Implementation of a novel emergency surgical unit significantly improves the management of gallstone pancreatitis

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ABSTRACT

INTRODUCTION Emergency surgery is changing rapidly with a greater workload, early subspecialisation and centralisation of emergency care. We describe the impact of a novel emergency surgical unit (ESU) on the definitive management of patients with gallstone pancreatitis (GSP).

METHODS A comparative audit was undertaken for all admissions with GSP before and after the introduction of the ESU over a six-month period. The impact on compliance with British Society of Gastroenterology (BSG) guidelines was assessed.

RESULTS Thirty-five patients were treated for GSP between December 2013 and May 2014, after the introduction of the ESU. This was twice the nationally reported average for a UK trust over a six-month period. All patients received definitive management for their GSP and 100% of all suitable patients received treatment during the index admission or within two weeks of discharge. This was a significantly greater proportion than that prior to the introduction of the ESU (57%, $p=0.0001$) as well as the recently reported national average (34%). The mean length of total inpatient stay was reduced significantly after the ESU was introduced from 13.7 ± 4.7 days to 7.8 ± 2.1 days ($p=0.03$). The mean length of postoperative stay also fell significantly from 6.7 ± 2.6 days to 1.8 ± 0.8 days ($p=0.001$).

CONCLUSIONS A dedicated ESU following national recommendations for emergency surgery care by way of using dedicated emergency surgeons and a streamlined protocol for common presentations has been shown by audit of current practice to significantly improve the management of patients presenting to a busy district general hospital with GSP.

KEYWORDS

Emergency surgery – Gallstones – Pancreatitis – Cholecystectomy – Guidelines

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The landscape of emergency surgery has changed significantly over the last couple of decades. Centralisation of surgical care, a far greater case load, the early subspecialisation of surgeons and financial restraints mean the existing model of emergency care may not be the optimal method by which to manage a busy on-call shift.¹ An on-call team consisting of a lead consultant who is on call for 12–24 hours, a registrar and a senior house officer has provided the traditional emergency service. Often the consultant may have coexisting clinical commitments delaying the management of a more pressing essential emergency, or he or she may lack the skillset owing to subspecialist interests.

The London North West Healthcare NHS Trust has been no exception to these changes. In an attempt to address these issues, the emergency surgical unit (ESU) was formed, based on a novel emergency surgery model, in line with recommendations by The Royal College of Surgeons of England (RCS) and the Association of Surgeons of Great Britain and Ireland (ASGBI), so as to provide safer and more efficient acute surgical care.² These include a dedicated clinical and

managerial leader, a consultant-led service, priority to emergency surgery over elective procedures, and a greater focus on the outcomes of care, regular audit and review of practice. Evolution of this model to meet local needs has led to an agreed multidisciplinary protocol for the management of commonly encountered acute surgical conditions. Together with a dedicated and broadly experienced on-call surgical team, this provides the basis for our ESU.

Gallstone pancreatitis (GSP) is an acute clinical condition associated with significant morbidity. Twenty per cent of patients develop a severe attack with organ failure or other complications and there is an associated overall mortality rate of 7%.^{3–5} The risk of recurrent GSP occurs in as many as 31% of patients within the first two weeks of discharge; however, this is reduced significantly with timely definitive surgical management or endoscopic treatment in those unfit for surgery.⁶ The British Society of Gastroenterology (BSG) guidelines recommend a laparoscopic cholecystectomy (LC) or endoscopic sphincterotomy (ES) during the index admission or within two weeks of discharge to

prevent recurrence of symptoms.⁷ Compliance with the BSG guidelines varies. Few trusts report compliance, with the compliance rates ranging between 6.6% and 89%.^{8–11} Reasons for poor compliance include financial reasons, inadequate theatre capacity and limited specialist interests of surgical on-call teams.

This study highlights the strengths and benefits of our emergency surgical model by showing improvement in the local management of GSP in a busy district general hospital.

Methods

All patients admitted with suspected acute GSP over three six-month periods (December 2010 – May 2011 [audit period 1], June – November 2013 [audit period 2], December 2013 – May 2014 [audit period 3]) were audited using a standard methodology (Fig 1). The final time period, representing

performance after the introduction of the ESU, was compared with data from the two previous audits.

All those patients with a diagnosis of suspected acute pancreatitis were identified on IntPaCS (Integrated Patient Coordination System), an in-house surgical patient management software program. Electronic records of laboratory and radiological investigations (ultrasonography and magnetic resonance cholangiopancreatography [MRCP]), electronic discharge summaries and clinical notes (if necessary) were used to select those from within this group who were diagnosed with acute GSP. Those with non-GSP and other diagnoses were excluded. Patients undergoing LC for GSP were also identified from histopathology records and those undergoing endoscopic retrograde cholangiopancreatography (ERCP) for GSP were identified from electronic endoscopy records for the respective time periods. This information was checked against IntPaCS search findings for additional accuracy.

Demographic and clinical data were collected on a pro-forma. The primary outcome measure was the number of patients receiving definitive treatment during the same admission or within two weeks of discharge. Secondary outcomes included reasons for any delays in definitive management, number of repeat admissions with recurrent GSP, mean length of stay and any complications or conversions to open cholecystectomy.

Emergency surgery unit

The ESU is run by a team of five surgeons broadly trained in the management of acute surgical emergencies, led by an emergency surgery clinical lead. Instead of having a single consultant on call, the 24-hour on-call period is split into three. There is a consultant on call from 8am until 5pm who is the admitting consultant for the week. However, the morning consultant is likely to be supervising trainees in theatre. For this reason, a second consultant comes in at midday to cover the ‘take’ and do the final handover at 8pm. From 8pm until 8am the following day, a third consultant is on call from home.

The night cover is shared with ten other non-ESU consultants who do not take part in the daytime rota and can

therefore focus completely on their subspecialist elective commitments. This helps the trust financially too by preventing loss of revenue from cancelled elective work. The rota structure allows for 12-hour on-site consultant presence and twice daily ward rounds, seven days a week, with two consultants available for the busiest 6-hour period during the afternoon.

There is an agreed protocol with the radiology team for requesting imaging in GSP patients, particularly MRCP, which is often necessary for subsequent surgical management (Fig 2). The ESU has a dedicated CEPD (Confidential Enquiry into Perioperative Deaths) emergency theatre list on three days of the week. In addition to existing hospital beds, the surgical admission unit consists of 15 beds for assessment and 8 dedicated inpatient beds for postoperative patients. The surgical department has approximately 400 surgical admissions per month, of whom 60% go on to have an operative procedure.

Reported figures

UK-wide figures are derived from those reported in the literature for comparison. Data from Hospital Episode Statistics (HES) for GSP from 2007 to 2008 have shown an

Figure 2 Algorithm for definitive management policy of acute gallstone pancreatitis

average of 35 cases per annum per trust.¹² This figure was halved to 17.5 cases and compared with the collected 6-month audit data after introduction of the ESU. HES data were also used to estimate the number of patients in whom LC was used as the definitive management of patients.⁶

Statistical analysis

The treatment of GSP before (audit period 2) and after the introduction of the ESU (audit period 3) was compared statistically using the chi-squared test for discrete variables. The *p*-values denoted compare these two time periods except where data were unavailable for audit period 2 and data from audit period 1 were substituted for analysis. All statistical analyses were performed using SPSS® version 20.0 (IBM, New York, US).

Results

Current practice

Between December 2013 and May 2014, there were 115 admissions for suspected acute pancreatitis (Fig 3), of which 35 (26 female and 9 male) were confirmed to have GSP. The patients had a mean age of 54.3 ±16.6 years (Table 1).

Twenty-five patients underwent LC (20 during index admission and 5 within 2 weeks of discharge) and eight had ES (all during the same admission) as definitive treatment because they were unfit for surgery (mean age: 82.5 ±12.5 years). Two patients were unsuitable for early LC. One had prolonged severe pancreatitis and the other needed urgent investigation of some ‘red flag’ bowel symptoms. Both underwent LC at three months and three weeks

Table 1 Demographics of the 35 patients admitted with GSP between December 2013 and May 2014, and followed until July 2014

Mean age	54.3 years
Male-to-female ratio	1:3
Mean length of total inpatient stay	7.8
Mean length of postoperative stay	1.8 days
Number having ultrasonography	35
Number having MRCP	26
Number having CT	2
Readmissions with GSP or other biliary event during study period and until end of follow-up	1

GSP = gallstone pancreatitis; MRCP = magnetic resonance cholangiopancreatography; CT = computed tomography

respectively following their index admission without recurrent pancreatitis in the interim period. All patients who were suitable for early definitive management (33/35) received it accordingly. One elderly patient was deemed unfit for both LC and ERCP. She was discharged with no planned definitive management but readmitted with a recurrent bout of GSP and underwent ERCP during same admission without complications.

Four patients underwent laparoscopic common bile duct exploration and one elderly patient had an open cholecystectomy because of anticipated technical difficulty and anaesthetic advice. No laparoscopic procedures were converted to open procedures and there were no significant complications or mortality. The mean overall length of stay was 7.8 ± 2.1 days and the mean postoperative stay was 1.8 ± 0.5 days with more than half of the patients going home less than 24 hours after surgery.

Comparison with previous practice

There were a significantly greater number of patients admitted with GSP after the introduction of the ESU with 35 patients being seen during audit period 3, compared with 19 and 17 patients seen during audit periods 1 and 2 respectively (Table 2). After the ESU was established, all suitable patients (33/35) received definitive treatment either during the same admission or within two weeks of admission, compared with 76% in audit period 1 and 57% in audit period 2 ($p=0.0001$). Such a trend was only seen for LC and not for ERCP ($p=0.14$). Although there was no statistical difference in the proportion of patients receiving definitive treatment before and after the ESU was introduced ($p=0.19$), this was significantly better than the national average (100% vs 75%).⁶

The rate of readmission with GSP improved from 17.6% in audit period 1 to 2.9% in audit period 2 but this was not statistically significant ($p=0.12$). The mean length of total

inpatient stay was reduced significantly after the introduction of the ESU from 13.7 ± 4.7 days to 7.8 ± 2.1 days ($p=0.03$). The mean length of postoperative stay fell significantly from 6.7 ± 2.6 days to 1.8 ± 0.8 days ($p=0.001$) after the emergency service.

Comparison with reported figures

In the final audit, 35 patients with GSP were seen during a 6-month period, which is double the average seen per NHS trust.¹² A greater percentage of patients (100%) received definitive management for their GSP compared with figures reported in the literature (75%).⁶ A functional ESU meant that three times the volume of patients were receiving definitive management on either the same admission or within two weeks of discharge (100% vs 34% in the literature)¹² with no patients receiving a delay in their definitive treatment unless they were clinically unsuitable for early treatment (0% vs 50% in the literature).¹⁵ Only 3% of patients during the final audit period were readmitted with GSP compared with 23% reported in the literature.⁶

Discussion

Complying with national guidelines by performing early cholecystectomy for GSP is essential to prevent morbidity and mortality. However, rates of compliance with BSG guidelines have been reported to be as low as 32% in the UK.¹⁴ The difficulty with providing definitive management during the index admission is not confined to the UK. The global cholecystectomy rate for the index admission is currently around 48%.¹⁵ In Germany, LC was performed for GSP during the initial hospital stay in only 23% of cases owing to a lack of theatre capacity and financial reasons.¹⁵ LC performed within two weeks for GSP has been shown to be economically feasible and cost neutral by avoiding the costs associated with readmission and prolonged morbidity of recurrent GSP through statistical modelling.¹⁶

The introduction of the ESU has allowed a busy district general hospital to comply fully with BSG guidelines for the management of GSP for the first time. This has implications for better patient management as well as the logistics of managing an acute surgical take.

Comparison of the data before and after the implementation of the ESU shows maintenance in the high rate of definitive treatment provision for GSP. More importantly, the ESU provides definitive treatment either during the index admission or within two weeks of discharge for all suitable GSP patients. This is an improvement of more than 70% since the previous audit and it is a third greater than nationally reported figures. The improvement was seen despite a twofold increase in the number of patients admitted with GSP compared with the previous audit period. The increase in patients is likely to be due to restructuring of the health service in the region.

The combination of an agreed management protocol and the establishment of a dedicated ESU with a change in work pattern is most likely to account for the improvement in performance of the management of GSP. The RCS has highlighted the suboptimal delivery of emergency surgical care,

Table 2 Comparison of results

	London North West Healthcare NHS Trust			Reported figures	p-value
	Audit period 1 Dec 2010 – May 2011 (n=17)	Audit period 2 June 2013 – Nov 2013 (n=19)	Audit period 3 Dec 2013 – May 2014 (n=35)		
Number of patients receiving definitive treatment during same admission or within 2 weeks of discharge	13 (76.5%)	11 (57.9%)	33 (100%)*	25% ⁶ and 34% ¹²	0.0001^{a,c}
Number of patients receiving delayed definitive treatment	4 (23.5%)	6 (35.3%)	2 (5.7%)†	50% ¹³	0.0001^{a,c}
Number of patients receiving no definitive treatment	0 (0%)	2 (10.5%)‡	0 (0%)	25% ⁶	
Number of suitable patients receiving LC as definitive treatment	8 (47.1%)	9 (47.3%)	25 (71.4%)		0.0001^{a,c}
During same admission	7	–	20		
Within 2 weeks	1	–	5		
Number of suitable patients receiving ES as definitive treatment	5 (29.4%)	8 (47.1%)	8 (22.9%)		0.14 ^{a,c}
During same admission	5	8	8		
Within 2 weeks	0	0	0		
Number of patients receiving definitive treatment (LC or ES)	17 (100%)	17 (89.5%)	35 (100%)	75% ⁶	0.19 ^{a,c}
Number of patients readmitted with GSP	3 (17.6%)	–	1 (2.9%)	23% ⁶	0.12 ^{a,d}
Mean length of total inpatient stay in days	13.7 (SD: 4.7)	–	7.8 (SD: 2.1)		0.03^{b,d}
Mean length of postoperative stay in days	6.7 (SD: 2.6)	–	1.8 (SD: 0.8)		0.001^{b,d}
Number of LC converted to open	0	0	0		
Number of LCBDE	2	6	4		
Number of significant complications	2 [§]	0	0		
Mortality	0	0	0	<10% in mild pancreatitis; 30% in severe pancreatitis ⁷	

LC = laparoscopic cholecystectomy; ES = endoscopic sphincterotomy; GSP = gallstone pancreatitis; SD = standard deviation; LCBDE = laparoscopic common bile duct exploration

^achi-squared test; ^bindependent t-test; ^ccomparison between audit periods 2 and 3; ^dcomparison between audit periods 1 and 3

*All clinically suitable patients (33/35) underwent early definitive treatment.

†Patients did not fit early definitive treatment criteria, as explained in the text.

‡Patients were unfit for both LC and ES.

§Both patients developed pancreatitis after LCBDE and intraoperative cholangiography.

and has produced some standards as guidance for providers and commissioners.¹⁷ These standards and recommendations have been adhered to in setting up the ESU, which to our knowledge is one of the very first of its kind in the country. Reauditing practice after implementing national recommendations has also shown improvements in length of hospital stay and postoperative recovery. These positive outcome measures add to the growing evidence base to help improve patient care and support commissioning in the field of emergency general surgery as recognised by the RCS and ASGBI in their position statement.²

The greater availability of senior support provided by the ESU allows for early diagnosis and commencement of an optimum management plan shortly after referral. A protocol has been agreed with consultant radiologists for requesting imaging in GSP patients, particularly for MRCP, which allows rapid acceptance of requests. This forms part of our GSP management protocol. All senior members of the ESU team follow the same agreed protocol, thereby removing delays associated with variation in surgeons' individual preferences and differences in opinion or expertise seen previously.

All cases of GSP are now admitted and managed by ESU surgeons only, rather than a range of surgeons with a different specialist interests and limited expertise in managing these cases. This is in line with the BSG recommendation that all cases of acute pancreatitis should be managed by a single nominated specialist team.⁷ Previously, patients were handed over to on-call upper gastrointestinal colleagues at the end of the week or discharged with an outpatient referral to another surgeon. This caused significant delays in definitive management and was associated with a higher overall readmission rate (17.6%). This has also meant employing emergency surgeons with experience in performing laparoscopic common bile duct exploration to reduce reliance on the sole upper gastrointestinal colleague having this expertise.

Introduction of the ESU has eliminated the logistical problems of finding a suitable operating list and experienced surgeon for patients with GSP. Owing to the increasing emergency workload, the trust is planning a second all-day CEPOD emergency list seven days a week dedicated to general surgery so as to deal with this workload more efficiently. Until the introduction of the extra lists, the ESU surgeons are partly using their twice weekly elective lists for 'spill over' cases that cannot be accommodated on existing CEPOD lists to prioritise the management of surgical emergencies. We plan to audit our performance again in 12–18 months using prospectively collected data to ensure that we maintain the achieved standards and follow-up of the present group of patients in order to look for recurrence rates or any long-term complications.

Conclusions

This study highlights the strengths and benefits of our emergency surgical unit, giving an example of an extremely efficient service, which is capable of performing to exceptionally high levels and setting new quality standards. Our aim is to improve management in all areas of emergency surgery, leading on from our success with the management of GSP. A motivated team of broadly trained emergency surgeons committed to achieving excellence in

the management of emergency surgical care and performing to evidence-based standards is the key to this success. Other institutions aspiring to similar standards of performance may want to follow our example of a dedicated ESU.

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