Laparoscopic Cholecystectomy

Fourth Edition

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Introduction

Laparoscopic approach

The laparoscopic approach for cholecystectomy gained widespread acceptance in the early 1990s and was the major factor allowing the procedure to be performed as a day case. It is now considered the preferred technique by most surgeons for most indications.

Day case rates

Day case rates have increased nationally over time from 16% in 2008/9 [1] to 64.8% in 2023 [2]. The British Association of Day Surgery (BADS) Directory of Procedures suggests a target day case rate of 75% [3]. This is currently being achieved by over 10% of trusts in England and the top 5% of trusts are achieving 81% day case rates [2, 3].

There have previously been a number of other initiatives aimed at increasing day case rates, such as the NHS Institute for Innovation and Improvement's 'Focus on cholecystectomy: delivering quality and value' guideline and the Rapid Improvement Programme through which it developed the 'Transforming your day surgery services: focus on cholecystectomy' toolkit [1]. Currently, GIRFT (Getting It Right First Time) is promoting day case Laparoscopic cholecystectomy as part of its HVLC programme which aims to increase day case rates, reduce variation and assist in addressing the backlog of planned operations following the covid-19 pandemic [4].

It is recognised that acute gallstone disease such as cholecystitis may benefit from early cholecystectomy. 2014 guidance from the National Institute for Health and Care Excellence (NICE) recommends offering laparoscopic cholecystectomy within one week of diagnosis to patients with acute cholecystitis [5]. These cases can be discharged home to return on a day case pathway. The BADS Directory of Procedure suggests a target day case rate of 25% for the urgent / emergency laparoscopic cholecystectomies, yet current data shows even the top 5% of trusts are only achieving day case rates of 13% [3].

Day case pathways

A number of studies and systematic reviews have investigated factors that can reduce the length of stay or increase day case rates in elective laparoscopic cholecystectomies [6, 7]. A consistent finding was that the most positive impact on increasing day case rates was the implementation of a dedicated perioperative pathway. A meta-analysis of 80 studies that included 10,615 patients found that the implementation of a care pathway had a day case rate of 51.0% compared with only 27.9% in those treated prior to care pathway implementation [6]. Another study at a UK hospital found that when their pathway was fully adhered to day case rates were 71% compared with 0% when not followed at all [7].

Patient Selection

Factors influencing day case cholecystectomy

In many centres day case rates are already over 75% and it is generally routine practice to adopt a default to day surgery policy for the surgeons and let pre-operative assessment determine medical and social suitability.

Conversion to open

A major factor influencing day case rates is conversion to open cholecystectomy which necessitates overnight admission. The large-scale multi-centre CholeS audit identified a number of factors that were significantly associated with a higher risk of converting to open surgery. These included increasing age ($p = 0.005$), female gender ($p < 0.001$), indication for surgery ($p < 0.001$), increasing ASA grade ($p < 0.001$), thick-walled gallbladder ($p = 0.040$) and common bile duct (CBD) diameter ($p = 0.004$) [6].

The presence of these factors, however, should not preclude the laparoscopic approach since even a very high-risk score calculated using the CholeS criteria is associated with only 19% risk of conversion to open [6].

Previous upper abdominal surgery, although not recorded in the CholeS study, is also recognised to be a risk factor for conversion [7] but should not preclude a laparoscopic approach. The technical approach should be adjusted in patients with previous upper abdominal surgery to enter the peritoneum with or without the use of an optical trocar away from any previous surgical scars. Optical trocar entry can be achieved with or without the use of a Veress needle placed in the left upper quadrant, 3cm below the costal margin in the mid-clavicular line (Palmer's point). A diagnostic laparoscopy can then be performed with adhesiolysis and attempted cholecystectomy if safe to do so.

Choledocholithiasis

There are a wide range of strategies available for management of choledocholithiasis (common bile duct stones). If cholecystectomy has been combined with exploration of the bile duct, then most surgeons would choose to leave a drain in place and keep the patient overnight to monitor for the development of a bile leak. One exception perhaps would be in the case of trans-cystic duct approach in which the bile duct itself is not opened. If imaging suggests a clear duct, then the risk of bile leak is low and the patient may safely be discharged on the same day. If the bile duct is not explored but intraoperative imaging with either cholangiogram or ultrasound suggests the presence of ductal stones then the surgeon will decide upon optimal further management. Small stones in the absence of jaundice may pass spontaneously. The presence of obstructive jaundice due to untreated choledocholithiasis is generally considered a contraindication to day case surgery due to the risks of bile leak and biliary sepsis.

The 'hot gallbladder'

There is no accepted definition of the 'hot gallbladder' although the term is generally used to refer to patients requiring admission to hospital with acute biliary pain, cholecystitis or mild acute gallstone pancreatitis. Guidelines indicate that early laparoscopic cholecystectomy should be offered to patients presenting with acute cholecystitis within 1 week of diagnosis [5]. The rationale for this is based on the fact that 25% patients awaiting interval cholecystectomy are re-admitted and that early cholecystectomy (within 5-7 days of an acute attack) is no more difficult or hazardous in experienced hands [8, 9].

This guidance has led to an increase in the number of 'hot gallbladder' operations carried out, further increased by initiatives such as the Chole-QuIC project aimed at reducing time to urgent cholecystectomy for patients with acute biliary pain or cholecystitis and increasing the proportion of patients treated on an urgent basis by using quality improvement methodology [10]. Patients undergoing urgent cholecystectomy suffer from sepsis and more pain than those operated on electively, which may be associated with a higher risk of unplanned overnight stay.

Other operative factors

There are a number of operative factors that are unpredictable and at the discretion of the surgeon, that may warrant unplanned overnight stay. These include placement of drains, increased risk of post-operative haemorrhage and operative duration/difficulty.

Patient factors

Body mass index (BMI)

Obesity is no longer seen as an absolute contra-indication to day case surgery in expert hands with appropriate resources [11]. The pneumoperitoneum can cause high ventilation pressures and if this causes problems with oxygenation then a frank discussion between anaesthetist and surgeon will need to occur regarding whether or not the operation should proceed.

Although patients with a high BMI are at increased risk of surgical complications, day case surgery in this group has been shown to be safe and has significant advantages in relation to cost and patient satisfaction [14]. Recent studies have shown that even in patients with BMI>40 there is no difference in day case rates [15, 16]. However, once BMI>50 there is a 10% increased odds of hospital admission [16]. It is important that these patients are screened for day case suitability and SOBA guidelines considered to exclude or optimise co-morbidities beforehand [17].

Comorbidity

Day case laparoscopic cholecystectomy can be performed safely in patients with a wide range of co-existing conditions, provided that these are stable and optimally managed. The creation of a pneumoperitoneum may have adverse consequences for those with severe cardiovascular or respiratory diseases and make laparoscopic surgery not a suitable option. Diabetes should not be a contraindication to day surgery but as per National guidelines these patients should have well controlled diabetes and be managed according to appropriate guidelines [(18)] if these patients are managed well and with any delay to oral intake reduced to no more than one missed meal [(14)].

Patient preference

Patients' and relatives' attitudes towards day case surgery are very important in determining success of day case surgery. A willingness to engage in the day case process is helped by provision of appropriate pre-operative information and counselling to reduce anxiety and increase co-operation. This is important at each step of the pathway including GP referral, outpatient appointments, pre-operative assessment and the day of admission. Consistency of information is vital whether it is communicated in person, or through patient information leaflets, online videos and trust websites. Patients need to be reassured by all staff they meet, that day surgery is safe and suitable for them.

Default to day surgery

Good pre-operative assessment should identify medical or social reasons that a patient cannot be a day case. Peri-operative problems which can prevent same day discharge are difficult to predict and the best strategy is to manage most patients as intended day cases, with subsequent admission arranged if necessary. There may be specific operative factors, such as a planned common bile duct exploration via choledochotomy (opening the bile duct directly) which most surgeons consider requires placement of a drain and overnight admission.

Factors discussed above that may lead to a higher rate of unplanned overnight stay can be utilised in list scheduling, so that patients with potential problems are scheduled early to allow a longer recovery period and a greater likelihood of same-day discharge. Cases considered to be straightforward can be operated on later in the day.

A default to day surgery approach allows more consistent patient information and preparation and also ensures that all patients receive the same quality of anaesthesia and pain relief. Treating all unselected patients as potential day cases can achieve extremely high rates of successful same day discharge.

Pre-oprative Assessment

Pre-operative assessment for the patient awaiting laparoscopic cholecystectomy aims to help achieve high quality care, to facilitate same-day discharge, to minimise re-admission rates and to help reduce complication rates through identifying and managing co-morbidity. Standardised pathways for pre-operative assessment and management of medical problems and patients awaiting laparoscopic cholecystectomy are now used widely and encouraged. Specific attention should be given to the following areas in patients undergoing laparoscopic cholecystectomy:

History

Recent and prolonged attacks of right-upper quadrant pain may indicate the development of cholecystitis. This information can be useful in predicting operative time and may be an indication to schedule early on the operating list.

Investigations
Important diagnostic investigations such as liver function tests and ultrasound scan should have been performed prior to waiting list booking. Liver function tests are useful in screening for passage of gallstones into the bile duct. These should be performed within 3 months of surgery; however, they should also be repeated if the patient develops any symptoms of obstructive jaundice. Individual surgeons will have their own preferences for managing patients with abnormal LFTs. Blood tests such as full blood count, coagulation screen and urea & electrolytes are now not performed routinely in most units, rather they are undertaken selectively in patients per NICE guidance [15].

For many years, routine group & save (G&S) was considered mandatory for laparoscopic cholecystectomy, however, severe peri-operative haemorrhage and the need for emergency transfusion is rare. For this reason, many centres are now proceeding to elective surgery without G&S [21]. In most cases of peri-operative haemorrhage, there is time to take a group and save and arrange formal cross-matching and in the rare event of major haemorrhage, 'emergency' group O negative blood can be administered.

Patient advice
Verbal advice should start in the surgeon's clinic when the patient is informed they need surgery and when they are added to the waiting list. The consent process is started at this stage and should involve general details of what to expect including the nature of day case surgery and recovery in addition to the risks and benefits of the surgery itself. Recommended practice is to provide written information in the form of a patient information leaflet to supplement verbal advice. Some trusts also provide links to informative patient videos that can be found on trust websites.

Many centres now advise patients with a BMI of >35 to adhere to a low-calorie diet (often known as a 'liver-reducing' diet) for two weeks prior to surgery. This is because surgery on obese patients can be technically challenging with longer operative times and increased risk of bleeding from the liver. Evidence from a randomised trial has shown significantly greater pre-operative weight loss, shorter operative time and subjectively easier Calot's triangle dissection in patients adhering to a two-week very low-calorie diet compared to patients following a normal diet [19].

Anaesthetic Technique

As with any day case procedure, laparoscopic cholecystectomy requires an anaesthetic technique which provides for a rapid recovery and minimises the incidence of side effects. In addition, particular consideration needs to be given to prevention and treatment of postoperative nausea and vomiting (PONV) and pain management.

Pre-operative assessment and explanation of anaesthesia by the anaesthetist and what to expect postoperatively in terms of pain and sickness will occur on the day of surgery for the majority of patients. Excessive fasting should be avoided and pre-operative analgesic and anti-emetic premedication are recommended.

Experienced day surgery anaesthetists tend to achieve lower rates of postoperative complications and hospital admissions than non-specialists, although the use of anaesthetic protocols (or "guidelines") can help transfer some of this experience to the occasional day surgery anaesthetist [20].

Choice of anaesthetic agent
Total intravenous anaesthesia (TIVA) is becoming an increasingly more common anaesthetic technique amongst UK anaesthetists, partly due to its beneficial reduction of PONV [24]. There is also evidence to suggest other benefits of using propofol-based techniques such as organ protection and theoretical mechanisms in reducing pain [24]. The harmful environmental impact of inhalational agents should also be considered. Overall, using a technique with which the anaesthetist is familiar and which is known to achieve good outcomes is probably more important.

The consensus guidelines for the management of postoperative nausea and vomiting 2020 has suggested avoiding nitrous oxide and volatiles to reduce baseline risk of PONV [25].

Muscle Relaxant and Reversal Agent

There is a suggestion that deep neuromuscular blockade can reduce operative times and complications by increasing the size of operative field during pneumoperitoneum or reducing intra-abdominal pressures [26]. However, the evidence is limited and sometimes conflicting - one recent RCT found deep neuromuscular blockade provided no improvement in quality of recovery when compared with moderate blockade [26].

Increasing evidence exists suggesting the benefits in using Sugammadex versus neostigmine in reversing neuromuscular blockade (where rocuronium or vecuronium have been used) [27] [28]. Some studies have shown its use can decrease the time from operating theatre to recovery, but that the overall discharge time is comparable between the two reversal agents [27]. There are other benefits to avoiding the use of reversal agents with muscarinic side effects (neostigmine/glycopyrrolate), such as reduced incidence of PONV. One study also showed the rates of urinary retention were lower in patients given Sugammadex over neostigmine in laparoscopic cholecystectomy cases [29].

Airway management

Controversy remains over the use of the laryngeal mask airway (LMA) for laparoscopic cholecystectomy. While the LMA is widely used in many forms of day surgery, there is justifiable concern that reflux of gastric contents and bile, which is especially irritant, may be more common during gall bladder surgery [24]. At least one case of aspiration during cholecystectomy with the LMA has been reported [25]. Second-generation LMAs offer increased protection from aspiration and provides increased seal pressure and easier controlled ventilation compared to the conventional LMA during laparoscopic cholecystectomy [32]. There is still insufficient published evidence on which to judge its safety for this procedure, but some anaesthetists have used it extensively without apparent problems.

Post-operative nauseas and vomiting

Risk factors

PONV is common after laparoscopic cholecystectomy, possibly because of peritoneal gas insufflation and bowel and biliary tree manipulation. Additional risk factors include female gender, previous history of PONV or motion sickness, being a non-smoker and the use of perioperative opioids [27]. The latter are a common cause of PONV and their use, even during laparoscopic cholecystectomy, should be reduced to the minimum necessary.

Prophylaxis

PONV is sufficiently common after laparoscopic cholecystectomy, that antiemetic prophylaxis with a combination of agents is justified [28]. Ondansetron (or other 5HT3 antagonists) and dexamethasone are suitable. The latter is long lasting and may also provide a degree of analgesia but should be used cautiously in patients with diabetes due to potential risk of hyperglycaemia. Adequate hydration is an important additional measure to reduce PONV, avoiding prolonged starvation by considering Sip til Send policies or giving appropriate intravenous fluid [29].

The consensus guidelines for the management of postoperative nausea and vomiting 2020 has suggested avoiding nitrous oxide and volatiles, using propofol to induce and maintain anaesthesia (TIVA), ensure adequate hydration and minimization of intraoperative and postoperative opioids [25]. The latest consensus guidelines have also added a recommendation that Sugammadex should be used over neostigmine.

Some centres have found Acupins (acupuncture pin at pressure point PC6 of the wrist) of use in reducing their PONV rate [36].

Treatment
PONV should be promptly treated when it occurs, preferably using an antiemetic of a different class to that used for prophylaxis. Further rehydration may be necessary. Intractable PONV is not an automatic indication for hospital admission, provided that the patient is able to retain some fluids and is still happy to be discharged. Consideration should be given to take-home antiemetic therapy. Buccal, sublingual or subcutaneous routes of administration are preferable in this instance, as they will ensure adequate drug absorption even in the presence of nausea or vomiting. PONV is most common in the immediate recovery period, sometimes persists for one to two days, but usually resolves thereafter. However, a very small minority of patients experience severe PONV for many days after laparoscopic cholecystectomy.

Analgesia
Effective pain relief should be provided using a multimodal approach which aims to minimise or avoid the use of strong, longer acting opioids, thereby limiting side effects and reducing pain and PONV. This should be started pre-operatively.

Non-steroidal anti-inflammatory drugs (NSAIDs)
NSAIDs are extremely effective analgesics and should be used unless there is an absolute contraindication. Ibuprofen and diclofenac are well-established and have a reasonable safety profile, particularly when only given for short courses.

NSAIDs should be started early, prior to commencement of surgery [37], administered at regular intervals and the patient should be advised to take these for at least five days at home. NSAIDs with a long half-life or sustained release preparations, which permit once-daily dosing, may be more convenient.

Paracetamol
Paracetamol should be used to supplement the analgesia provided by NSAIDs.
An oral loading dose of paracetamol can be given pre-operatively or alternatively an intravenous dose near the end of the procedure. Advice should be given to have a supply for regular use post-operatively at home. Many units now prefer to issue paracetamol separately to codeine rather than the combination preparations to avoid accidental paracetamol overdosing and to minimise complications (such as constipation) associated with the regular use of opioids.

Weak opioids
Weak opioids may also be used as first-line analgesia where NSAIDs are contraindicated. Opiate medication can cause increased tone in the Sphincter of Oddi. For this reason, it has been suggested that patients with suspected or known CBD stones should avoid these medications as they could exacerbate any resulting symptoms. However , a recent article by the British Pain Society has suggested dihydrocodeine could be the optimal opiate for patient discharge [38]. This is partly due to dihydrocodeine having less intrinsic pharmacological adverse properties, but also from a practical point of view dihydrocodeine is a schedule 5 controlled drug and therefore can be stocked and dispensed with greater ease [38]. From Recommendations of Safe Perioperative Use of Opioids in Day Surgery from BADS Bitesize series 'Provision of opioid analgesia should be guided by functional pain scores, rather than unidimensional pain scores alone and there should be local protocols for prescription of discharge medications after surgery. This should provide 5 days of medication, and no more than 7 days.' [49]

Opioids
The routine use of intravenous intra-operative opioids is controversial. The PROSPECT (PROcedure SPECific Postoperative Pain ManagemenT) Working Group is a collaboration of surgeons and anaesthetists that have used over 200 RCTs and systematic reviews to provide an evidence-based consensus on management of pain after laparoscopic cholecystectomy [37]. As part of their recommendation, they suggest opioids should be reserved for post-operative rescue pain only, and preferably administered by the oral route [37]. However, many centres still routinely use short acting opioids intra-operatively successfully and the authors find it reduces the amount of rescue analgesia needed.

Where routine opioids are used, some centres successfully use morphine intra-operatively but centres with higher day-case rates tend to use fentanyl at a dose of 200-300mcg intra-operatively so we would recommend using Fentanyl over intravenous morphine.

Intravenous opioids should not be required beyond the first few hours of recovery, when oral analgesics are usually sufficient.

Local anaesthesia
Although much of the postoperative pain is deep in nature, the laparoscopy portals should always be infiltrated with a long-acting local anaesthetic (such as bupivacaine or levobupivacaine). 0.5% solutions should be used at a maximum total dose of 2 mg/kg (20 ml will be safe and effective in the majority of adults). This may be administered before skin incision or at the end of the procedure and should include infiltration down to rectus sheath level.

The results of intraperitoneal local anaesthetic, sprayed between liver and diaphragm, have been variable in efficacy, although a recent meta-analysis suggested there was an overall small reduction in pain scores with this technique [39]. Other techniques, such as transversus abdominis plane (TAP) block, or even intrapleural analgesia may be effective, but probably not necessary for laparoscopic cholecystectomy.

Natural history of pain
Some pain after laparoscopic cholecystectomy, despite the use of prophylactic, multimodal analgesia is not uncommon, but the incidence is variable and difficult to predict, bearing little relationship to intraoperative surgical findings or haemodynamic response. Many patients are likely to require some opioid “rescue” analgesia during early recovery and/or one or two doses of oral analgesia prior to discharge so this should be written up by the anaesthesist for post-operative use. Pain tends to be moderate during the first one or two days, declining rapidly in intensity beyond that. A few patients experience prolonged and severe pain, but this is not common. Severe pain may prevent discharge on the day of surgery, but this should be an unusual event with appropriate therapy.

Post laparoscopic shoulder tip pain
Shoulder tip pain is a common finding in patients post laparoscopic cholecystectomy, occurring in up to 50% of patients [40]. It should therefore be discussed with all patients before surgery is performed. It is generally considered to be caused by diaphragmatic irritation from CO^2 insufflation, direct injury or stretching. This then manifests as pain referred to the shoulder tip via the phrenic nerve. Research has shown lower intra-abdominal pressures decrease the incidence and surgeons often try to expel insufflated gas before closing [41, 40]. There have been limited studies that suggest ventilator-piloted pulmonary recruitment manoeuvres may also be beneficial [42].

Surgical Technique

Operating time
Routine laparoscopic cholecystectomy should take under an hour in most cases but, with modern anaesthetic techniques, same-day discharge is still possible after considerably longer procedures, provided there is good surgical technique utilising low pressures and good day case anaesthesia with attention to pain and PONV management and adequate postoperative recovery time before the day unit closes.

Ports
The most common approach uses a 4-port technique with a sub-umbilical 10-12mm diameter port, a 10-12mm epigastric port and two 5mm right upper quadrant ports. There are a number of variations in this technique, some only using 3 ports, some using 3mm ports or needlescopic instruments (directly traversing the abdominal wall without the use of a port/cannula) instead of 5mm ports and others adopting the use of 5mm cameras. However, there is no good evidence to support the use of any single technique over another.

Single-incision surgery [33], natural orifice transluminal endoscopic surgery (NOTES) [34] and robotic surgery [35] have all been undertaken successfully as day case procedures, however, none have been adopted widely in the UK. In particular, an analysis of surgical value defined by outcome divided by cost suggested that single incision surgery and robotic surgery offered significantly less value than traditional 4-port cholecystectomy [35], therefore, neither are likely to become commonplace in the UK.

Access to the peritoneum is frequently established by open cut-down immediately below or above the umbilicus, however, other techniques are often used such as optical trocar entry with or without prior Veress needle insufflation.

Pneumoperitoneum
A standard operating pressure of up to 12mmHg to maintain the carbon dioxide (CO^2) pneumoperitoneum is normally used to avoid inferior vena cava compression/reduced venous return and to prevent diaphragmatic splinting, otherwise resulting in lower ventilatory tidal volumes and the need for higher airway pressures. Abdominal pain and shoulder tip pain are both significantly associated with the volume of residual pneumoperitoneum [36], so efforts should be made to release as much gas as possible before closure.

Post-operative pain
In addition to residual gas from the pneumoperitoneum, free blood or bile in the peritoneum can give rise to post-operative pain; so, any spilled bile or blood should be irrigated and suctioned and careful attention should be made to ensure haemostasis, for example in the liver bed. Many surgeons are using peritoneal levobupivacaine in addition to infiltration of port-sites / laparoscopic-guided abdominal wall blocks. Local anaesthetic techniques are also described in the anaesthetic section above.

Drains
Wound drains are sometimes used when it is felt there is increased risk of bile leakage or bleeding. This is usually a matter of individual surgeon choice; however, the routine use of drains should be avoided since their presence and removal can be associated with unnecessary pain. Drains may be removed on the day of surgery according to surgeon's preference and indication and are, therefore, not a barrier to day case discharge.

Discharge Criteria

All of the usual day surgery discharge criteria apply to patients undergoing laparoscopic cholecystectomy [37], however, as the patient has had an intra-abdominal procedure, it is important to ensure that the patient can tolerate oral fluids and a light diet.

Fitness for discharge should be based on defined parameters, rather than time-based. In practice, most patients will take 4–6 hours to achieve the discharge criteria. Successful discharge should be possible after operations performed in the morning or afternoon but this is naturally dependent on the discharge criteria and critically, what time the day surgery unit stays open until. If patients are transferred to an inpatient ward, they are much less likely to be discharged on the same day.

Patients should be discharged with written advice highlighting the signs that could indicate complications requiring urgent medical attention [38]. They should also be provided with clear instructions on who to contact in case of complications or emergencies.

Key Points

1. Laparoscopic cholecystectomy day case rates of over 75% can be achieved consistently by adopting a default to day surgery policy.

2. NICE recommends early laparoscopic cholecystectomy for patients presenting with acute cholecystitis within 1 week of diagnosis. This guidance has led to an increase in the number of 'hot gallbladder' operations carried out. BADS recommends a day case rate of 25% for these is possible.

3. Patients' and relatives' attitudes towards day case surgery are very important in determining success of day case surgery. Good and consistent information is vital.

4. Creating a multi-disciplinary guideline has proven to be very effective in helping standardise patient management and increase day case rates.

5. The routine use of drains should be avoided though it is not a barrier to day case discharge.

6. Analgesia should be multi-modal and pre-emptive treatment should be given for analgesia.

7. Risk of PONV should be minimised by appropriate anaesthetic techniques and anti-emetic prophylaxis.

8. Consider effective muscle relaxant and reversal.

9. Surgeons to use lowest pressure for pneumoperitoneum possible and be very careful to avoid leaving any free blood or bile in the peritoneum.

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Appendix

An example Guideline for Day Case Laparoscopic Cholecystectomy - North Devon District Hospital Protocol

Anaesthetic Medication

Pre-operative

- Ensure procedure performed as early in the day as possible
- Fasted as per standard policies with clear fluids up to 2 hours pre-surgery
- Oral Paracetamol 1g for all patients unless genuine contraindication
- Consider oral Ibuprofen 400mg or Piroxicam 20mg if no contraindication
- (Caution in elderly, history of IHD, asthma, CKD with eGFR <60, PUD)

Intra-operative

- **General anaesthetic** – induction and maintenance up to individual choice
- **Fentanyl is the strong opiate of choice**
  - Dose will be patient dependent but most will need 400-500mcg, possibly more
  - Higher doses create a reservoir of drug to slow fall in plasma concentration
- **Dexamethasone 3.3-6.6mg IV**
- **Ondansetron 4mg IV** (particularly if risk factors for PONV)
- **Antibiotics** as per Trust Guidelines (usually given only if bile or stones spilled intra-abdominally)
- **Plasmalyte 1000-2000mls** IV
- **Levobupivacaine:**
  - **20ml 0.25%** intra-peritoneal via RUQ 5mm port prior to gallbladder extraction by surgeons
  - **20mls 0.5%** to port-sites prior to skin closure

  (total dose will require adjustment if patient bodyweight <75kg)

Post-operative

- Regular **Paracetamol** 1g PO QDS (even if no pain)
- Regular **Ibuprofen 400mg** PO TDS/QDS (even if no pain) if not contraindicated
- **Codeine 30-60mg** PO 4-hourly prn
- **Oramorph 10-20mg** PO 2-hourly prn
- **Fentanyl** as per recovery protocol
- **Ondansetron 4mg** PO/IV 6-hourly prn
- **Cyclizine 25-50mg** PO/IV 6-hourly prn (caution in the elderly)
- **Prochlorperazine 12.5mg** IM 12-hourly prn OR **Buccastem 3-6mg** Buccal 6-hourly prn

Take home medication

If OK with NSAIDs then:

- **Paracetamol 1g** PO QDS
- **Ibuprofen 400mg** PO TDS
- **Codeine 30-60mg** PO 4-hourly prn (Max 240mg daily)
- **Lansoprazole 30mg** PO OD
- **Senna 1 to 2 tabs** prn

If unable to take NSAIDs then:

- **Paracetamol 1g** PO QDS
- **Oramorph 10-20mg** PO 2-hourly prn (50ml bottle on discharge)
- **Senna 1 to 2 tabs** prn

Surgical Technique

Pneumoperitoneum

- 5mm optical trocar to right upper quadrant or 12mm sub-umbilical port
- 1x 12mm epigastric port
- 2x 5mm right upper quadrant ports

Dissection technique

- Avoid trauma to liver capsule and parietal peritoneum

Procedure technique

- Standard dissection with critical view of safety
- Routine intra-operative biliary ultrasound scan
- Double ligation of cystic duct and artery (liga clips or Hem-o-lok clips)
- Gallbladder extraction within bag via epigastrium if optical trocar entry, otherwise via umbilicus

Closure

- Closure of any 12mm port fasciae
- Subcuticular 3/0 undyed monofilament rapidly absorbable skin suture (e.g. Monocryl)
- Opsite dressings

Post-operative instructions

- Eat and drink when awake
- Mobilise freely
- No routine low molecular weight heparin
- Nurse-led discharge