

# Same Day Discharge after Emergency Appendicectomy: Is it Feasible?

ALEXANDER ACHILE AIKOYE<sup>1</sup>, MOHAMED TOEIMA<sup>2</sup>, VEERA ALLU<sup>3</sup>, SANJOY BASU<sup>4</sup>

## ABSTRACT

**Introduction:** In the UK, approximately 70,000 appendicectomies (one of the most common surgical procedures) are performed yearly. There is a wide variation in length of stay following Laparoscopic Appendicectomy (LA).

**Aim:** To review the feasibility of safe same day discharge following LA for patients with acute appendicitis.

**Materials and Methods:** This was a retrospective review of 92 consecutive adults ( $\geq 18$  years) who underwent emergency appendicectomy in a District General Hospital (DGH), between April and July 2018. The patients were divided into two groups. Group A comprised all patients not discharged on day of operation while Group B comprised all patients discharged on same day of operation. Data collected and analysed included demographics, clinical diagnosis, WBC, CRP, operative details, complications and length of stay. Outcomes were compared using Fisher's exact test.

**Results:** Group A: Total 86 (93%), included male: female of 38:48, age 36 years (median), range (18-81) years, heart rate 78 (median), range (51-162)/minute, temperature 36.8°C (median), range (35.7-40.2)°C, WBC 13.5 (median), range (3.8-25.6), CRP 36 (median), range (2-498) and PO stay 1 (median), range (1-11) days.

Group B: Total 6(7%), included male:female of 2: 4 with age of 27 years (median), range (18-49) years, temperature 36.8°C (median), range (36.5-39.2)°C, WBC 10.5 (median), range (7-15.6), CRP 5.5 (median), range (1-94) and PO stay of 0 day. Four had uncomplicated appendicitis, 1 had pus and 1 had appendicular mass with pus. Five out of six patients had LA and were operated before noon. Group B had no complications including no readmissions.

**Conclusion:** Selective approach to same day discharge, for medically fit patients undergoing emergency laparoscopic appendicectomy, is safe. Complicated appendicitis is not an absolute contraindication to same day discharge.

**Keywords:** Appendicitis, Laparoscopic appendicectomy, Length of stay

## INTRODUCTION

For over a hundred years (since McBurney described emergency appendicectomy) appendicectomy has remained the gold standard treatment for acute appendicitis. Patients across the world following uncomplicated appendicectomies have remained in hospital for 1 to 2 days before being discharged home.

Length of hospital stay can be a strong index of quality of care and prolonged hospital stay has its associated risks that include hospital acquired infections [1]. In addition, delayed discharges come with increased cost and service delivery implications to the hospital or Trust.

In the UK, it remains standard practice for patients who have had emergency laparoscopic appendicectomy to be kept in hospital overnight before consideration of discharge [2]. Frequently Trusts are constrained by a lack of beds to look after patients. The knowledge that a selected group of patients could be discharged home more promptly would be novel for the UK and have profound benefits both for the patient and the healthcare trust.

Thus the present study aimed to identify whether a selected group of adult patients could be considered for same day discharge following laparoscopic appendicectomy for acute appendicitis.

## MATERIALS AND METHODS

This was a retrospective review of 92 consecutive ( $\geq 18$  years) appendicectomies on adult patients, performed at a District General Hospital, over a 4 month period (01/04/2018 to 31/07/2018). In line with NHS England Health Research Authority guidelines, ethical approval was not required considering that this was a retrospective review of service delivery/provision.

**Exclusion criteria:** patients who underwent laparotomy for appendicitis and those who had also undergone other procedures such as bowel resection.

Patients were divided into 2 groups based on their length of post-operative hospital stay. Group A patients had length of stay of 1 or more days whilst Group B patients were discharged on same day as their appendicectomy. The hospital's usual practice is to discharge the post-appendicectomy patient on the 1<sup>st</sup> post-operative day (next day after surgery) unless the patient has still not met the other discharge criteria (stated below).

Nearly all the appendicectomies were performed or directly supervised by a surgical registrar with only about 20% performed or directly supervised by a consultant. Although the surgical team varied the surgeons employed a very similar approach to laparoscopic appendicectomy (e.g., open access for pneumoperitoneum, 3 ports, closure of 10 mm port-site fascia layer and limited washout when pus is encountered).

Post-operatively, all the patients were monitored and reviewed by doctors (registrar grade) for nausea, vomiting, mobilisation, oral intake, vital signs (pulse, respiration, temperature, blood pressure and saturation) and pain relief and were discharged only when they met discharge criteria. The patient fulfils discharge criteria when he/she is not nauseous, not vomiting, eating and drinking freely, mobilising independently, has pain well controlled with simple analgesics (i.e., either completely pain free or minimal enough as not to affect their normal functioning including their activities of daily leaving), feels ready for home, has pulse rate  $< 90$  and  $> 50$  beats per minutes, has normothermia and has an oxygen saturation of 97% or greater (on air). Prior to discharge, the patients were provided with contact details and free access to the hospital for attention and urgent review by the on call surgical team for 72 hours. Following this period, the patient with post-operative complication comes to the surgical team's attention via their respective General Practitioner (GP) or the study hospital's Accident And Emergency (A&E) department.

The outcome(s) for each patient was analysed at time points varying from 1 month to 4 months. The local policy, in line with National (UK-wide) practice, is not to arrange further hospital visits for post-appendicectomy patients who had an uneventful hospital episode.

The primary outcome of interest was the length of post-operative hospital stay however other outcomes including re-admissions, wound infection and re-operations were also noted.

## STATISTICAL ANALYSIS

Data were obtained and analysed from a prospectively collected database. Outcomes were compared using Fisher's-exact test and p-value of 0.05 or less considered as statistically significant.

## RESULTS

Study included 92 consecutive adult appendicectomies with median length of stay of 1(0-18) day. A patient had two further procedures for deep surgical site infection resulting in 18-day hospital stay. The male to female ratio was 10:13 and median age was 35 years. The duration of follow-up for entire study population was up to 4 months (median=two and half months).

A total of 86 (93.5%) and 6 (6.5%) patients belonged to Group A and Group B, respectively. This large variation between the groups reflects the observational nature of the study.

**Group A:** This included 80 laparoscopic and 6 open (Lanz incision) appendicectomies. The most common appendix histology in this group was uncomplicated acute appendicitis (51/86). Other histologic diagnoses are shown in [Table/Fig-1]. Surgical site infection was the most common complication in this group. The complications encountered are shown in [Table/Fig-2].

	Patient group	Group A-Patients not discharged on day of appendicectomy (n=86)	Group B-Patients discharged same day as appendicectomy (n=6)	p-value
<b>Histology</b>				
1. Uncomplicated acute appendicitis		51	4	1
2. Gangrenous/perforated appendix		16	2	0.33
3. Normal appendix		13	0	1
4. Faecolith		3	0	1
5. Spirochaete		1	0	1
6. Carcinoid		1	0	1
7. Lymphoid hyperplasia		1	0	1

[Table/Fig-1]: Histological diagnosis of resected appendix.

	Patient group	Group A-Patients not discharged on day of appendicectomy (total, n=86)	Group B-Patients discharged same day as appendicectomy (total, n=6)	p-value
		Male/female-38/48	Male/Female-2/4	0.69
<b>Complication</b>				
Superficial surgical site infection		2- Both managed conservatively (ClavienDindo grade I)	0	1
Deep surgical site infection		2- Both drained under general anaesthetic (ClavienDindo grade IIIb)	0	1
Intra-operative complication(s)		1- Enterotomy repaired uneventfully (ClavienDindo grade IIIb)	0	-
Others		1- Postoperative acute coronary syndrome which was managed on the high dependency unit with uneventful recovery (ClavienDindo grade IV)	0	1

[Table/Fig-2]: Complications observed in patients by length of hospital stay.

**Group B:** These were all very fit patients with no co-morbidities. Four had simple/ uncomplicated appendicitis, 1 had appendix abscess while the sixth had appendix mass with associated abscess. Five underwent laparoscopic appendicectomy and 1 had open appendicectomy. Final histology of appendix specimen revealed acute appendicitis (5 patients) and normal appendix (1 patient). The two patients with complicated appendicitis were sent home on a five-day course of broad-spectrum oral antibiotics. There were no re-admissions and no complications recorded in this cohort of patients in their follow-up period [Table/Fig-2].

## DISCUSSION

In the UK, average cost per day for surgical patients on a general ward is about £250-£300. With increasing pressure for hospital beds and with the backdrop of limited resources, early discharge of surgical patients not requiring hospital-based care would have far reaching benefits.

In a recent study amongst the paediatric population, Cairo SB et al., has shown that over 20% of children can enjoy safe same day discharge following appendicectomy for uncomplicated acute appendicitis [3]. A similar earlier study had also shown that 28% of paediatric patients were safely discharged home on same day of appendicectomy for uncomplicated acute appendicitis [4]. Both studies identified surgery in latter half of the day and provider habits are the two main barriers to same day discharges.

Crandall M et al., showed that appendicectomy for uncomplicated acute appendicitis is associated with mean length of stay of 20 hours 40 minutes when done in the early hours of the morning and 32 hours 24 minutes when done later in the day [5].

Thus, variable length of hospital stays for post-appendicectomy patients have been reported in the literature, however, the current trend is for earlier discharges especially following the laparoscopic approach [6] for all appendicitis patients and more so for those with perforated appendicitis [7].

Lower analgesic requirements and cosmesis are well known benefits of laparoscopic surgery. A randomised trial has reported better infective complications rate for the laparoscopic approach and attributed this to surgical expertise [8]. However, there have also been studies that have not identified any difference between the two groups (open vs laparoscopic) with respect to the length of hospital stay. Out of the 92 patients of the present study, none of the 7 patients who underwent open appendicectomy suffered any complication. Also, patients successfully discharged home on same day of operation are more likely to have undergone open appendicectomy when compared with those who were not discharged home, the same day (17% vs 7%, p 0.39). This study therefore suggests that open appendicectomy may not reduce a patient's chance of same day discharge.

A retrospective study of over 12,000 patients has shown better re-admission rate and overall cost benefits for same-day discharge after laparoscopic appendicectomy for uncomplicated acute appendicitis [9]. Masoomi H et al., have shown lower mean hospital charges in addition to reduced length of stay and complications rate with laparoscopic appendicectomy for similar group of patients [10]. The cost benefit of same day discharge after laparoscopic appendicectomy has also been shown by other authors [11,12].

This study showed that a subset of patients can be discharged safely on the same day after appendicectomy for acute appendicitis but this is more likely to be achieved in the well-motivated and supported group of patients in the absence of significant comorbidity and when procedure is performed earlier in the day. Study also revealed that appendicular perforation/abscess and/ or mass formation are not absolute contraindications to same day discharge, however, would require appropriate and thorough assessment before discharge with adequate home support and arrangement with provision for contacts and easy access to the hospital.

The outcomes in the present study's same day discharge cohort of patients were compared with day case (<24 hours) appendicectomy results in literature [Table/Fig-3] [13,14]. The results showed that an even higher proportion of patients can be discharged within 24 hours after emergency appendicectomy than was observed in present study. These were either prospective studies or studies where the default position at the start of the study was to enroll every patient into the same day discharge arm unless patient had contra-indications. Present study was totally observational as there was no external influence on the study arm into which each individual patient fell into. These results from literature indicate that if default same day discharge (after emergency appendicectomy) was practiced at the present study hospital then significantly higher proportion of patients discharged on same day of surgery would have been observed in present study.

Study	Present study (Aikoye AA et al.,)	Hussain A et al., [13]	Sabbagh C et al., [14]
Design	Case series	Case series	Prospective cohort
Appendicectomy approach	Laparoscopic and open	Laparoscopic	Laparoscopic
Discharge <24 hours (% total study population)	Same day 6 (7%)	Same day 26 (87%)	<24 hours 64 (52%)
Age* years	29	-	25.6
CRP* (mg/L)	21.7	-	27.4
WCC* (per mm <sup>3</sup> )	10,600	-	13,766
Re-admission*	0	0	2

**[Table/Fig-3]:** Literature on day case appendicectomy outcomes compared. Age\*: Mean age of patients discharged <24 hrs; CRP\*: Mean preoperative CRP of patients discharged <24 hrs; WCC\*: Mean preoperative White cell count of patients discharged <24 hrs; Number of re-admissions for patients discharged <24 hrs

Present study's outcomes in the same day discharge cohort of patients were similar or better than the results reported in literature. Hussain A et al., showed that 3 out of the 4 patients who could not be discharged on the same day of appendicectomy stayed overnight only on account of social reasons (anxiety, fear) [13]. This result indicates that with adequate patient and attendant education same day discharge rates would be improved significantly. Similarly, Hussain A et al., [13] also ensured patients with ASA I, II or well controlled ASA III were chosen for day case appendicectomy. Their study highlights the role of careful patient selection to achieve the best outcomes.

A previous large study reported 2-3 days mean length of stay for laparoscopic appendicectomies [15]. Present study hospital's median length of stay for all appendicectomies has consistently been 1 day for the last two years and in this series 51(59%) of group A arm (86 patients) were discharged home by the first post-operative day.

In a study of 185 consecutive laparoscopic appendicectomies, 59% were performed as ambulatory procedures (same day discharge) [16]. There was no significant difference in re-hospitalisation or re-consultation when compared with the conventional group and complicated acute appendicitis was not an absolute contra-indication to same day discharge. The term ambulatory surgery is often used interchangeably to describe same day discharge surgery [16] and prompt discharges can be achieved for uncomplicated acute appendicitis [17,18].

Hospital systems, staff and patient education, culture review/change and efficient working are important considerations when contemplating implementing safe same day discharge. Culture change is typically not only a slow process but often also a difficult one [19,20]. This is the case even where specific cultural practices are discovered to be without benefit or in some cases even harmful. A good example is seen with patients undergoing major colonic resections who were starved and kept in hospital for several days in

the not so distant past. Popularisation of Enhanced Recovery After Surgery (ERAS) has brought changes to this practice but for this to be successful and safe requires a serious proactive approach and commitment from the entire team (doctors, nurses, other clinical support staff, hospital discharge team, hospital management, etc.). It is also extremely vital to set-up a strong vigilance and safety net to avoid patients suffering serious complications and not many surgeons presently would still entertain the thought of same day discharge for patients with complicated acute appendicitis.

Thus, patient selection is an important aspect of ambulatory surgery. In the bid to ensure safety in patients considered for same day discharge different recommendations has been put forward. Gignoux B et al., [16] have proposed pre-operative and peri-operative contraindications for the same day discharge after appendicectomy: (i) Home-hospital distance greater than 1 hour (ii) Post-operative generalised peritonitis, fever or vomiting (iii) Has severe comorbidities which require monitoring; and/or (iv) Cannot be operated before 5 pm and cannot be postponed to the next day.

British Association for Day Surgery (BADs) and The International Association for Ambulatory Surgery (IAAS) have recommended clear cut protocols and recommendations for ambulatory surgery (same day discharges). The Modified Post-Anaesthetic Discharge Scoring System (PADSS) represent an objective assessment of readiness for discharge after a general anaesthetic procedure [21]. It utilises 6 criteria with each criterion scoring between 0 and 2. The vital signs must never be lower than 2, none of the other 5 parameters must ever be 0 and the total score must be at least 9.

Lefrancois M et al have proposed a scoring system for early discharge following appendicectomy for acute appendicitis [22]. These authors utilised 5 preoperative parameters (BMI, CRP, appendix diameter, WCC and no evidence of perforation on radiology).

### Limitation(s)

A potential limitation of present study is the fact that patients were not routinely invited for post-operative review. The assumption that patients who develop post-operative problems would return to hospital directly or via their general practitioner was relied upon (considering the fact that the patients were provided adequate post-operative care advice and that the hospital is the only acute hospital serving the local population).

In addition, the sample size of present study is relatively small. This potentially may have been the primary reason why statistically significant results were not obtained in this study.

### CONCLUSION(S)

Multiple studies have shown benefit of same day discharge following emergency appendicectomy. This study further reiterates this vision; however, we do realise that our numbers are small for a definitive conclusion. Hence, we recommend a multicentre randomised study with strict inclusion and exclusion criteria to deliver a definitive conclusion for this extremely common surgical condition that would go a long way in saving the NHS its valuable resources in this current climate of financial crunch (while maintaining good patient outcomes).

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**PARTICULARS OF CONTRIBUTORS:**

1. Consultant, Department of General Surgery, Norfolk and Norwich University Hospital NHS Foundation Trust, Norwich, Norfolk, United Kingdom.
2. Consultant, Department of General Surgery, Queen Elizabeth Hospital, Lewisham and Greenwich NHS Trust, Woolwich, London, United Kingdom.
3. Trust Doctor, Department of General Surgery, William Harvey Hospital, East Kent Hospitals NHS Foundation Trust, Ashford, Kent, United Kingdom.
4. Consultant, Department of General Surgery, William Harvey Hospital, East Kent Hospitals NHS Foundation Trust, Ashford, Kent, United Kingdom.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Alexander Achile Aikoye,  
Department of Surgery, Norfolk and Norwich University Hospital NHS Foundation Trust,  
Norwich, Norfolk, United Kingdom.  
E-mail: alexander.aikoye@nhs.net

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