Laparoscopic Cholecystectomy in Day Surgery

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10.1 Introduction

Laparoscopic cholecystectomy (LC) has now become the "gold standard" treatment for symptomatic gallstone disease. Thanks to its advantages (i.e., smaller scars, reduced postoperative pain), patients enjoyed a shorter hospital stay and consequently, many healthcare providers have started to explore the feasibility of offering LC as a day-case procedure, and in 1990 some authors had already reported the first experiences of ambulatory surgery [1, 2].

When LC was first introduced, patients were admitted 1 day prior to their operation and stayed for 1–2 days postoperatively. With improvements in surgical and anesthetic technique, the concept of same-day admission (SDA) was introduced in 2001, thereby shortening the length of stay (LOS) by 1 day.

Day-surgery setting allows to combine patients' satisfaction to cost-saving policies that seems to be more and more important for a modern hospital management. Minimally invasive surgery seems to be the ideal surgical approach for day-case

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Table 10.1 Practice/clinical guidelines published on January 2010 by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)

1. Search date: July, 2009
2. Search terms: "laparoscopic cholecystectomy hospital discharge"
3. Limits: English language, humans, and published within the last 5 years
4. Results: 58 articles, abstracts reviewed, 8 chosen as pertinent
Levels of evidence
I – Evidence from properly conducted randomized, controlled trials
II – Evidence from controlled trials without randomization or cohort or case-control studies or multiple time series, dramatic uncontrolled experiments
III – Descriptive case series, opinions of expert panels
Scale used for recommendation grading
Grade A – Based on high-level (level I or II), well-performed studies with uniform interpretation and conclusions by the expert panel
Grade B – Based on high-level, well-performed studies with varying interpretation and conclusions by the expert panel
Grade C – Based on lower-level evidence (level II or less) with inconsistent findings and/or varying interpretations or conclusions by the expert panel

procedures since reducing trauma to a minimal level allows patients to return quickly to a normal life with minimal nursing assistance.

Early experience of day-case laparoscopic cholecystectomy produced very high overnight admission rates of up to 44 % [3], but more recent studies have shown more acceptable overnight unplanned admission rates of less than 10 % [4–7]. It can be argued that this is far in excess of the 2–3 % normally accepted for intermediate day-case procedures, but if overall day-surgery rates are to achieve the hoped for 75 %, as targeted in the US National Health plan [8], then this higher unplanned admission rate for more major procedures is acceptable, at least initially, in most units. The reduction in overnight admission rates to less than 10 % is due to rigorous patient selection, accepting only well-motivated patients, and attention to detailed anesthetic and surgical technique.

SAGES guidelines [9] for the clinical application of laparoscopic biliary tract surgery—Practice/Clinical Guidelines published on January 2010 by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)—analyzed length of stay after LC, and modality of data extraction from PubMed, levels of evidence, and grade of recommendations of this study are reported in Table 10.1.

These guidelines stated the following conclusions:

- Patients undergoing uncomplicated laparoscopic cholecystectomy for symptomatic cholelithiasis may be discharged home on the day of surgery [10]. (*Level II*, *Grade B*)
- Control of postoperative pain, nausea, and vomiting is important to successful same-day discharge [11], and admission rates despite planned same-day discharge are reported to be 1–39 %; patients older than age 50 may be at increased risk for admission [11–17]. (*Level II*, *Grade B*)

- Readmission rates range from 0 to 8 %; common causes for readmission after same-day discharge include pain, intra-abdominal fluid collections, bile leaks, and bile duct stones [10, 12]. (*Level II*, *Grade B*)
- Time to discharge after surgery for patients with acute cholecystitis and bile duct stones or in patients converted to an open procedure should be determined on an individual basis. (*Level III*, *Grade A*)

10.2 Methods

Moving from these conclusions, we thought to analyze the available data in PubMed and to restrict the research just on specific papers concerning day-case or ambulatory LC within the last 20 years with the following queries:

1. Search date: March 2013.
2. Search terms:
   "laparoscopic cholecystectomy
   laparoscopic cholecystectomy and hospital discharge
   laparoscopic cholecystectomy and day case
   laparoscopic cholecystectomy and ambulatory procedures
   laparoscopic cholecystectomy and hospital discharge and day case and ambulatory procedures"
3. Results:
   laparoscopic cholecystectomy – 5,490 articles
   laparoscopic cholecystectomy and hospital discharge – 138 articles
   laparoscopic cholecystectomy and day case – 175 articles
   laparoscopic cholecystectomy and ambulatory procedures – 137 articles
   laparoscopic cholecystectomy and hospital discharge and day case and ambulatory procedures – 15 articles

All articles published in English were initially collected. From this huge pull of papers, the randomized clinical trials, multicenter studies, practice guidelines, systematic reviews and meta-analyses, and Cochrane Reviews were included for a deeper examination of their abstracts. Finally, we selected 35 papers for the most accurate and extensive research of the methods, the results, and the conclusive statements (Table 10.2).

The level of evidence of these selected papers was graded according to Oxford Centre for Evidence-Based Medicine 2011.

Table 10.2 Selected studies and their level of evidence

N. 4	Meta-analysis and review of clinical trials [10, 18–20]	LoE 1
N. 5	Randomized controlled trial [21–25]	LoE 2
N. 12	Nonrandomized prospective cohort/observational study [12, 14–17, 26–32]	LoE 3
N. 12	Retrospective case series [11, 33–43]	LoE 4
N. 2	Questionnaire survey [44, 45]	LoE 5

10.3 Discussion

During the years after the initial experiences, the surgeons have become more and more confident to suggest ever faster discharges. Ambulatory LC (ALC) has automatically been the next step in patients' management. Nowadays day-case LC (DLC) has been adopted with different rates and it is not fully accepted by all surgeons. The main question concerns whether the DLC might be feasible for all or just for selected cases. So some aspects deserve to be deepened. First of all it is useful to point out our attention on its definition, safety in terms of surgical results, readmissions, eventual selective criteria for patients, the costs, patients' satisfaction, and return to normal activities.

The day surgery is a model of care that allows to diversify the flow of surgical patients, allowing, in over half the cases, the discharge on the same day of admission or no later than the morning of the next day. First of all, we must pay attention to the definition of day surgery, because at the international level, different terms are used, such as ambulatory surgery, day surgery, day case, same-day surgery, 1-day surgery, office-based ambulatory surgery, and office-based surgery, with considerable difficulties of interpretation. The term ambulatory surgery must be considered synonymous with day surgery, day case, and/or same-day surgery and it should not include an overnight stay, which is expected in cases of extended recovery. The ambulatory/day surgery, with or without an overnight stay, must also be distinguished from office-based ambulatory surgery, or office-based surgery, namely, the ability to perform surgery or diagnostic procedures and/or treatment in the clinics, also placed away from shelter facilities.

The proportion of ambulatory management generally increases with experience [36] [LoE 4].

In some cases the hospital stay lasts until the day after the LC and the admission overnight after the operation can be due to different surgical, social, or logistic reasons [32] [LoE 3]: surgeon preference, operation late in the afternoon [40] [LoE 4], medical problems (i.e., nausea and vomiting, pain, urinary retention, intraoperative pneumothorax) [19, 40, 42, 43] [LoE1], doubt about reimbursement by insurance companies or psychological [43] [LoE 4], age (elderly patients showed a tendency to like to stay in the hospital rather than being a day case) [37] [LoE 4], medical observation, patient's preference [40, 42] [LoE 4], and conversion to laparotomy [17] [LoE 3].

There are no significant differences between DLC and overnight lap cholecystectomy (ONLC) as regards to morbidity, prolongation of hospital stay, readmission rates, pain, quality of life, patient satisfaction, and return to normal activity and work [18] [LoE 1].

In the majority of papers, good results have been reported.

DLC is safe because its morbidity and mortality rates are low. Complications and mortality rates vary, respectively, from 0 to 11.6 % [12, 17, 21, 24, 36, 37, 41–43] [LoE 2] and from 0 to 0.13 % (0.08 in ALC and 0.5 % in ONLC) [27, 37] [LoE 3]. The overall conversion rate varies from 0 to 2 % [31, 32] [LoE 3]. Prolonged hospital stay and readmission are connected with minor and more easily controlled complications or social reasons [10] [LoE 1] and are a valid indicator of safety.

Some patients later can require admission to the inpatient department for conversion to the open procedure or relaparoscopy [12, 18, 19, 32, 34, 38] [LoE 1], but the readmission rate is low (0–10 %) [12, 16, 17, 22, 24, 27, 28, 33, 36, 37, 40, 42, 43] [LoE 2] and less frequent after ALC than in ONLC [27] [LoE 3].

It is common opinion that DLC is indicated for selected cases and the selection may concern medical and logistic criteria.

Some *exclusion criteria* may be considered advisable: common bile duct stones [10, 32, 43] [LoE 1], acute cholecystitis [10, 38, 43] [LoE1], pancreatitis [10, 43] [LoE1], patients' age [11, 12, 16, 29, 32] [LoE 3], and intraoperative complications [11] [LoE 4].

In different experiences some *inclusion criteria* have been adopted and they concern:

(a) *Medical aspects*: absence of symptomatic cholelithiasis [34] [LoE 4] or low risk for concomitant presence of bile duct stones [34] [LoE 4], preoperative workout (abdominal US, liver function tests, and routine preoperative tests) [10] [LoE 1], absence of other diseases [18, 19] [LoE 1], surgical risk measured by the ASA (American Society of Anesthesiologists) score [10] [LoE 1] (grade < II [12, 16, 32–34, 40, 43] [LoE 3] or < III [38] [LoE 4]), and body mass index (BMI) [10, 32, 34, 40] [LoE 1].

(b) *Logistic aspects*: operation performed in the morning [32, 33] [LoE3], social aspect [10] [LoE 1], informed consent [38] [LoE 4], living in easy reach of the hospital [18, 19, 34] [LoE 1] (within 50 km [32] [LoE 4] or 100 km of the hospital [40] [LoE 4] or 1 h traveling time [12] [LoE 3]), willing to make their own arrangements for a return to hospital in case of problems [12] [LoE 3], and availability of a responsible carer [16, 18, 19, 34, 40, 43] [LoE 1].

(c) *Surgeon's expertnesses*: in the centers in which the trainees are involved in day DLC, there are no significant differences in terms of number of complications, patient outcomes, prolonged stay, and readmission [10] [LoE 1]. Many procedures (62 %) can be also performed by trainees in DLC, with statistically significant difference in operating time between consultants (41 min) and trainees (47 min) ($p = 0.001$), but clinical outcome or patient satisfaction is the same [30] [LoE 3].

The adoption of new devices might be important such as the use of the harmonic scalpel that is associated with a low complication rate and a high-same-day discharge rate when carried out as DLC [35] [LoE 4]. Sensible scheduling of operations and avoiding the use of drains may decrease unplanned admissions following DLC [40] [LoE 4].

(d) *Geographic differences*: DLC is found to be safe and effective in developed countries, but it has not been well accepted all over of the world probably because of the lack of infrastructures, established norms, and published reports [28] [LoE 3], but for selected groups of patients DLC can be safely done with good patient satisfaction even in undeveloped countries [34] [LoE 4].

Some authors pointed out the importance of anesthesia and postoperative control of pain, nausea, and vomiting as strongly needed elements to allow patients' early discharge:

1. *Choice of anesthesia*
   Bessa et al. [22] [LoE 2] compared the surgical outcome of DLC performed with the patient under spinal anesthesia (SA-DLC) with that performed with the patients under general anesthesia (GA-DLC) in the management of symptomatic uncomplicated gallstone disease with four (4.4 %) anesthetic conversions due to intolerable right shoulder pain. In the SA-DLC group, all patients were discharged on the same day. Overnight stay was required in eight patients (8.9 %) in the GA-DLC group ($p < .001$). The cause of overnight stay was nausea and vomiting in four patients (4.4 %), inadequate pain control in three patients (3.3 %), and unexplained hypotension in one patient (1.1 %).
2. *Pain management*
   Recent randomized trials showed the efficacy of transversus abdominis plane (TAP) block in providing postoperative analgesia after abdominal surgery. A TAP block may reduce pain while coughing and at rest for the first 24 postoperative hours, opioid consumption, and opioid side effects in patients undergoing LC. In DLC TAP block may have some beneficial effect in reducing pain, but this effect is probably rather small. Petersen et al. [21] [LoE 2] reported that the median morphine consumption (0–2 h postoperatively) was 7.5 mg (interquartile range, 5–10 mg) in the placebo group compared with 5 mg (interquartile range, 0–5 mg) in the TAP group ($p < 0.001$). The odds ratio of a random patient in group TAP having less morphine consumption than a random patient in group placebo was p (group TAP < group placebo) = 0.26 (confidence interval, 0.15, 0.37) where 0.5 represents no difference between groups. Total ketobemidone consumption, levels of nausea and sedation, number of patients vomiting, or consumption of ondansetron were similar between the groups.

   An adequate control of pain is an essential component in DLC service and it is possible at home after LC [10] [LoE 1].

   The duration of hospitalization after LC is mainly determined by temporary side effects such as pain, comparing remifentanil, a short-acting opioid, and sufentanil, a longer-acting opioid, on their ability to reduce these postoperative effects and facilitate LC in day-case surgery. Damen et al. [23] [LoE 2] did not find major relevant differences between remifentanil and sufentanil on the quality of recovery after DLC in a randomized blinded trial. Post-discharge pain may be controlled and the 2-day supply of diclofenac and co-codamol could also be extended as 65 % of patients had moderate to severe pain [14] [LoE 3].
3. *Postoperative nausea and vomiting* (*POVN*) *prevention or avoidance*
   Jawaheer et al. [35] [LoE 4] reported that the induction of anesthesia might be changed to total intravenous anesthesia, using propofol (target 4–6 μg/mL) and remifentanil (target 3–5 ng/mL) and using the gaseous anesthetic sevoflurane eliminated with the aim of reducing the risk of PONV.

Adequate control of nausea or vomiting is an essential component in DLC and it is possible at home [10] [LoE 1].

Postoperative nausea and vomiting are common in patients receiving a morphine-based PCA and in those with higher antiemetic requirement (10/25 in PCA and 7/41 non-PCA groups; $p < 0.05$) [26] [LoE 3].

The incidence of PONV post-discharge suggests that adding an antiemetic to our take-home analgesic packs may improve patient comfort [14] [LoE 3].

At the end, economic and social aspects deserve particular attention and they might be very attractive to increase the diffusion of DLC.

LC provides a reduction in *hospital costs* approximately to 41 % [43] [LoE 4].

The mean direct medical cost per patient in DLC (3,085 € or 768 £) was lower than that in the ONLC (3,394 € or 1,430 £) [24, 30] [LoE 2].

DLC has acceptable discharge rate and level of patient satisfaction [10] [LoE 1].

In many experiences patients' satisfaction may be complete in 95.3 % of cases, related to a correct preoperative information [43] [LoE 4], and in the majority of research it goes from 80 to 97 % [11, 15, 28, 30–32, 34, 43] [LoE 3].

It is very important that patients feel themselves safe at home. For this reason, surgeons and/or nurses have to maintain a clinical control after patients' discharge. Different manners and timing have been planned to contact patients at home. Someone considers it useful to call by telephone in the same day of surgery [17] [LoE 3] or the day subsequent to surgery. Briggs et al. [10] [LoE 1] have suggested that recovery may be monitored by telephone questionnaire on days 2, 5, and 14, including complications, satisfaction, and general practitioner consultation.

There is no clear agreement regarding the duration of the total period of monitoring [45]. [LoE 4] in a questionnaire survey reported a postoperative surveillance planned in the outpatient unit 8–10 days after LC. Majority of patients are followed up after first and sixth week [34, 38] [LoE 4], while for some authors it should last within the first month after surgery in 93.9 % of cases and within the first year in 86.7 % of patients [17] [LoE 3].

Patients are generally able to resume their usual daily activities within 2 weeks after surgery [16] [LoE 3], and more than 90 % of patients resumes their normal job or activities after 1 week [34] [LoE 4].

Wasowicz et al. [25] [LoE 2] reported the use of an accelerometer and standardized encouragement accelerated recovery in women in contrast with men, and women in the intervention group did show a faster recovery of daily physical activity as compared to the control group ($p = 0.02$). Although there was no significant difference in postoperative VAS scores for pain and nausea between both groups, patients in the intervention group experienced pain less often as a limiting factor ($p = 0.006$).

In conclusion, DLC seems to be a safe and effective intervention in selected patients (with no or minimal systemic disease and within easy reach of the hospital) with symptomatic gallstones.

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