

ORIGINAL

## Day case laparoscopic cholecystectomy, room for improvement: A United Kingdom District General Hospital experience

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### ABSTRACT

**Background:** Laparoscopic cholecystectomy (LC) is the surgical treatment of choice for symptomatic gallstones. The current NHS innovation drive is to perform 60 % of all elective laparoscopic cholecystectomies as day cases.

**Methods:** A retrospective data analysis was performed for all day case laparoscopic cholecystectomies in a single institution between January 2009 and December 2011. Causes of failed discharges, post-operative complications and readmission rates were recorded.

**Results:** A total of 476 patients were listed as day-cases. 348 patients (73 %) were discharged the same day. 128 patients (27 %) were admitted, of these 89 (69.5 %) were discharged within 24 hours and 21 (16 %) were discharged within 2 days. 39 patients who failed discharge were due to pain only (30 %), 6 due to nausea & vomiting (5 %), 55 due to other reasons (43 %) and the remaining 28 due to a combination of symptoms. All 15 patients who had a drain inserted, stayed overnight ( $P < 0.001$ ). All those patients who had a procedure lasting longer than two hours, failed same day discharge ( $P < 0.001$ ). Our overall rates for complications, conversions to open and readmission were 2.5 %, 1.5 % and 1.7 % respectively. Our daycase rate doubled from 22 % in 2009 to 50 % in 2010 and then plateaued at 48 % in 2011 as more emergency cases were being performed over this period.

**Conclusion:** Day case laparoscopic Cholecystectomy is a feasible and a safe treatment for symptomatic gallstones. Patients should be listed on a morning list and drain insertion avoided whenever possible, with robust protocols for management of post-operative pain and vomiting.

**Keywords:** Day-case, day surgery, laparoscopic cholecystectomy, day case laparoscopic cholecystectomy.

### INTRODUCTION

Gallstones are common and 4 to 45 % of the adult UK population are diagnosed with gallstones depending on age and gender (1,2). Although the majority are asymptomatic, about 1 to 4 % becomes symptomatic every year. Since 1990s, laparoscopic surgery for gallstones became more popular (3-5). The median hospital stay dropped from 8.8 days for open surgery down to 2.7 days for Laparoscopic cholecystectomy (LC) (6).

LC is currently the treatment of choice for symptomatic gallstones as it offers a shorter hospital stay due to smaller wounds and reduced postoperative pain. Patient satisfaction (7,8) and cost effectiveness (9,10) render day case laparoscopic surgery desirable for clinicians, surgeons and managers, but patient safety still remains the main priority (11). Bleeding and bile duct injury are the serious complications that can be encountered following LC (12,13) and are usually detected intra-operatively.

While some clinicians argue that patients feel safer if they are observed overnight (12), advocates of day surgery claim that significant bleeding following LC is rare (12) and that bile duct injury is either detected intra-operatively or few days later (12). Gurusamy et al 2008 showed that there was no difference in the rates of serious complications after LC whether patients were discharged home either on the same day or if they were admitted overnight for observation (14). In the year 2000, with the aim of continuous healthcare improvement, the NHS Plan advocated by the department of health in UK proposed that 75 % of all elective surgery should be performed as day case surgery (15). The British Association of Day Surgery (BADs) recommended that 60 % of elective laparoscopic cholecystectomies could be done as day cases per annum (16).

The BADs standards recommended for day case LC are summarized as follows (17).

The following patient factors should be considered when offering a day case procedure: previous upper abdominal surgery (e.g. gastrectomy is a relative contraindication), severity of gallstone complications (previous attacks of pancreatitis and/or obstructive jaundice, frequent episodes of cholecystitis and their severity), Body Mass Index (BMI), existing co-morbidities and patient education and understanding.

Surgery & anaesthesia-related factors that should be considered include anaesthetic technique, surgical technique, post-operative management of pain, nausea and or vomiting, operative time and adequate recovery time prior to discharge (at least 6 hours of monitoring advised [17,18]).

We present our experience of performing day case LC examining these various factors influencing a day case procedure with a view to improve our practice and achieve these recommendations.

## PATIENTS AND METHODS

We carried out a retrospective cohort study over a three-year period from January 2009 to December 2011. Patients, booked to have a day case LC, were identified through the theatre computer system; using the code "J183" i.e. Total Cholecystectomy. Inclusion criteria included all patients booked for day case LC during the study period. Exclusion criteria included all other patients booked to undergo elective inpatient, expedited and emergency LC. All patients identified as breaches by the "Hospital Episode Statistics" (HES) were analysed and their pre-operative, intra and post-operative records were reviewed. We examined various parameters that could have potentially had an impact on patient's hospital length of stay such as patient's body mass

index (BMI), co-morbidities (using the American Society of Anaesthesiology "ASA" classification), underlying psychological issues (e.g. depression, anxiety), surgeon's and anaesthetist's level of experience/grade, drain insertion, operative time and length of recovery.

A member of the surgical team and the nursing staff using a standard protocol reviewed all patients in the pre-assessment clinic. Patients unsuitable for a day case procedure were identified prior to admission. Any patient with BMI > 45 and/or chronic pain issues were referred for a further anaesthetic assessment, and a joint anaesthetic/ surgical decision was made regarding overnight stay. All patients received routine deep venous thrombo-prophylaxis pre-operatively in accordance with their body weight, with subcutaneous low molecular weight heparin.

A standard anaesthetic protocol was followed, but it was up to the individual anaesthetist to tailor the anaesthetic to the patient's needs. Anaesthetic induction was carried out in all patients using propofol, midazolam, fentanyl and atracurium and maintained using isoflurane +/- nitrous oxide till gall-bladder bed dissection was complete. Patients routinely received cyclizine +/- dexamethasone intra-operatively for antiemesis (17) along with intravenous (IV) fluids. Nasogastric tube intubation was not undertaken routinely in all cases. They were inserted only at the surgeon's discretion to decompress a dilated stomach to gain access to the surgical field. IV antibiotics were not given routinely in our practice, but only given in case of spillage of bile or stones or if there was significant active inflammation detected intra-operatively.

IV paracetamol and tramadol were used for intra and post-operative analgesia and IV ondansetron for anti-emesis as required. Patients were encouraged to mobilize early and oral fluid and dietary intake were given as soon as tolerated. On discharge, patients were given wound care advice, and advised to contact their general practitioner (GP) or the emergency admissions unit at the hospital or present to the Accident & Emergency (A&E) department in case of severe symptoms within 48 hrs of the procedure.

## Inclusion and exclusion criteria

The inclusion criteria for day-case LC were patients with symptomatic gall stones, ASA grades 1, 2 and 3 who had adult company at home for the first 48 hours and a history of uncomplicated gallstones (no previous episodes of severe pancreatitis or cholecystitis or percutaneous cholecystostomies). These patients with complicated gall stones were thoroughly assessed for suitability for a day case procedure and were offered day case LC only if the surgical procedure was not expected to be difficult and there was always a provision for overnight admission if required.

Patients with severe sleep apnoea and previous extensive abdominal surgery were not considered for day case LC.

### Discharge criteria

Patients were discharged the same day if they were able to tolerate oral diet, pass urine, mobilise safely, were haemodynamically stable without significant pain, nausea and or vomiting. Furthermore, wounds had to be completely dry at the time of discharge. For quality assurance, the Consultant in charge of the patient took the decision for discharge in the initial 2 years of the study and subsequently this evolved into a protocol-driven nurse led discharge.

Primary outcome was classified as a successful day case LC and discharge in patients identified for a day case procedure preoperatively. Secondary outcomes were considered as failed day case discharges (due to complications directly related to surgery, post-operative pain, nausea and vomiting and other reasons for failed discharge) and readmissions following a successful day case procedure and discharge.

### Statistical methods

Statistical analysis was carried out using the Chi-Square test to compare variables between the groups where applicable.

## RESULTS

A total of 476 patients were booked for day-case LC over the three-year period. The breakdown for all laparoscopic cholecystectomies performed during that period is shown in Table I. Our day surgery rate doubled from 22 % in 2009 to 50 % in 2010 and 48 % in 2011, but we were also performing more emergency/same-admission LC (Figure 1).

TABLE I

BREAKDOWN OF LAPAROSCOPIC CHOLECYSTECTOMY OVER THE THREE-YEAR PERIOD

|                    | 2009       | 2010       | 2011       |      |
|--------------------|------------|------------|------------|------|
| Elective Daycase   | 73 (22 %)  | 209 (50 %) | 194 (48 %) | 476  |
| Elective Inpatient | 231 (70 %) | 156 (37 %) | 130 (33 %) | 517  |
| Emergency          | 27 (8 %)   | 55 (13 %)  | 77 (19 %)  | 160  |
|                    | 332        | 420        | 401        | 1153 |

The initial HES search identified 250 breaches. After reviewing all medical case notes, only 150 cases that were initially booked for day surgery were identified as breaches. Amongst the remaining, 89 were booked as elective inpatients and 11 had emergency LC and these were excluded for analysis. Among these wrongly coded 100 cases, only 8 (8 %) were from the third year. Out of the 150 breaches, 22 patients were still discharged the same day (i.e. coding error). Therefore true day case breaches were only 128 cases. Analysis of these breaches yielded the following results; the male/female ratio was 31/97, and the median age was 53 years (range 18-78 years). Patients' obesity is displayed in Table II according to the BMI classification (Table II) (19). BMI was not an inclusion or exclusion criteria in our study. Significant obesity (class II and morbid) was not found to be a significant factor hindering day surgery as shown in other studies (20). Indeed this was borne out in this study as 101 patients (80 %) of breaches had a BMI < 35 and only 26 patients (20 %) who breached had a BMI ≥ 35.

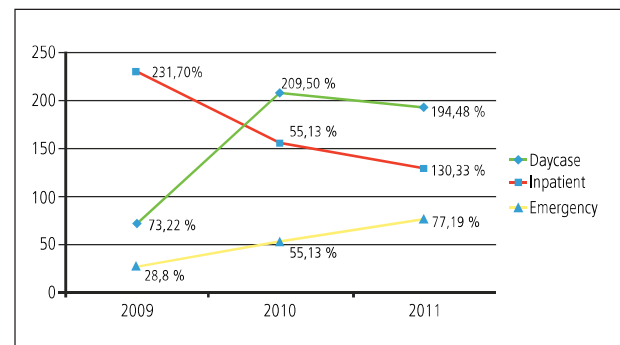


Fig. 1. Progress of laparoscopic cholecystectomy over the three-year period.

TABLE II

BMI OF TRUE DAY-CASE BREACHES

| CLASSIFICATION             | BMI           | NUMBER OF PATIENTS |
|----------------------------|---------------|--------------------|
|                            | Not available | 1                  |
| Underweight                | < 18.5        | 0                  |
| Desirable weight           | 18.5-24.9     | 17                 |
| Overweight                 | 25-29.9       | 49                 |
| Obese - class I            | 30-34.9       | 35                 |
| Obese - class II           | 35-39.9       | 14                 |
| Morbidly obese - class III | ≥ 40          | 12                 |

The agreed anaesthetic protocol was followed in all patients. The majority of breaches were ASA class 1 (104 patients, 81 %), 22 patients were class 2, and the remaining two patients were class 3 using the ASA classification illustrated in Table III (21). Therefore good patient selection in our cohort did not render existing co-morbidity a significant factor affecting breaches.

TABLE III

RISK CLASSIFICATION OF THE AMERICAN SOCIETY OF ANAESTHESIOLOGY (ASA)

| CLASSIFICATION | PHYSICAL CONDITION OF THE PATIENT                |
|----------------|--|
| 1              | Normally healthy                                 |
| 2              | Discrete systemic disease                        |
| 3              | Serious, non-incapacitating systemic disease     |
| 4              | Life-threatening incapacitating systemic disease |
| 5              | Moribund with death expected within 24 h         |

Anaesthesia was carried out by a consultant in 109 cases (85 %), and by registrar/staff grade in the remaining 19 patients. Seven surgeons, across different subspecialties (four colorectal surgeons, two upper gastro-intestinal surgeons and one general/endocrine surgeon), provided the day case service. Surgery was performed by a consultant grade in 96 patients (75 %), and by a registrar/staff grade in the remaining 32 cases supervised by a consultant. Therefore anaesthetist and surgeon's grade was not a significant factor affecting breaches.

All of our surgeons used the standard four-port technique. The pneumoperitoneum was induced with the open Hasson's technique, and then maintained at a pressure of 10 mm Hg. Insufflation pressure was rarely increased up to 13 mm Hg to improve the surgical view and dropped back to 10 mm Hg once the critical surgical dissection was done. Pneumo-peritoneum does not appear to be a significant factor affecting day-case breaches in other studies (22). This was not accurately demonstrated in this study, as documentation was not accurate.

Five patients (out of the 128) had previously been diagnosed with psychological issues namely anxiety and depression. However these numbers were too small to show any significance that prevented same day discharge. Of these 5 patients, three patients had difficult procedures. One procedure was difficult due to presence of significant inflammation and adhesions. Two other procedures were longer than 2 hours, where one was converted to an open procedure and the other was complicated by intra-operative

bleeding. The two remaining patients were admitted overnight for pain control and discharged the next day.

34 day case breaches had a drain inserted, of which fifteen patients had no clear reason documented, which was a statistically significant factor preventing same day discharge ( $P < 0.001$ ). In 5 cases, a drain was inserted after conversion to an open procedure. Four other patients had drains inserted following difficult subtotal resections and common bile duct (CBD) stones requiring Endoscopic Retrograde Cholangiopancreatography (ERCP) on the same day. Indications for drain insertion are illustrated in Table IV.

TABLE IV

INDICATIONS FOR DRAIN INSERTION IN DAY CASE BREACHES

| NUMBER OF PATIENTS | REASON/FINDING  |
|--------------------|---|
| 15                 | Non specific reasons (12 patients discharged within 24 hrs) |
| 12                 | Difficult procedure +/- conversion                          |
| 2                  | Laparoscopic subtotal cholecystectomy                       |
| 2                  | CBD stones + ERCP on the same day                           |
| 1                  | Associated intra-operative Asystole + liver bed ooze        |
| 1                  | Associated urine retention                                  |
| 1                  | Pneumonia, low O <sub>2</sub> saturation & HDU admission    |

The mean operative time (time from knife to skin till wound closure) was 95 minutes (range 40-245 minutes). The procedure lasted for two hours or longer in 31 cases. 30 of these 31 patients breached their intended day case stay, which was statistically significant ( $P < 0.001$ ). Prolonged and difficult procedures were due to significant inflammation and adhesions compromising the surgical operative field. This led to conversion to open in seven cases, of which two patients had subtotal cholecystectomy. The total hospital length of stay ranged from 1 to 14 days as shown in Figure 2.

The most common cause of failed discharge was persistent pain requiring overnight admission for pain control in 39 patients (30.5 %) or a combination of pain with other symptoms in 15 patients (11.7 %). Six breaches (4.7 %) were due to nausea and vomiting alone, or combined nausea and vomiting with other symptoms in eleven (8.6 %) patients. 82 patients had other (55) and combined (27) symptoms as outlined in Figure 3. Among "other" causes that led to overnight admission, the commonest were: overnight drain

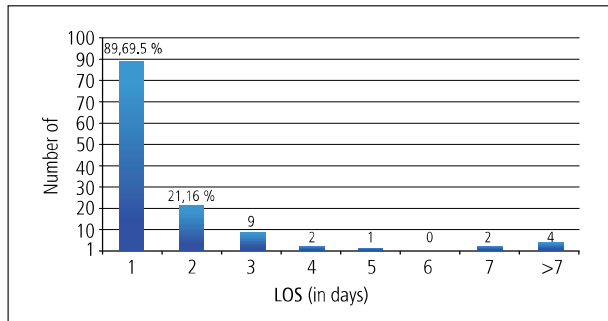


Fig. 2. Total hospital length of stay (in days).

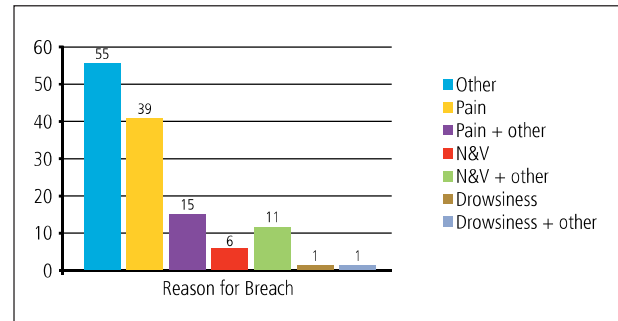


Fig. 3. Reasons for day case breaches.

insertion in 16 cases, 15 procedures described as difficult, 7 conversions to open, 7 had poor documentation, and 6 patients had post-operative urinary retention. All other reasons for failed discharges are detailed in Table V.

Twelve patients (9 %) developed post-operative complications, 8 of which required readmission. The most common complication was recurrent abdominal pain in 8 patients, and wound infection in 3. The overall readmission rate within 30 days was 1.47 %, but immediate readmission within 48 hours for a day case LC was only 0.2 %. Complications are illustrated in Table VI with readmissions and the hospital length of stay (LOS) in days.

Post-operative recovery time was calculated as the time from patient's return to the day surgery unit until the time of discharge. In our study, recovery time started when the patient left the post-operative care unit (PACU) to return to the day surgery ward. As our day surgery unit closes at 21:00, all patients who left PACU after 15:00 had less than

6 hours recovery time. In the first two years, all patients who had six hours recovery or less in the day surgery unit breached their intended day case admission. After assessing the first two years results and applying our new discharge protocol, some patients who left PACU between 15:00 & 17:00 in the third year (2011), managed to be discharged successfully on the same day. All patients who had less than 4 hours recovery time failed to be discharged on the same day. Time out of PACU is displayed in Figure 4.

## DISCUSSION

This study represents one of the largest up-to-date UK studies. Patient demographics (age, gender, ASA grade) were comparable between successful day-cases (348) and failed discharges (128). Coding errors were noted during the first two years of our study, but decreased significantly over the third year. Accurate coding systems are crucial for record keeping and for receiving the correct tariff from primary

TABLE V

### OTHER REASONS LEADING TO BREACH OF DAY-CASE SURGERY

| OTHER REASONS FOR BREACH  | NUMBER OF PATIENTS |
|---|--------------------|
| Overnight drain (including high output)   | 16 (4)             |
| Difficult procedure (including gall bladder tear + bile leak)   | 15 (6)             |
| Conversion to open  | 7                  |
| Poor documentation  | 7                  |
| Urine retention   | 6                  |
| Late finish / low oxygen saturation   | 4 (each)           |
| Tachycardia / low blood pressure  | 3 (each)           |
| Pyrexia / social / high blood pressure  | 2 (each)           |
| Non-procedure related (chest pain / ECG changes / vasovagal episode / bradycardia / AF / intra-operative asystole / blood in endotracheal tube / CBD stones + ERCP / allergic reaction / red tender right breast / painful right eye) | 1 (each)           |



TABLE VI  
POST-OPERATIVE COMPLICATIONS IN DAY-CASES

| COMPLICATIONS                                     | READMISSION                           | LOS (IN DAYS) |
|---|---------------------------------------|---------------|
| Low O <sub>2</sub> saturation + SOB               | No                                    | 14            |
| Low O <sub>2</sub> saturation + SOB               | No                                    | 4             |
| Umbilical port bleeding + fast AF & ST depression | No                                    | 4             |
| Abdominal pain (wound infection)                  | No                                    | 0             |
| Worsening RUQ pain 6 days later                   | Yes (CTPA: postop atelectasis)        | 1 then 3      |
| Wound infection 3 days later                      | Yes                                   | 1 then 2      |
| Pain around drain site 5 days later               | Yes                                   | 1 then 2      |
| Recurrent RUQ pain 7 days later                   | Yes (MRCP: normal)                    | 0 then 1      |
| Recurrent RUQ pain 8 days later                   | Yes (MRCP: normal)                    | 1 then 2      |
| Recurrent RUQ pain 9 days later                   | Yes (subphrenic collection aspirated) | 1 then 3      |
| Abdominal pain & DVT 4 days later                 | Yes                                   | 0 then 1      |
| Severe postop abdominal pain 1 day later          | Yes                                   | 0 then 1      |

Right upper quadrant (RUQ), magnetic resonance cholangiopancreatography (MRCP), computed tomographic pulmonary angiography (CTPA), deep vein thrombosis (DVT).

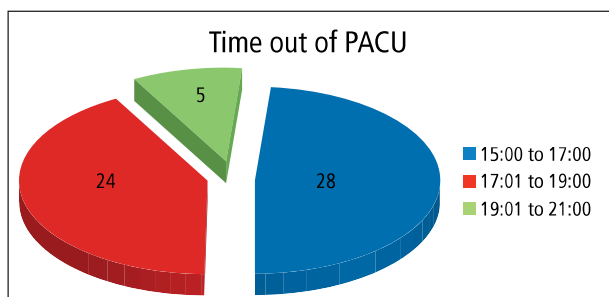


Fig. 4. Failed discharged with less than six hours recovery time.

healthcare providers. Only 150 out of the initially identified 250 cases were true day case procedures. Of the wrongly coded 100 cases, only 8 (8%) were from the third year. 22 of the 150 identified day case breaches were still discharged the same day, 14 (64%) of which were from the third year. Thus although these 14 cases were correctly coded as day cases, outcome coding (successful versus failed day cases) is also crucial as it reflects the overall unit performance.

Accurate documentation is essential and in our study seven failed discharges had no clear reasons stated in their notes for an overnight admission (6 patients in the first 2 years). All seven patients were discharged successfully the next day. Patient education is also vital during the decision-making process. Two failed discharges were due to social reasons, which could have been avoided with better counselling, both of which occurred in the first 2 years. Fol-

lowing assessment of the first two years performance, a new discharge protocol was instigated which led to improvement in the services provided and patient education in the third year.

Drain insertion should be avoided whenever possible or only when indicated. Briggs et al 2009 discharged patients, who had a drain inserted for mild ooze intra-operatively, the same day as these patients were monitored for 6 hours post-operatively and the drain was removed prior to discharge (23). Therefore a recovery period of at least 4 hours is advisable. Our study clearly demonstrates that drain insertion had a negative outcome for day case LC.

Abdominal pain is still the main cause of in-hospital morbidity and readmission; hence robust measures for management of post-operative pain are essential. Our conversion to open rate of 1.5 % compares well with the literature (23,24). Our morbidity and complication rate of 2.5 % compares favourably with those reported by other centres (7-10,23,24). There were no mortalities in either group during the study. Also our overall readmission rate of 1.7 % compares favourably with other national and international centres (23,24) and our readmission rate within 48 hrs was only 0.2 %.

Our overall day case rate was 48 % (476/993) for the period of this study but showed a year on year improvement. Our overall day case discharge rate was 73 % (348/476) but again showed a declining unplanned admission rates in the

latter half of this study period. On the basis of our inclusion criteria, when the study was initiated a higher than accepted unplanned admission rate was accepted in favour of a high day case rate. Furthermore, we were able to achieve a high day case rate without a dedicated day care surgery unit. This study shows that day case LC is safe and feasible in a district general hospital setting in the UK (4,5,7-10,23-30) though there is room for further improvement within our service.

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