radiological evidence of cholelithiasis and at least two out of three of upper abdominal pain, elevated blood pancreatic enzyme levels and radiological evidence of pancreatic inflammation. Where more than one diagnosis existed, cholangitis/gallstone pancreatitis took precedence over acute cholecystitis which itself took precedence over biliary colic/choledocholithiasis.

The index admission was defined as the first admission to an inpatient ward meeting the aforementioned criteria for acute gallstone disease. IC was defined as a cholecystectomy during this admission. Acute cholecystectomy was defined as cholecystectomy performed during an unscheduled acute admission (but not necessarily the index admission) for acute gallstone disease.

The primary end points of the study were IC rate and excess morbidity caused by not performing IC in cases where this could have been suitable. Excess morbidity was defined as additional admissions, ED presentations or OPC visits incurred between the index admission and eventual cholecystectomy.

Nominal data is presented as actual numbers. Continuous data is presented as medians (range). The statistical software used was R version 2.15.2 (Vienna, Austria). Kruskall-Wallis test was used to compare ordinal and nominal data. Wilcoxon signed rank test was used to compare groups with
continuous variables. Fisher’s exact test was used for categorical data. *P*<0.05 was considered significant. Missing data was excluded from the analysis.

Ethical approval was not required as this study met the definition of an audit as outlined in the guidelines published by the New Zealand National Ethics Advisory Committee.

**Results**

Over the 1-year study period, 186 cholecystectomies were performed in the Hawke’s Bay at two hospitals. Thirty-eight patients were excluded. Twenty-four underwent cholecystectomy in private for an unknown reason, as they had had no contact with the public hospital. Eight underwent incidental cholecystectomy for cholelithiasis noted at the time of abdominal surgery for a separate pathology. Six patients underwent cholecystectomy for reasons other than gallstone disease—four for acute acalculous cholecystitis and two for unexplained right upper quadrant pain without radiological evidence of cholelithiasis. This left a study size of 148. The median age was 53 (range 18–92) and 78% were female.

126 (85%) operations were performed in the public sector at Hawke’s Bay Hospital. The remaining 22 (15%) operations were performed privately at Royston Hospital.

Patients’ diagnoses at time of surgery are summarised in Figure 1. Sixty-six patients (45%) underwent cholecystectomy for biliary colic, 39 (26%) for acute cholecystitis, 23 (16%) for gallstone pancreatitis, 12 (8.1%) for cholangitis, and eight (5.4%) for choledocholithiasis. Seventeen patients received their operation acutely during an admission. For nine of these patients this was during their index admission and was thus an IC. Five patients receiving acute cholecystectomy were already on the waiting list for elective surgery.

**Figure 1. Diagnosis at time of surgery for all patients undergoing cholecystectomy (n=148)**

![Diagram showing the distribution of diagnoses at time of surgery](image-url)
Figure 2. Prior management and outcome for patients undergoing cholecystectomy in Hawke’s Bay between 01 March 2009 and 01 March 2010
During the same study period 61 patients were admitted with symptomatic gallstone disease. This included the nine patients who underwent IC. The IC rate was therefore 15%.

Figure 2 summarises the prior management of the 148 patients who underwent cholecystectomy during the study period. Ninety-one (61%) of these patients were admitted acutely for symptomatic gallstone disease at some point prior to their surgery.

Of these patients, nine received IC while a further 77 could have been suitable for index surgery but were instead discharged. Five patients would have been unsuitable; three were deemed medically unfit for surgery at that time by either the surgeon or anaesthetist and two patients declined an acute operation. Discharged patients were either placed directly on the waiting list (29–38%) or followed up in OPC (41–53%). Five patients (6.5%) went to the private sector while two (2.6%) were discharged to their general practitioner.

Of the 77 patients who could have been suitable for IC but were discharged without an operation, ten (13%) subsequently developed one or more complications/recurrences (total 13) of their gallstone disease. These are summarised in Table 1.

Fifteen patients (19%) (total 17 admissions) were readmitted with further symptomatic gallstone disease. This resulted in an additional 72 inpatient days. Of the patients who were readmitted, five subsequently underwent acute cholecystectomy. Within this group of patients, there were also an additional 26 ED visits (16 patients) and 51 OPC visits (38 patients) prior to their eventual operation.

<table>
<thead>
<tr>
<th>Table 1. Development of complications following index admission for patients who could have been suitable for index cholecystectomy</th>
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</thead>
<tbody>
<tr>
<td><strong>Index diagnosis</strong></td>
</tr>
<tr>
<td>Choledocholithiasis</td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Acute cholecystitis</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Cholangitis</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Gallstone pancreatitis</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
</tr>
</tbody>
</table>

Of the three patients who were medically unsuitable for IC at the time of their index admission, one subsequently developed recurrent pancreatitis and another developed recurrent acute cholecystitis (four times). All three patients eventually underwent elective cholecystectomy.
Overall median length of stay (including the operative admission) was unchanged between the IC and delayed surgery (for those who could have been suitable for IC) groups (5 versus 6 days respectively) as shown in Table 2.

Table 2. Number of admissions and hospital stay for IC and delayed cholecystectomy groups

<table>
<thead>
<tr>
<th>Outcome</th>
<th>IC n=9</th>
<th>Delayed surgery n=59*</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median number of admissions</td>
<td>1</td>
<td>1 (1–4)</td>
<td>0.10</td>
</tr>
<tr>
<td>Median overall length of stay</td>
<td>5 (3–13)</td>
<td>6 (3–33)</td>
<td>0.56</td>
</tr>
</tbody>
</table>

IC=index cholecystectomy; *For those in whom IC could have been suitable, excluding patients with missing data.

Of the patients who underwent IC, seven (78%) were completed laparoscopically, compared with 86% in the delayed surgery group. One patient required a conversion to open, compared with three in the delayed surgery group. There were four (6.8%) bile leaks in the delayed surgery group and none in the IC group (overall bile leak rate of 2.7%). No major bile duct injuries were sustained.

Table 3. Operative comparisons between IC and delayed cholecystectomy groups

<table>
<thead>
<tr>
<th>Outcome</th>
<th>IC n=9</th>
<th>Delayed surgery n=59*</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laparoscopic</td>
<td>7 (78%)</td>
<td>51 (86%)</td>
<td>0.51</td>
</tr>
<tr>
<td>Conversion rate</td>
<td>1 (11%)</td>
<td>3 (5%)</td>
<td>0.41</td>
</tr>
<tr>
<td>Bile leak</td>
<td>0 (0%)</td>
<td>4 (6.8%)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

IC=index cholecystectomy; *For those in whom IC could have been suitable, excluding patients with missing data.

The median waiting list time for the 112 patients who underwent public elective cholecystectomy was 129 days (3–1552). Waiting times by diagnosis are shown in Table 4. Twenty-three patients underwent cholecystectomy for gallstone pancreatitis. Of these patients, 22 were admitted acutely, with five cholecystectomies performed acutely, and a further two performed within 2 weeks of discharge.

Table 4. Median waiting time to surgery by diagnosis for public elective cholecystectomies (n=112)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Median waiting time to surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biliary colic</td>
<td>138 (7-1552)</td>
</tr>
<tr>
<td>Choledocholithiasis</td>
<td>174 (16-459)</td>
</tr>
<tr>
<td>Acute cholecystitis</td>
<td>136 (10-805)</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>121 (8-465)</td>
</tr>
<tr>
<td>Gallstone pancreatitis</td>
<td>61 (3-1231)</td>
</tr>
<tr>
<td><strong>Overall:</strong></td>
<td><strong>129 (3–1552)</strong></td>
</tr>
</tbody>
</table>
Discussion

Good quality evidence suggests that the definitive management of patients with acute gallstone disease should involve early cholecystectomy. Ideally this should be performed during the index admission in order to prevent morbidity associated with further gallstone-related complications\(^1\).

Hawke’s Bay Hospital’s IC rate is 15%. This compares poorly with figures published by tertiary centres around New Zealand, such as Christchurch Public Hospital (78%)\(^6\), Middlemore Hospital (66%)\(^7\) and Auckland Public Hospital (63% - gallstone pancreatitis only)\(^10\). Of concern is the low rate of surgery performed within two weeks following presentation with acute gallstone pancreatitis (32%). The median waiting list time for those not operated on acutely was 61 days – well outside the time frame recommended by the UK guidelines\(^3\).

Forty-three patients (29%) underwent cholecystectomy for pathology relating to the presence of common duct stones (choledocholithiasis, cholangitis or gallstone pancreatitis) – a group of patients with the most potential to become critically unwell. This is a high figure, reflecting a regional population receiving delayed operative management.

Patients with simple biliary colic typically wait many months for elective cholecystectomy. In our study, the median waiting time for these patients was 138 days. This was relatively similar to waiting list times for patients with acute cholecystitis, cholangitis and choledocholithiasis.

Patients with more severe complications of gallstone disease should be operated on with priority over biliary colic and our study shows this prioritization needs review. Improvements in communication should be made with waiting list booking staff regarding the comparative urgency of particular diagnoses.

Studies have shown that rates of admission with acute gallstone pathology increase in accordance with length of time spent on the waiting list\(^11\). Overall hospital stay is significantly shorter in groups of patients receiving early treatment.\(^12\)

In our study however, there was no significant difference in total length of stay between the index and delayed surgery groups. This was unexpected given the number of readmissions observed within the delayed surgery group. It therefore demonstrates the inefficient way in which patients receiving acute surgery were managed - including time spent obtaining radiological investigations and waiting on the acute operating list prior to theatre.

In our study, 86 patients admitted acutely prior to their eventual operation could have potentially undergone IC. Only nine patients actually did. The re-presentation rate with interval complications or recurrence of symptoms of those treated conservatively was unacceptably high. During the time between first admission and eventual surgery, there were an additional 17 admissions (total of 72 inpatient days), 26 ED presentations and 51 OPC visits, all of which could have been potentially avoided.

While a formal cost–benefit analysis was not performed, financial data supplied by the Hawke’s Bay DHB enables the cost of these additional presentations to the public
sector to be estimated at $59,520 (assuming one overnight surgical bed = $450, one ED presentation = $334 and one OPC visit = $250). It must be mentioned however, that reducing one patient bed-day does not necessarily save $450, as the ward and staffing infrastructure are already in place. Reducing unnecessary stays over time will however translate into financial savings long term.

The cost of readmissions is only the tip of the iceberg in terms of the financial cost of delaying cholecystectomy. The cost of procedures, investigations, pharmaceuticals, admissions to other hospitals and presentations to GP’s are an additional financial burden to be considered. Furthermore, health system costs fail to take into account the social cost of patient suffering and lost income. Overall, it would seem more cost effective to perform early cholecystectomy.

It is clear however that significant barriers exist to performing surgery in accordance with published guideline recommendations. A survey of UK surgeons identified surgeon reluctance, delays to confirming diagnosis and lack of acute surgical facilities as key barriers to early cholecystectomy. When compared with tertiary centres in New Zealand, different constraints exist at provincial hospitals contributing to low rates of IC. Identification and recognition of these barriers is the first step towards improving timely operative management.

Like many provincial centres, Hawke’s Bay Hospital has difficulties with access to acute surgical facilities. During the study period, Hawke’s Bay had one acute surgical theatre, shared between all surgical specialties. Cholecystectomy should ideally be performed during the day due to the potential requirement for intra-operative cholangiogram, further constraining available theatre time. Granted, time taken up by acute cholecystectomy is time taken away from other specialties, with the relevant incurred costs to those departments. Since the study period however, Hawke’s Bay Hospital has opened a further theatre specifically for orthopaedic acute cases. It is anticipated that this additional resource will increase theatre access for acute cholecystectomy cases.

Hawke’s Bay Hospital has accreditation to supervise SET trainees up to year three only. A consultant surgeon must therefore be available to supervise registrars performing acute cholecystectomies. Due to the low number of acute admissions compared with tertiary centres, the on call consultant is routinely otherwise occupied with their own elective list or clinic, thereby limiting their availability for acutes.

With the Ministry of Health’s focus on provision of elective surgical procedures, there is reluctance by hospitals to cancel elective patients in order to manage the acute load. With this study demonstrating the financial consequence of delaying surgery for acute gallstone disease it would seem prudent that elective surgeries may need to be postponed from time to time. With just 61 patients admitted with acute gallstone pathology over the one year study period, it would only require a few additional cholecystectomy cases per week to dramatically improve the IC rate.

Hawke’s Bay Hospital employs one gastroenterologist able to perform ERCP, with only one list per week. Patients requiring common bile duct clearance are therefore routinely discharged to return for elective ERCP at a later date. By the time this occurs, the opportunity for early cholecystectomy may have elapsed. A pragmatic
solution would be to operate in the first instance and manage ductal stones postoperatively when ERCP is more readily accessible.

Our paper reports an IC rate similar to that published by Nelson, another provincial hospital. It is likely that this is the case throughout many provincial centres in New Zealand. Sakowska et al in Nelson proclaim that taking all these barriers to consideration could mean that provision of an acute cholecystectomy service may be unrealistic in a provincial centre and that the focus should be shifted to providing an operation on an elective list within a minimum safe timeframe.

A definitive date should be provided on discharge from hospital for those patients who would be suitable for IC. In our study 41 (53%) patients who could have received IC were followed up in outpatient clinic, compared with 29 (38%) who were booked onto the waiting list directly. In patients without suspicion of choledocholithiasis and who do not require additional investigations, routine outpatient follow-up prior to booking patients onto the waiting list would seem unnecessary and time delaying.

Patients undergoing cholecystectomy in private were included in this study to demonstrate the not insignificant number of patients accessing the private service in order to obtain timely surgery following an acute admission (19%).

In conclusion, provincial centres face significant challenges in improving timely operative management of acute gallstone disease with respect to current international standards. Hawke’s Bay in particular has a very low rate of IC, with a considerable proportion of those discharged without an acute operation re-presenting to health services with the associated additional morbidity and financial expense.

We have suggested a number of pragmatic solutions that may improve the rates of acute surgery for this disease whilst working within the constraints of a provincial surgical service. It will be important to implement these strategies and reassess progress. As found by Christchurch, a coordinated clinician driven approach will be crucial to this process.

Competing interests: Nil.

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References:
3. Working Party of the British Society of Gastroenterology; Association of Surgeons of Great Britain and Ireland; Pancreatic Society of Great Britain and Ireland; Association of Upper GI


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