



**ASGBI**

Association of Surgeons of Great Britain and Ireland



**RCS**

ADVANCING SURGICAL STANDARDS

2014

# Commissioning guide:

Emergency general surgery  
(acute abdominal pain)

**Sponsoring Organisation: Association of Surgeons of Great Britain and Ireland**

**Date of evidence search: July 2013**

**Date of publication: April, 2014**

**Date of Review: March, 2017**



NICE has accredited the process used by Surgical Speciality Associations and Royal College of Surgeons to produce its Commissioning guidance. Accreditation is valid for 5 years from September 2012. More information on accreditation can be viewed at [www.nice.org.uk/accreditation](http://www.nice.org.uk/accreditation)

## CONTENTS

<b>Glossary</b> .....	<b>2</b>
<b>Key messages for commissioners</b> .....	<b>3</b>
<b>Introduction</b> .....	<b>4</b>
<b>1 High value care pathway for emergency general surgery</b> .....	<b>4</b>
1.1 Assessment of acute abdominal pain.....	4
1.2 Emergency laparotomy pathway.....	7
1.3 Emergency surgery ambulatory care (ESAC) pathway .....	9
1.4 The management of non-specific abdominal pain.....	11
1.5 Right iliac fossa pain/appendicitis pathway .....	12
1.6 Right upper quadrant pain/gallstones pathway.....	14
1.7 Left iliac fossa pain/diverticulitis pathway .....	16
1.8 Small bowel obstruction pathway .....	18
1.9 Large bowel obstruction pathway.....	21
<b>2 Procedures explorer for emergency general surgery</b> .....	<b>22</b>
<b>3 Quality dashboard for emergency general surgery</b> .....	<b>22</b>
<b>4 Levers for implementation</b> .....	<b>23</b>
4.1 Audit and peer review measures.....	23
4.2 Quality specification/CQUIN (Commissioning for Quality and Innovation) .....	24
<b>5 Directory</b> .....	<b>25</b>
5.1 Patient Information for emergency general surgery.....	25
5.2 Clinician information for emergency general surgery.....	25
<b>6 Benefits and risks of implementing this guide</b> .....	<b>26</b>
<b>7 Further information</b> .....	<b>26</b>
7.1 Research recommendations.....	26
7.2 Other recommendations .....	27
7.3 Evidence base .....	27
7.4 Guide development group for emergency general surgery .....	30
7.5 Funding statement .....	31
7.6 Conflict of Interest Statement.....	31

## Glossary

Term	Definition
EGS	Emergency general surgery
NELA	National Emergency Laparotomy Audit
SIRS	Systemic inflammatory response syndrome
ESAC	Emergency surgery ambulatory care
NSAP	Non-specific abdominal pain
FBC	Full blood count
U&E	Urea and electrolytes
LFT	Liver function test
CRP	C-reactive protein
BHCG	Beta Human Chorionic Gonadotropin
ECG	Electrocardiogram
CT	Computerised tomography scan
IBS	Irritable bowel syndrome
USS	Ultrasound scan
WCC	White cell count
ICU	Intensive care unit
MRCP	Magnetic resonance cholangiopancreatography
ERCP	Endoscopic retrograde cholangiopancreatography
PTC	Percutaneous transhepatic cholangiography
SBO	Small bowel obstruction
LBO	Large bowel obstruction
MDT	Multidisciplinary team

## Key messages for commissioners

- Emergency General Surgery (EGS), and specifically acute abdominal pain, represents a huge inpatient burden of heterogeneous diagnoses. Historically, the care of this group of patients has been underfunded and overlooked and there has been resultant variability in the quality of care provided.
- There is an appetite for service improvement and a number of recent publications by specialty organisations have quite clearly defined standards and timelines for EGS admissions. Adoption of these improvements is still patchy and Commissioners can play a very positive role in encouraging service improvement.
- Emergency laparotomy for peritonitis, bowel obstruction and other abdominal catastrophes is a high risk and high cost area of acute surgical care. Resource allocation in the past has not reflected the complexity of such cases, and there is significant variability in survival between units. Adequate consultant input, routine critical care, adequate and timely theatre access and a defined rota for interventional radiology are all key components of the best services.
- In the near future, the current National Emergency Laparotomy Audit (NELA) will provide robust comparative data on perioperative care and outcomes. This will facilitate local quality improvement.
- Sub-acute conditions such as biliary colic, cholecystitis, and non-specific abdominal pain represent a substantial, expensive, inpatient burden. The development of acute ambulatory surgical services can reduce admissions within this basket of diagnoses by up to 30% and thereby reduce costs. The presence of a defined acute biliary pathway can help identify well organised services. Integrated and rapid access to imaging must be part of these services.
- Early cholecystectomy during the index admission is a safe and cost effective model of care and avoids a 10-15% re-admission rate in patients with acute biliary disease. Predicated theatre access is required if this service is to be delivered reliably.
- The Procedures Explorer and Quality Dashboard data tools are derived from HES data and can be used to evaluate performance at both Trust and CCG level against a number of different quality indicators. They represent a strong audit tool, both for commissioners and individual Trusts, to benchmark their results.
- Clear levers for implementation and improvement have been defined for each of the EGS pathways.

## Introduction

Annually, in England, there are around 600,000 emergency admissions under the care of general surgeons (HES data). Of this group, just over half present with abdominal pain. The care of this vast, heterogenous group of patients is beset with challenges, not least because this is an area that has traditionally been underfunded and overlooked.

Patients presenting as an emergency have a greater risk of dying than those admitted electively.<sup>1</sup> Data from the Emergency Laparotomy Network confirm that emergency laparotomy still carries a mortality of 15% overall with even higher risks in the elderly and comorbid.<sup>2</sup> Critical care resource allocation in the past has not reflected the complexity of such cases, and there is significant variability in outcomes between units.

At the other end of the spectrum, around 90,000 patients annually are admitted with non-specific abdominal pain, where no further diagnosis is forthcoming. Along with sub-acute conditions such as cholecystitis (where patients may wait up to a week for surgery), these represent a substantial, expensive and potentially avoidable, inpatient burden.

There is an appetite for service improvement and innovative ways of managing the acute surgical take are fast being developed. This guide for commissioners outlines evidence-based best practice in the management of acute abdominal pain. It is not intended as a comprehensive guide to all emergency surgical conditions, and reference is made to other bodies where a standard has already been set. This document defines high quality, safe and cost effective management of acute abdominal pain, which, if followed, will result in improved outcomes and patient experience.

# 1 High value care pathway for emergency general surgery

## 1.1 Assessment of acute abdominal pain

### Primary care

General Practitioners face the challenge of dealing with a heterogenous group of patients with abdominal pain, without immediate access to the diagnostic facilities available in secondary care.

The vast majority of patients with abdominal pain are effectively managed in general practice. Acute pain of less than 24 hours duration and localised peritonism are the strongest predictors of the need for secondary care referral.<sup>3</sup>

Of those who are referred to secondary care, there will be a proportion that, after senior surgical assessment, are discharged immediately or managed in an ambulatory setting. It is unreasonable to expect

highly selective GP triage, as this would presently risk missed serious diagnoses; therefore the onus must fall on secondary care to manage this group appropriately. Different care models in Europe appear to allow more effective primary and emergency care management.

### Secondary care

#### History and examination

The provision of an experienced surgeon (at registrar level or above) to take referrals, divert to other specialties and provide early assessment has been shown to reduce unnecessary admission.<sup>4</sup> It is essential to have a team model in place that reflects the EGS workload of the unit and facilitates timely senior review. In larger units it may prove cost efficient to alter or augment the traditional on call team structure.

The importance of high quality history and examination cannot be overestimated. There is some evidence that formally structured patient data sheets improve diagnostic accuracy.<sup>5-7</sup>

The use of opiate analgesia in acute abdominal pain is beneficial in terms of patient comfort, and does not delay diagnosis or retard decision making.<sup>8</sup>

Digital rectal examination has been shown to have a low utility in the diagnosis of undifferentiated abdominal pain, and should be used selectively in those presenting with colonic symptoms.<sup>9</sup>

#### Investigations

FBC, U&Es, LFTs, amylase (or lipase), glucose and CRP should be considered mandatory blood tests in those presenting with acute abdominal pain. Arterial blood gases (including estimation of lactate) are essential in the evaluation of abdominal catastrophe. Urinalysis should be performed on every patient, along with urine or serum BHCG in women of childbearing age (with subsequent referral to gynaecology if positive).

Clotting and G&S or cross match will be required if surgery is anticipated. An ECG should be performed on those over 50 years of age, or where the history is indicative.

An erect chest radiograph remains the primary investigation of choice for the detection of free intraperitoneal gas, and may detect lower lobar pneumonia.

Plain abdominal radiography should be used selectively in the event of suspected intestinal obstruction, fulminant colitis, or perforation.<sup>10</sup>

Abdominal ultrasound (USS) is fundamental to the assessment of acute abdominal pain<sup>11,12</sup> and is of particular utility in the evaluation of biliary, gynaecological and renal pathology or the identification of collections. Seven day access to ultrasound is required, with dedicated slots for emergency surgical admissions.

Abdominal CT is invaluable in the assessment of abdominal sepsis and bowel obstruction. There are

relatively few occasions where a patient cannot be stabilised sufficiently for scanning to take place, and the information afforded in terms of accurate diagnosis and therapeutic intervention cannot be underestimated. In patients over the age of 50 presenting with abdominal pain but no sepsis, CT (either on an inpatient or early outpatient basis) is advisable, due to the risk of occult malignancy in this group.

#### **Criteria for admission**

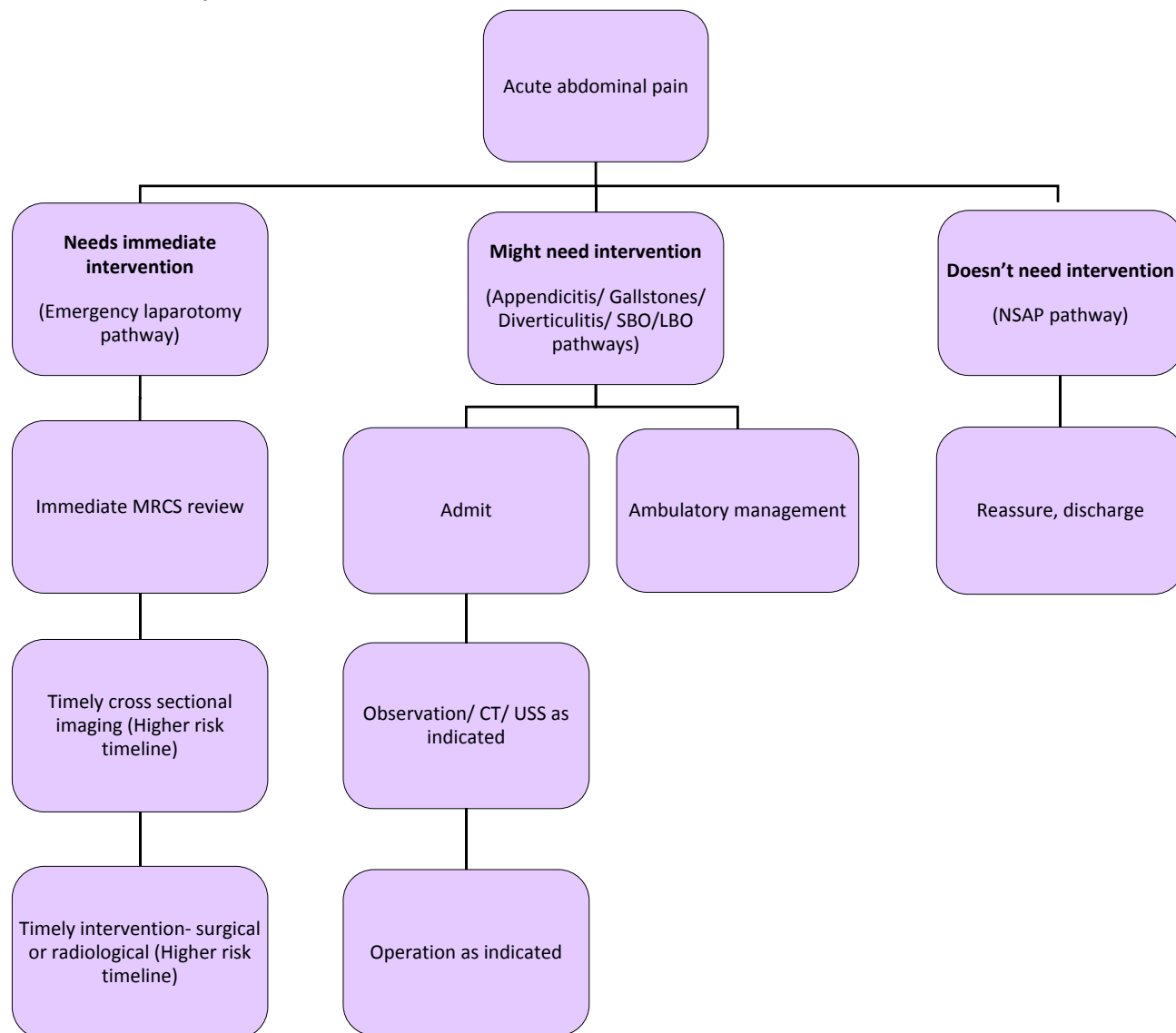
All patients with acute pancreatitis, intestinal obstruction, or abdominal sepsis will require admission.

Where diverticulitis is suspected, urgent abdominal CT is indicated. Most will be admitted for 36-72 hours of IV antibiotics. Those with uncomplicated diverticulitis can be discharged on oral antibiotics or managed in an ambulatory setting where such facilities exist. Care must be exercised in the frail, comorbid or immunosuppressed.

Patients with suspected appendicitis and raised WCC and CRP should be admitted for imaging/laparoscopy.

Those with suspected biliary colic or uncomplicated cholecystitis are suitable for early discharge or ambulatory care, as are younger patients with non-specific abdominal pain, in the absence of any derangement in inflammatory markers. The local provision of early USS and a robustly organised ambulatory care service will dictate the proportion of these patients that are admitted.

**Acute abdominal pain flow chart**



**1.2 Emergency laparotomy pathway**

**Background**

Emergency laparotomy for peritonitis, bowel obstruction and other abdominal catastrophes is a relatively modest part of emergency general surgery (about 10% of caseload) but carries a sizeable mortality (average 15%), causes complications in over 50% of cases and consumes enormous resource, being the largest single user of ICU beds.<sup>13</sup> Around 30 000 emergency laparotomies are carried out each year. The substantial associated mortality is particularly striking when compared to major elective colorectal resection which carries an average mortality of 4.7%.<sup>14</sup> Emergency outcomes vary three fold between units giving a real



opportunity for better outcomes and reduced cost.<sup>53</sup>

Outcomes vary with available resources such as CT scan use and ICU bed numbers<sup>54</sup> and organisational commitment to Emergency Surgery also varies between hospitals (consultant time and input, specific beds, priority over electives). There is a shortfall particularly in access to critical care beds for one third of these patients, in operating theatre access and to interventional radiology.<sup>55</sup> Approximately 50% of surgeons describe delays in theatre access for emergency cases<sup>55,15, 16</sup> and interventional radiology is now an optimal emergency treatment for some conditions.

Speed and accuracy of early diagnosis and treatment determines outcome

- a. Trainees describe markedly different approaches between units
- b. Management of complications among major elective cases also varies substantially and survival differs significantly (two fold) between best and worst units<sup>57</sup>
- c. Consultant involvement in high risk cases is suboptimal being reduced at night with sicker cases<sup>2</sup>

In line with many other disciplines, there is a current re-evaluation of major general emergency care to determine which aspects of intervention should be centralised or delivered by specialists. Assessment should remain a general skill delivered as close to home as possible: clinical pathways which meet current standards should feature early senior surgical assessment and direct patients to timely specialist care when required.

A national audit of emergency laparotomy has begun with patient outcome data available from April 2015.<sup>58</sup>

#### For commissioners and primary care

- Consider which hospital best meets the needs of which patients
- Patient's outcomes are much improved (3 to 5 times better) if major treatments can be undertaken before a full blown emergency state develops
- Imaging tests for severe abdominal conditions should generally not be ordered from primary care.
- The development of acute ambulatory surgical services can reduce admissions by 30% and reduce costs

#### Secondary care

The best units will:

- Have a defined care pathway in line with 'Higher Risk Surgical Patient' guidance<sup>13</sup> to assess new emergencies and manage complications developing in established cases using staff with appropriate defined qualifications
- Feature early consultant involvement as circumstances dictate and in all cases within a maximum of 14h, deploying sufficient senior manpower to realistically achieve this for emergencies and major elective inpatient cases
- Follow 'Surviving Sepsis' guidelines (see p.28) particularly regarding early antibiotic administration and timely resolution of the cause of severe abdominal sepsis
- Provide 24h diagnostic CT scan with consultant reporting

- Have availability of interventional radiology (on site or transfer protocols with defined rota).
- Have adequate critical care facilities available at all times for emergency surgery. If these are not available then agreed protocols for transfer should be in place. Critical care teams should be involved peri-operatively, where possible, to ensure optimal safe care.<sup>17</sup>
- Implement as many components of enhanced recovery as possible, including pre-operative resuscitation and shared decision making, intra operative hydration and pain control, post-operative hydration and nutrition, proactive pain management, minimising disability and promoting early mobilisation.<sup>18</sup>
- Ensure emergency laparotomy:
  - a. Is always undertaken with consultant surgeon and consultant anaesthetist present
  - b. Is performed within the following **maximum** recommended timings deferring elective or less urgent cases when necessary
    - i. Major bleeding or septic shock: within 2 hours
    - ii. Severe sepsis (organ dysfunction): within 6 hours
    - iii. Sepsis but no organ compromise: within 18 hours
    - iv. No SIRS or sepsis: over 18 hours
  - c. Is performed with goal directed fluid therapy
  - d. Patients are admitted to critical care post-operatively
  - e. Risk of surgery is predicted and outcomes audited

### 1.3 Emergency surgery ambulatory care (ESAC) pathway

#### Definition

**Ambulatory care** is a personal health care consultation, treatment, or intervention using advanced medical technology or procedures delivered on an outpatient basis.

#### Background

Emergency ambulatory care is well established in medicine but not yet within surgery. Pilot studies<sup>19</sup> have shown that up to 30% of patients on a general surgical emergency take can be managed in this way. Further development of this type of service will be common place in the next three years. Presently about one third of hospitals offer a version of this service.

#### Assessment

Given the risk associated with a surgical ambulatory pathway the initial assessment should be made by a consultant surgeon.

#### Suitable abdominal conditions

*Depending on local protocols, suitable conditions can include:*

- Non-specific abdominal pain
- Right upper quadrant pain – biliary colic, acute cholecystitis
- Acute diverticulitis (mild)

#### Unsuitable conditions

- Acute pancreatitis
- Acute appendicitis
- Perforated viscus
- Bowel obstruction
- Peritonitis

#### Patient exclusions

- Sepsis
- Deranged vital signs and shock states
- Grossly deranged blood tests
- Frail elderly
- Live alone
- Significant co-morbidities
- Inadequate response to analgesia

#### Consultant assessment

- Consultant takes phone calls from primary care and may redirect at this point
- Focused history and examination

#### Assistant practitioner

- Performs observations, urinalysis and blood tests as per “Assessment” section of this document (p.7)

#### Tests

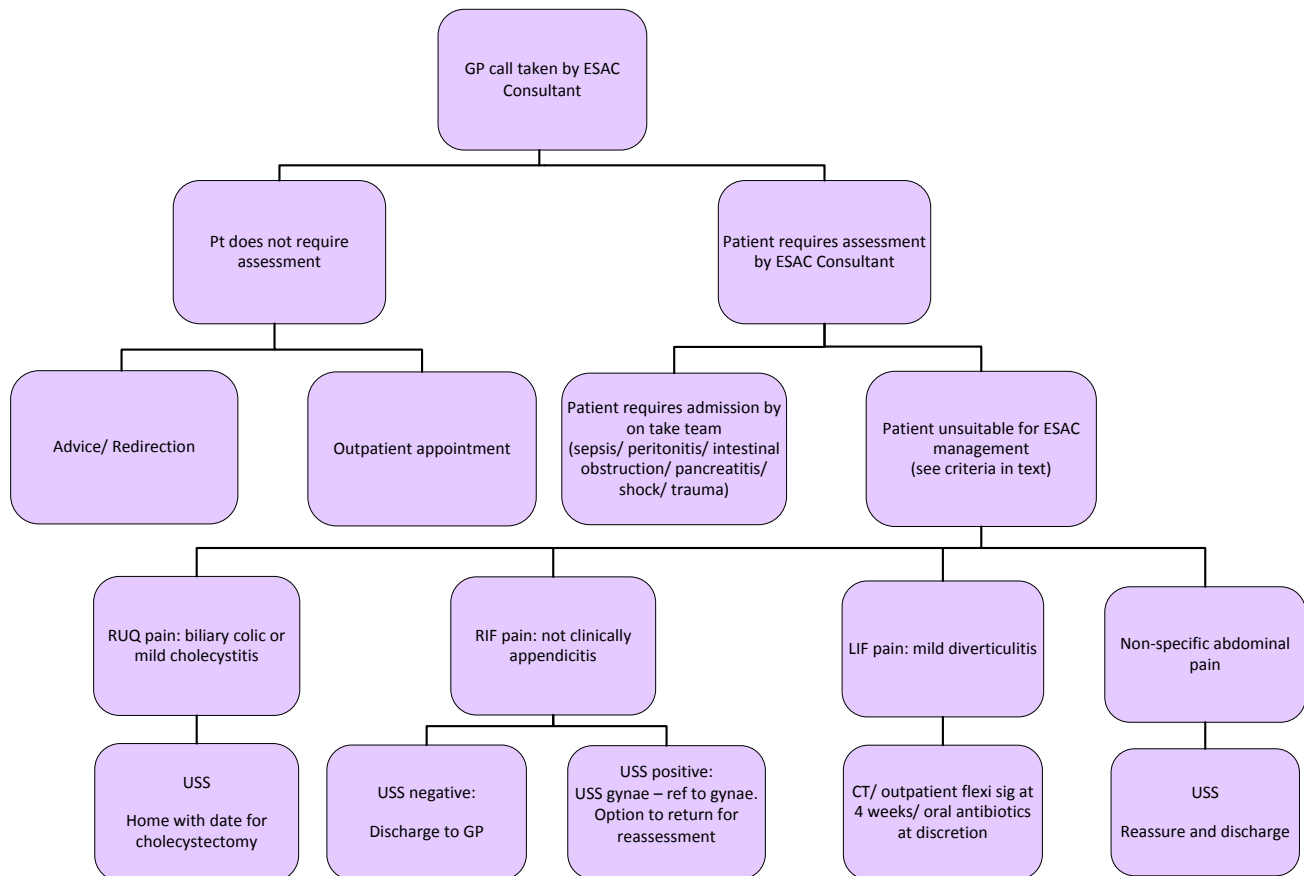
*May include:*

- None, reassure and discharge
- Bloods
- Abdominal x-ray, erect chest x-ray
- USS abdomen/pelvis (same or next day)
- CT abdomen (same or next day)
- Predicated imaging slots are essential and must be negotiated by contract. One protocol for a catchment population of 500 000 patients provides 10 guaranteed USS slots for this service every day and 1 daily CT slot

#### Consultant review

- Discharge to primary care with electronic letter
- Discharge after drainage of superficial sepsis under local anaesthetic
- Discharge with date for surgery (usually gallstones)
- Discharge with date for further investigation (usually PR bleed/acute diverticulosis)
- Discharge with appointment to return for review to acute surgical (“hot”) clinic at discretion of consultant
- Discharge to return for day case surgery next day

**Emergency surgery ambulatory care (ESAC) flow chart**



**1.4 The management of non-specific abdominal pain**

The diagnosis of non-specific abdominal pain (NSAP) comprises 13-40% of all surgical admission with abdominal pain<sup>20</sup>. It is generally defined as acute abdominal pain of less than seven days duration, where no diagnosis is reached after examination and baseline investigations. Causes include gynaecological conditions, irritable bowel syndrome (IBS), gastroenteritis and abdominal wall pain.

The use of early diagnostic laparoscopy in the diagnosis of such patients has been advocated by some, and such an approach will reduce the frequency of NSAP to around one in five<sup>21</sup> and facilitate early discharge. However general anaesthetic and laparoscopy are associated with a small risk of complication and performing this procedure specifically for the diagnosis of a non-surgical condition is controversial. Up to 40% of such patients with NSAP fit strict criteria for IBS.<sup>22</sup> Appropriate history taking and counselling of those with functional bowel disorders may avoid unnecessary laparoscopy.

Care must be exercised in a diagnosis of NSAP in the over 50 years age group, as the frequency of intra-abdominal malignancy in this group is 10%.<sup>23</sup> CT is advisable in this group and surgical follow up is advisable.

## 1.5 Right iliac fossa pain/appendicitis pathway

Right iliac fossa pain is one of the most common presentations to the acute surgical take. The lifetime risk of having appendicitis is 7% - 8% with an overall incidence of 11 cases per 10,000 population per year.<sup>24-26</sup> Whilst in some patients, who present with a typical history and convincing examination signs, it is easy to determine what their management should be, those with less specific signs can be more of a diagnostic challenge. It is these patients that require further time and investigations to determine the correct diagnosis and subsequent treatment. There is huge intra and inter hospital variability on management of these patients.<sup>27</sup>

### Investigations

- Observations, urinalysis and blood tests as per “Assessment” section of this document (p.7)
- In patients suspected of having appendicitis, an elevated WCC (neutrophilia) and CRP should prompt either imaging or a laparoscopy
  - A raise in both inflammatory markers gives a sensitivity of over 95% for the diagnosis<sup>24, 28, 29</sup>
  - Positive predictive value is increased by having both a raised WCC and CRP<sup>30, 31</sup>
  - If the duration of symptoms is less than 12 hours then a rise in CRP may not be seen compared to WCC which will show an early rise<sup>24,28</sup>
- In patients with both a normal WCC and CRP either a watch and wait policy or imaging is advocated as they have a very low likelihood of appendicitis.<sup>28,30</sup> Ambulatory care may be appropriate.

### Outpatient management

- Patients assessed in the acute surgical unit with an atypical history, no peritonism and a normal WCC and CRP may be suitable for discharge with a planned ambulatory care admission to a ‘hot clinic’ the next day, with or without, an USS scan
- These patients are only suitable for this kind of management if they are generally well, have easy access to return to the hospital, have no other reason to be admitted and have no serious co-morbidities
- They should all be given an abdominal pain information sheet and a contact number to ring, along with full details of when and where to return the following day
- Provision needs to be made for this service to run 7 days a week

### Scoring systems

- Various scoring systems have been developed with a particular view to determining cut-off values for ‘ruling in’ and ‘ruling out’ appendicitis.<sup>5, 6</sup> There is however insufficient evidence to support their routine use.

### Imaging

- Imaging is a useful diagnostic tool in right iliac fossa pain and its widespread use is increasing<sup>32</sup>
- The group of patients that most benefits from imaging is those who have an indeterminate diagnosis<sup>33</sup>
- Evidence suggests that its use decreases the negative appendicectomy rate and does not delay operative management or lead to complications<sup>34-36</sup>

- Both USS and CT are useful, USS being preferred in young women due to the high preponderance of gynaecological disease and also the radiation risks with CT<sup>37-39</sup>

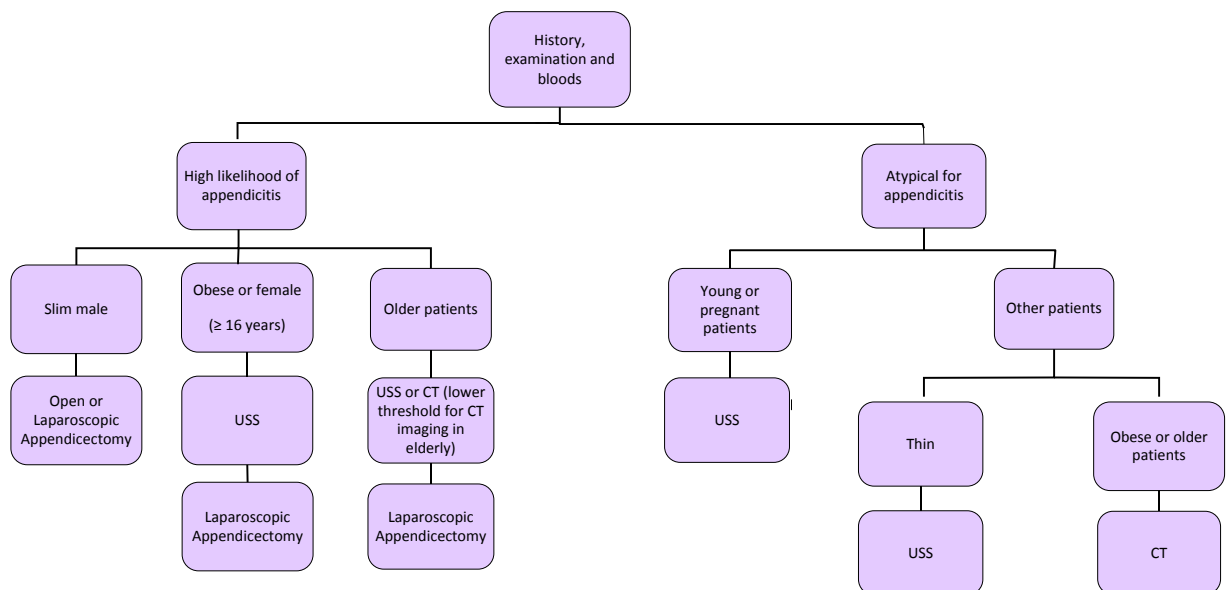
**Criteria for immediate appendicectomy**

- High suspicion of appendicitis with severe sepsis or septic shock

**Laparoscopic versus open appendicectomy**

- Laparoscopic appendicectomy is recommended over open appendicectomy in all patient groups where not contraindicated and where technically feasible<sup>40-46</sup>
- The laparoscopic approach is especially recommended in young females, employed patients and obese patients<sup>40, 47</sup>
- Laparoscopy reduces the complication rate, postoperative pain, hospital stay, time to normal activity and work, outside of hospital cost and risk of negative appendicectomy<sup>41, 44-46</sup>
- Historic concerns about this approach are now being addressed with a definite trend in recent studies towards shorter operating time, less overall cost (in and out of hospital combined) and lower rates of intra-abdominal abscess formation with laparoscopic appendicectomy<sup>41, 45, 48</sup>

**Right Iliac fossa/appendicitis flow chart**



## 1.6 Right upper quadrant pain/gallstones pathway

The acute onset of severe right upper quadrant pain most commonly is associated with the presence of gallstones. Between 10-15% of males and 20-25% of females of all ages have gallstones and the incidence of symptoms developing in asymptomatic patients is between 1-2% per annum. Patients present acutely with severe right upper quadrant pain which lasts several hours with minimal systemic upset (biliary colic) or more prolonged pain associated with localised gallbladder inflammation and systemic symptoms (acute cholecystitis). Both of these conditions are referred to as simple acute biliary disease. Patients in whom the severe pain is associated with jaundice and biliary dilatation or gallstone pancreatitis are regarded as having a complex biliary presentation and are managed according to a different pathway.

### Initial assessment and diagnosis

Typical clinical features will include right upper quadrant pain, nausea, vomiting, tachycardia and sometimes a pyrexia. Tenderness may be present on examination in the right upper quadrant. Initial blood tests should be performed as per “Assessment” section of this document (p.7). Early radiological input is essential with ultrasound scan of the abdomen being the most appropriate initial examination.

The ultrasound scan findings together with the liver function tests allow an initial triage of acute biliary patients into one of four categories:

- **Biliary colic** – short duration of pain, minimal systemic upset, normal liver function tests, no biliary dilatation on ultrasound
- **Acute cholecystitis** – pain for over 24 hours, systemic upset (pyrexia, tachycardia), raised white cell count, oedematous thick-walled gallbladder, often with stone stuck in neck on ultrasound (with normal liver function tests unless Mirizzi syndrome)
- **Complex biliary disease** – variable duration of pain, systemic upset possibly including rigors, pyrexia, deranged liver function tests and dilated biliary tree on ultrasound. High suspicion of gallstones being present in the common bile duct in addition to the gallbladder
- **Gallstone pancreatitis** – periumbilical pain that radiates to the back of variable duration and intensity, systemic upset, raised amylase or lipase. May have deranged liver function tests and inflammatory markers. USS may reveal a dilated biliary tree. Should have the disease severity stratified on admission and at 24 hours by a validated prognostic scoring system such as Glasgow, APACHE II or CRP<sup>49</sup>

### Ongoing management

This is entirely dependent on the cause of the right upper quadrant pain and varies according to the classification outlined above:

**Patients with biliary colic** are suitable for treatment in the ambulatory care setting or by early inpatient cholecystectomy. If the severe pain has settled patients may be either:

- a) Discharged to have an early outpatient ultrasound with follow up in either a hot biliary or acute general surgical clinic. Most patients who are medically fit will be offered an elective laparoscopic cholecystectomy (within 6 weeks ideally) after one severe attack of biliary colic as the likelihood of symptomatic recurrence is high.
- b) Proceed after ultrasound to acute inpatient cholecystectomy. A reliable service requires predicated theatre access.

**Patients with acute cholecystitis on ultrasound scan** should be admitted to hospital to have fluid resuscitation, antibiotics and analgesia.

Treatment options in this situation are either:

- a) conservative management followed by elective cholecystectomy

Or,

- b) early cholecystectomy during the first admission, particularly if the pain is of less than 5 days duration. Early cholecystectomy has been shown to be safe and cost effective in this setting

However in patients with conservatively managed acute cholecystitis approximately 10% of patients will not settle and will require cholecystectomy (or percutaneous cholecystostomy if frail /elderly) whilst in hospital. If treated conservatively a date should be offered for elective surgery, ideally around 6 weeks following discharge.

In spite of this short time interval 10-15% of patients will represent to secondary care in this time period with further biliary symptoms and may require urgent surgery at that time.

**Patients with complex biliary disease** should be admitted to hospital and treated with analgesia, antibiotics and fluids. Ongoing assessment should include daily liver function tests. These patients may have acute cholecystitis plus additional problems due to the presence of stones in the common bile duct, causing cholangitis and jaundice. Further management is guided by the following:

- trend of the liver function tests
  - ultrasound scan findings especially presence of biliary dilatation
  - systemic response to antibiotic treatment
- a) **Patients with temporarily deranged liver function tests that quickly return to normal** and who have **no biliary dilatation** are suitable for either early inpatient cholecystectomy, or delayed elective cholecystectomy (ideally within a 6 weeks of discharge).
  - b) **Patients with temporarily deranged liver function tests which slowly resolve, with ultrasound scan findings indicating biliary dilatation** should:
    - be discharged when their symptoms have resolved
    - undergo urgent outpatient magnetic resonance cholangiopancreatography (MRCP) examination
    - have early follow up after in a hot biliary or acute surgical clinic



Subsequent management depends on the MRCP findings:

- patients without common bile duct stones should be offered elective cholecystectomy around 6 weeks after discharge
  - patients with common duct stones on MRCP have the option of either endoscopic retrograde cholangiopancreatography (ERCP), followed by elective cholecystectomy, or cholecystectomy and common bile duct exploration, depending on local expertise.
- c) **Patients in whom the acute pain persists and the liver function tests continue to deteriorate** should be treated in hospital and undergo urgent ERCP and common bile duct clearance. After discharge elective cholecystectomy should be offered to all medically fit patients, although if elderly and frail, ERCP and sphincterotomy can be regarded as definitive management. Occasionally urgent biliary drainage, either by ERCP or percutaneous transhepatic cholangiography (PTC), is required in severely septic patients with cholangitis, who may require high doses of inotropic agents in addition to fluids and antibiotics.

**Patients with gallstone pancreatitis** should be admitted and resuscitated with intravenous fluids, oxygen and analgesia. Those with predicted mild disease can be managed on a general ward, but those with predicted severe disease should be transferred to critical care.

- Ultrasound should be performed urgently to confirm the presence of gallstones.
- Those with predicted severe disease will require a CT between the third and tenth day of admission to determine the presence of pancreatic necrosis<sup>49</sup>
- Early ERCP should be considered where there is co-existing biliary obstruction or cholangitis<sup>50</sup>
- If facilities exist, early laparoscopic cholecystectomy is preferable to delayed cholecystectomy in mild gallstone pancreatitis, but there is currently no evidence to support this approach in severe gallstone pancreatitis<sup>51</sup>

## 1.7 Left iliac fossa pain/diverticulitis pathway

### Background

Diverticulitis usually refers to acute sigmoid diverticulitis which is caused by inflammation of diverticula of the sigmoid colon and will be further discussed here, being a common condition. Other intestinal diverticula can become inflamed but much less commonly so and occasionally diverticula may also bleed significantly (see rectal bleeding pathway).

### Initial assessment

Typical clinical features include left iliac fossa pain and tenderness, inflammatory mass in left lower abdomen, tachycardia, and pyrexia. There may be any of nausea, vomiting, constipation, peritonitis and shock. Diverticulitis ranges in severity from a mild self-limiting process to fatal colonic perforation and the assessment process should be sufficiently speedy and senior to assess and triage appropriately.

Full clinical assessment including rectal exam is supported by investigations which include inflammatory blood markers.

The diagnosis of acute diverticulitis should be confirmed during the acute attack by radiological means, preferably urgent CT. Other causes of left lower abdominal pain include complicated colorectal cancer, various gynaecological pathologies, urinary obstruction or infection and leaking or ruptured abdominal

aortic aneurysm.

#### Acute diverticulitis – initial management

- Critical illness including shock and peritonitis requires immediate fluid resuscitation, critical care support, diagnosis and treatment of the cause, including antibiotics
- Whenever possible, patients with uncomplicated diverticulitis should be managed medically without recourse to surgery. Traditionally, patients have been admitted to hospital for intravenous antibiotics and fluids. Most settle within 36 to 72 hours
- It is feasible to manage patients with mild attacks in an emergency ambulatory setting with access to real-time imaging and senior clinical input. Treatment with oral fluids, antibiotics and stool softeners is supported by regular clinical review
- Some patients with acute diverticulitis can be managed without antibiotics but patients unwell enough to be admitted to hospital should probably have antibiotic therapy initiated, choosing oral or intravenous route according to individual patient circumstance
- CT scanning results are graded and may show localised inflammation, local or more extensive abscess formation, local or free perforation. Bowel obstruction can occur and fistulation into bladder or vagina particularly is seen

#### Acute diverticulitis – subsequent management of the acute attack

- Several options exist for patients with both complicated and uncomplicated diverticulitis who fail to respond to conservative management, including radiological (either CT or USS) drainage of a pericolic abscess, laparoscopic lavage (with/without drain placement), emergency surgery (defunctioning stoma, Hartmann's procedure, sigmoid colectomy with primary anastomosis either with/without covering loop stoma). All of these treatments have a role to play and the decision as to which one is utilised should be made on an individual patient basis.
- Percutaneous drainage is a useful technique and in some patients may prevent subsequent surgery, can make surgery less urgent and enable surgery to be carried out under better physiological control. Access to interventional radiology is therefore an essential requirement. Radiologically guided drainage may be effective treatment of pericolic abscess, however, appropriate follow up and ownership of the patient by a secondary care clinician is essential as ongoing sepsis may occur and may warrant consideration of other treatment pathways.
- In future, emergency surgery may include laparoscopic lavage and drainage but initial optimism has been offset by the abandonment of recent studies in Europe on account of adverse outcomes with this management protocol.
- Emergency resection, with or without primary anastomosis, carries significant risks and requires senior surgical input and appropriate post-operative care (access to critical care/ high dependency).
- There is minimal evidence investigating the use of laparoscopic resection in patients requiring emergency sigmoid colectomy but laparoscopic surgery should be considered, if there is appropriate expertise available.

#### Patients with acute diverticulitis – later management

- All patients require investigation of the colonic lumen by either endoscopy, barium enema or CT colonography after the acute attack has resolved
- Elective resection for a patient with a single episode of uncomplicated diverticulitis is not

supported. Patients need to have access to appropriate expert colorectal advice regarding surgery in the future if symptoms recur. This should be done according to ACPGBI guidelines (p.27)

- The decision when to offer elective resection for a patient with recurrent (two or more) episodes of diverticulitis is dependent on a number of factors. A single blanket recommendation is not appropriate and the decision as to whether or not to offer surgery in this group of patients should be made on an individual patient basis
- Age alone (both young and old) should not be a criterion when considering whether or not to offer elective surgery

## 1.8 Small bowel obstruction pathway

### Background

Small bowel obstruction (SBO) results from a partial or complete mechanical blockage preventing food, fluid or gas moving through the intestines. SBO accounts for 12-16% of emergency surgery admissions and 20% of emergency laparotomies in the UK (some 7000 operations per year).<sup>52</sup>

### Initial assessment

SBO is characterised clinically by abdominal pain (intestinal colic), vomiting and distension. Patients with this symptom pattern or where SBO is suspected should be referred urgently to secondary care for assessment and management.

Initial assessment and management includes clinical examination for peritonism or hernia, fluid resuscitation, analgesia, placement of a nasogastric tube (which should be aspirated regularly) and urinary catheter, blood tests (including lactate) and plain radiography of the chest and abdomen. Other medical conditions including diabetes and anti-coagulation should be attended to.

Early surgery is indicated without the need for further imaging if there is clinical (pyrexia/ tachycardia/ peritonitis/ increasing pain) or biochemical (white cell count/ C-reactive protein/ metabolic acidosis) evidence of potential ischaemia, strangulation or if an obstructed hernia is detected.<sup>52</sup>

### Radiological imaging

Strangulation/bowel ischaemia may be challenging to detect clinically; serial examinations by an experienced surgeon and/or CT scanning are required. Delaying surgery in the context of strangulation is associated with poor outcomes.

If early surgery is not indicated, CT scans provide incremental information and are valuable in management. CT can confirm the diagnosis of SBO when plain films are ambivalent and in addition determine the level of obstruction and the cause.<sup>52, 53</sup>

Surgery is indicated if the CT has demonstrated a non-adhesional cause (tumour, hernia, volvulus or gallstone) or shows evidence of bowel ischaemia.<sup>52</sup> Surgery is not indicated if the CT has demonstrated that the clinical scenario results from a functional problem (ileus – particularly post-operatively, pseudo-obstruction, diabetes or opiate related).

### Adhesional obstruction

Adhesional obstruction is common among patients who have had previous abdominal surgery and many episodes settle with conservative management. However the timing of emergency surgery for the obstruction can be challenging.

Clinically stable patients with confirmed adhesional obstruction can safely be managed conservatively for 72 hours (3 days).<sup>52,54</sup> If obstruction has not resolved at this point surgery is recommended and should not be delayed beyond 120 hours (day 5) as the risk of mortality then increases further.<sup>52,54</sup>

A gastrografen contrast study can be an aid to decision making after 48 hours of conservative management. Contrast reaching the colon predicts resolution without surgery. The hypertonic contrast medium itself can be therapeutic.<sup>52,53</sup>

#### **Surgery**

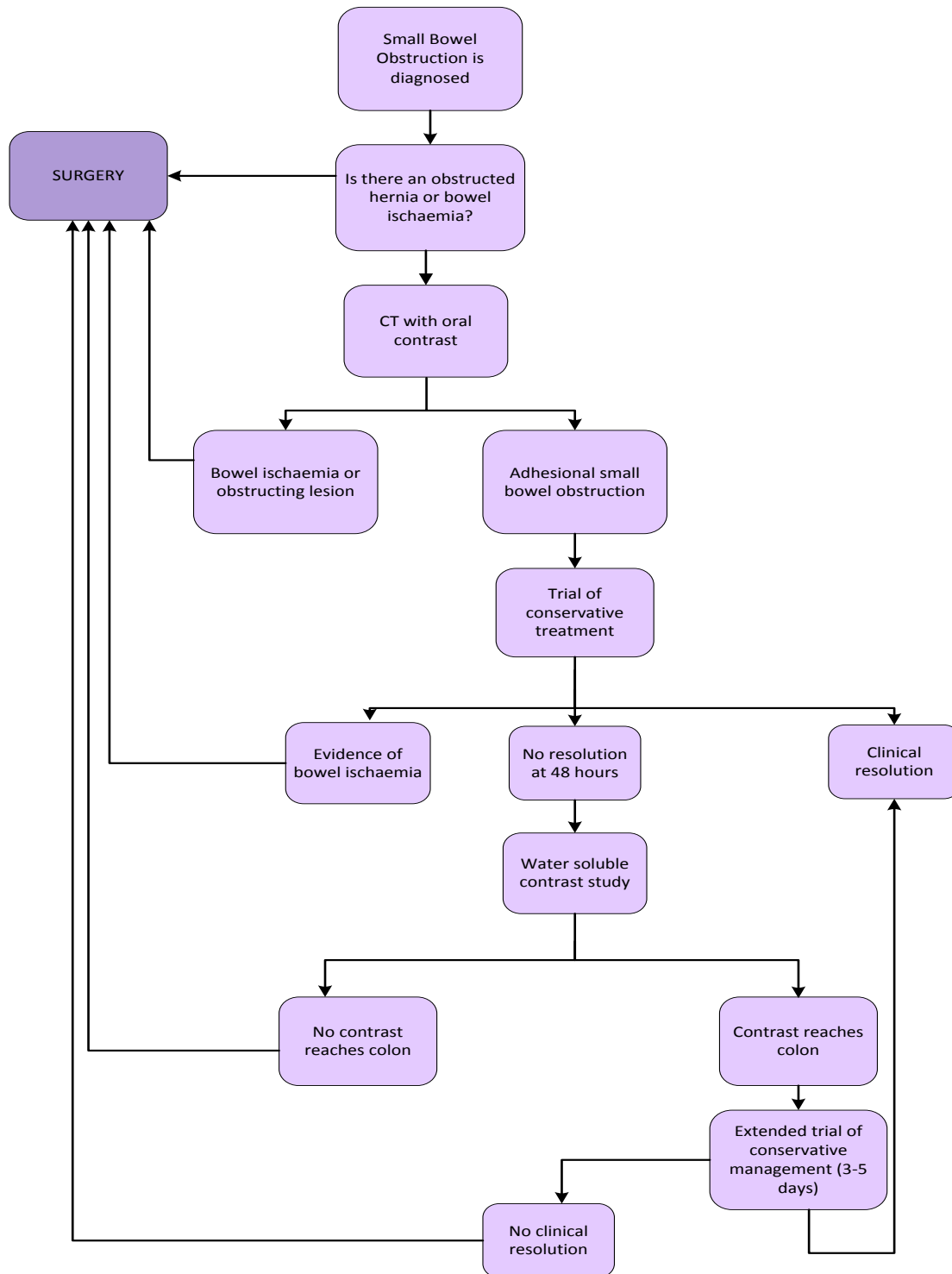
If there is suspected ischaemia or strangulation, surgery should be carried out as soon as possible and in any event within 6 hours of the suspected onset of ischaemia or strangulation.

Laparoscopic surgery may be considered as an alternative to open surgery by experienced laparoscopic surgeons particularly if imaging has suggested a technically straightforward obstruction.<sup>53</sup> Successful laparoscopic surgery is associated with a shorter length of stay.<sup>55</sup>

Current evidence does not support the routine administration of anti-adhesion products after surgery for adhesional obstruction.<sup>52</sup>

Surgery for SBO is associated with significant morbidity and mortality (10.6% at 30 days in UK practice).<sup>56</sup> Consultant surgical and anaesthetic personnel should be in attendance and post-operative care should be in a critical-care environment.

Small bowel obstruction flow chart



## 1.9 Large bowel obstruction pathway

### Introduction

Large-bowel obstruction (LBO) is an emergency condition that requires early identification and intervention. Causes include cancer (60%), diverticular strictures (20%) and volvulus (5%). Up to 30% of colorectal cancer cases initially present in the emergency setting. Emergency surgery performed for LBO is associated with a high morbidity and peri-operative mortality ranges from 10-20%, compared with rates less than 5% in elective surgery. Mortality rates increase to 40% if there is colonic perforation. Surgery in these patients should ideally occur during the day by colorectal surgeons.

### Symptoms

Include abdominal distension, absolute constipation (of stool and flatus), nausea, vomiting and colicky lower abdominal pain. Continuous pain is an ominous symptom heralding bowel ischaemia. An abrupt onset of symptoms makes an acute obstructive event (e.g. volvulus) a more likely diagnosis. A longer history with a change in bowel habit favours malignancy.

### Signs

Abdominal distension, perhaps with a palpable mass. Tenderness over the caecum implies impending perforation. Peritonitis demands urgent resuscitation and surgery within 6 hours.

### Referral

All patients with a history consistent with LBO need urgent referral to secondary care. Where possible, within 24 hours of admission, such patients should be under the care of a colorectal surgeon.

### Investigation of LBO

Patients suspected to have LBO should undergo an urgent CT scan within 24 hours maximum. CT is the most sensitive way of confirming LBO, identifying colonic perforation / dilatation and staging malignant disease.<sup>57, 58</sup> A water soluble contrast study can be performed; however it is less sensitive than CT in identifying perforation and cannot stage malignant disease. Contrast studies are most useful for excluding pseudo obstruction. CT with rectal contrast is performed in some units.

### Management

All patients should be resuscitated with IV fluids, nasogastric intubation and urethral catheterisation. The nasogastric tube should be aspirated regularly to reduce risk of aspiration.

Management thereafter depends on the underlying pathology and clinical state of the patient.

- Malignant obstruction:

Malignant LBO without peritonism does not require emergency surgery and should be assessed by a colorectal surgeon. Options should include colonic stenting (see below). Surgical options include a defunctioning stoma, resection and exteriorisation and resection with primary anastomosis. In the presence of non-viable bowel or perforation, primary anastomosis should be avoided and all non-viable bowel resected. Laparoscopy has little role in the obstructed patient.

- Benign strictures:

Usually require surgery if causing LBO.

- Volvulus:

Is most common in the sigmoid colon and caecum. Most can be treated with endoscopic decompression followed by elective resection in selected patients.

If symptoms and signs suggest ischaemia or if decompression fails, surgery is indicated.

#### Stenting for malignant LBO

Self-expanding metal stents allow endoscopic decompression of LBO in an attempt to avoid emergency surgery. Following decompression, elective surgery should take place within 2 weeks.<sup>59</sup> In the frailest patients, stenting may be definitive management for their disease. Stents are most effective in left-sided colonic obstruction and are not suitable in low rectal obstructions.<sup>60</sup> Patients with benign strictures are rarely appropriate for stenting.

Commissioners should ensure there is a stenting service available to each MDT within the cancer networks. Trusts should be able to offer a service within 24-48 hours of referral.<sup>61</sup>

## 2 Procedures explorer for emergency general surgery

Users can access further procedure information based on the data available in the quality dashboard to see how individual providers are performing against the indicators. This will enable CCGs to start a conversation with providers who appear to be 'outliers' from the indicators of quality that have been selected.

The Procedures Explorer Tool will be available via the [Royal College of Surgeons](#) website.

## 3 Quality dashboard for emergency general surgery

The quality dashboard provides an overview of activity commissioned by CCGs from the relevant pathways, and indicators of the quality of care provided by surgical units.

The quality dashboard will be available via the [Royal College of Surgeons](#) website.

#### Note on the use of the data tools

Both the Procedures Explorer and Quality Dashboard are derived from HES data. Each of the pathways detailed in this document is defined by a group of ICD10 and OPCS4 codes and can be used to evaluate performance against seven indicators: activity volume, short stay rate, average length of stay, seven-day

readmission rate, 30-day readmission rate, 30-day reoperation rate, and day case rate. These analyses can be performed at both Trust and CCG level. They represent a strong audit tool, both for commissioners and individual Trusts, to benchmark their results.

For EGS, where there are a number of possible diagnoses, ICD10 and OPCS4 codes have their limitations. It is not, for example, always possible to differentiate between an emergency laparotomy performed for an obstructing colonic carcinoma, and that performed for a perforated colonic carcinoma. The code set used for each pathway is therefore a “best fit” estimate, and there may be some overlap between pathways. This should be taken into consideration when interpreting the data.

## 4 Levers for implementation

### 4.1 Audit and peer review measures

The following measures and standards are those expected at primary and secondary care. Evidence should be able to be made available to commissioners if requested.

	Measure	Standard
<b>National Audit</b>	Provider can demonstrate participation in Emergency Laparotomy National Audit	
<b>Standards for Emergency Surgery in the High Risk Patient</b>	Should conform with the Royal College of Surgeons and Department of Health standards	The Higher Risk General Surgical Patient: Towards Improved Care for a Forgotten Group
<b>Standards for Emergency Surgery</b>	Should conform with the Royal College of Surgeons standards	Emergency Surgery: Standards for Unscheduled Care
<b>Surviving Sepsis</b>	Should conform with Surviving Sepsis guidelines	Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock



## 4.2 Quality specification/CQUIN (Commissioning for Quality and Innovation)

Measure	Description	Data specification (if required)
<b>Acute abdominal pain</b>	<ul style="list-style-type: none"> <li>• Unplanned readmission within 30 days</li> <li>• Unplanned surgery within 30 days</li> <li>• Mortality within 30 days</li> </ul>	
<b>Emergency laparotomy</b>	<ul style="list-style-type: none"> <li>• Mortality rate from emergency laparotomy</li> <li>• Consultant surgeon presence</li> <li>• Consultant anaesthetist presence</li> <li>• Proportion of emergency laparotomies not admitted directly to critical care after surgery</li> <li>• Availability of interventional radiology rota</li> </ul>	
<b>Ambulatory emergency surgery</b>	<ul style="list-style-type: none"> <li>• Proportion of patients managed in an ambulatory setting</li> <li>• Proportion of total EGS admissions with a diagnosis of NSAP</li> </ul>	
<b>Right iliac fossa pain/appendicitis</b>	<ul style="list-style-type: none"> <li>• Time to diagnostic imaging</li> <li>• Time to appendicectomy in acute appendicitis</li> <li>• Percentage appendicectomies performed laparoscopically</li> <li>• Negative appendicectomy rate</li> </ul>	
<b>Right upper quadrant pain/gallstones</b>	<ul style="list-style-type: none"> <li>• Time to diagnostic imaging</li> <li>• Percentage of patients treated in ambulatory setting</li> <li>• Early cholecystectomy rate</li> <li>• Readmission rate with biliary symptoms before elective cholecystectomy</li> </ul>	
<b>Large bowel obstruction</b>	<ul style="list-style-type: none"> <li>• Proportion of malignant obstruction operated on by core member of colorectal MDT</li> <li>• Definitive management (surgery or stent) within 48 hours</li> <li>• Technical and clinical success rate of stenting (90% and 80% respectively as benchmark)</li> </ul>	

## 5 Directory

### 5.1 Patient Information for emergency general surgery

Name	Publisher	Link
<b>Patient information relating to bowel symptoms, diseases and treatments.</b>	Association of Coloproctology of Great Britain and Ireland	<a href="http://www.acpgbi.org.uk/patients/">www.acpgbi.org.uk/patients/</a>
<b>Patient information on surgical procedures</b>	Association of Laparoscopic Surgeons of Great Britain and Ireland	<a href="http://www.alsgbi.org/patient_information/index.htm">www.alsgbi.org/patient_information/index.htm</a>
<b>Information on abdominal pain</b>	NHS Choices	<a href="http://www.nhs.uk/conditions/stomach-ache-abdominal-pain/pages/introduction.aspx">www.nhs.uk/conditions/stomach-ache-abdominal-pain/pages/introduction.aspx</a>
<b>Patient information about a range of conditions affecting the gut and liver</b>	Digestive Disorders Foundation in conjunction with British Society of Gastroenterology	<a href="http://www.bsg.org.uk/patients/general/patient-information.html">www.bsg.org.uk/patients/general/patient-information.html</a>
<b>Health information on symptoms, investigations and surgical procedures</b>	Patient.co.uk	<a href="http://www.patient.co.uk/health/operations-surgical-procedures-1257">www.patient.co.uk/health/operations-surgical-procedures-1257</a>
<b>Patient information about having surgery</b>	The Royal College of Surgeons of England	<a href="http://www.rcseng.ac.uk/patients/about-surgery/having-surgery">www.rcseng.ac.uk/patients/about-surgery/having-surgery</a>

### 5.2 Clinician information for emergency general surgery

Name	Publisher	Link
<b>The Higher Risk General Surgical Patient: Towards Improved Care for a Forgotten Group</b>	The Royal College of Surgeons of England and Department of Health	<a href="http://www.rcseng.ac.uk/publications/docs/higher-risk-surgical-patient/">http://www.rcseng.ac.uk/publications/docs/higher-risk-surgical-patient/</a>
<b>Emergency Surgery: Standards for Unscheduled Care</b>	The Royal College of Surgeons of England	<a href="http://www.rcseng.ac.uk/publications/docs/emergency-surgery-standards-for-unscheduled-care">http://www.rcseng.ac.uk/publications/docs/emergency-surgery-standards-for-unscheduled-care</a>
<b>Issues in Professional Practice: Emergency General Surgery</b>	The Association of Surgeons of Great Britain and Ireland	<a href="http://www.asgbi.org.uk/en/publications/issues_in_professional_practice.cfm">http://www.asgbi.org.uk/en/publications/issues_in_professional_practice.cfm</a>
<b>Position statements and management guidance</b>	The Association of Coloproctology of Great Britain and Ireland	<a href="http://www.acpgbi.org.uk/resources/guidelines/">//www.acpgbi.org.uk/resources/guidelines/</a>

**Surviving Sepsis Guidelines**

The Surviving Sepsis Campaign

<http://www.survivingsepsis.org/Guidelines/Pages/default.aspx>

## 6 Benefits and risks of implementing this guide

Consideration	Benefit	Risk
<b>Patient outcome</b>	Ensure universal access to best quality, timely and effective treatment	
<b>Patient safety</b>	Reduce mortality and readmission rates for emergency laparotomy	Risk associated with a surgical ambulatory pathway if the initial assessment is not made by a consultant surgeon.
<b>Patient experience</b>	Clearer explanation and identification of correct patient pathway for the treatment of acute abdominal pain	
<b>Audit</b>	Provides detailed data tool for audit and benchmarking	
<b>Equity of access</b>	Improve access to the correct treatment at the correct time	
<b>Resource impact</b>	Reduce unnecessary emergency surgical referrals	Resource required to establish emergency surgery ambulatory care services

## 7 Further information

### 7.1 Research recommendations

- Audit of selected aspects of emergency care should be intensified given the scale and cost of the service. Ambulatory care, time to investigations, appendicitis, gallstone disease and emergency laparotomy are probably good markers of the different facets of this service. Indicators are suggested above.
- The development of ambulatory care has the potential to offer a better service at reduced cost. Research into methods of staffing these services would be timely. This could include advanced nurse practitioners or primary care physicians in conjunction with surgeons.
- Prospective well designed comparative studies evaluating interventions in emergency general surgery, including assessment of outcomes of importance to patients, surgeons and the health service are required.

## 7.2 Other recommendations

- Auditing and publishing outcomes from emergency laparotomy at a hospital level is timely. A national audit of emergency laparotomy has begun with patient outcome data available from April 2015. This will be addressed in subsequent updates of this document.

## 7.3 Evidence base

1. Dr Foster. <http://myhospitalguide.drfoosterintelligence.co.uk>.
2. Saunders DI, Murray D, Pichel AC, Varley S, Peden CJ. Variations in mortality after emergency laparotomy: the first report of the UK Emergency Laparotomy Network. *Br J Anaesth* 2012;**109**(3): 368-375.
3. Brekke M, Eilertsen RK. Acute abdominal pain in general practice: tentative diagnoses and handling. A descriptive study. *Scand J Prim Health Care* 2009;**27**(3): 137-140.
4. Dookeran KA, Bain I, Moshakis V. Audit of general practitioner referrals to a surgical assessment unit: new methods to improve the efficacy of the acute surgical service. *Br J Surg* 1996;**83**(11): 1544-1547.
5. Adams ID, Chan M, Clifford PC, Cooke WM, Dallos V, de Dombal FT, Edwards MH, Hancock DM, Hewett DJ, McIntyre N, et al. Computer aided diagnosis of acute abdominal pain: a multicentre study. *Br Med J (Clin Res Ed)* 1986;**293**(6550): 800-804.
6. Paterson-Brown S, Vipond MN, Simms K, Gatzen C, Thompson JN, Dudley HA. Clinical decision making and laparoscopy versus computer prediction in the management of the acute abdomen. *Br J Surg* 1989;**76**(10): 1011-1013.
7. Liu JL, Wyatt JC, Deeks JJ, Clamp S, Keen J, Verde P, Ohmann C, Wellwood J, Dawes M, Altman DG. Systematic reviews of clinical decision tools for acute abdominal pain. *Health Technol Assess* 2006;**10**(47): 1-167, iii-iv.
8. Manterola C, Vial M, Moraga J, Astudillo P. Analgesia in patients with acute abdominal pain. *Cochrane Database Syst Rev* 2011(1): CD005660.
9. Kessler C, Bauer SJ. Utility of the digital rectal examination in the emergency department: a review. *J Emerg Med* 2012;**43**(6): 1196-1204.
10. Royal College of Radiologists Working Party. Making the best use of a department of clinical radiology: guidelines for doctors. London; 2003.
11. Nural MS, Ceyhan M, Baydin A, Genc S, Bayrak IK, Elmali M. The role of ultrasonography in the diagnosis and management of non-traumatic acute abdominal pain. *Intern Emerg Med* 2008;**3**(4): 349-354.
12. Walsh PF, Crawford D, Crossling FT, Sutherland GR, Negrette JJ, Shand J. The value of immediate ultrasound in acute abdominal conditions: a critical appraisal. *Clin Radiol* 1990;**42**(1): 47-49.
13. The Royal College of Surgeons of England and Department of Health. The Higher Risk General Surgical Patient: Towards Improved Care for a Forgotten Group. 2011.
14. The Association of Coloproctology of Great Britain & Ireland. National Bowel Cancer Audit Annual Report 2013; 2013.
15. Association of Surgeons of GB & Ireland. Emergency General Surgery. Issues in Professional Practice. 2012.
16. NCEPOD. Elective & Emergency Surgery in the Elderly: An Age Old Problem 2010.
17. The Royal College of Surgeons of England. Emergency Surgery: Standards for unscheduled surgical care; 2011.
18. Enhanced Recovery Partnership and NHS Improvement. Fulfilling the potential: a better journey for patients and a better deal for the NHS; 2012.
19. Tierney GM, Lund J. Personal communication in press. Bulletin of the Royal College of Surgeons of

England; 2014.

20. Poulin EC, Schlachta CM, Mamazza J. Early laparoscopy to help diagnose acute non-specific abdominal pain. *Lancet* 2000;**355**(9207): 861-863.
21. Decadt B, Sussman L, Lewis MP, Secker A, Cohen L, Rogers C, Patel A, Rhodes M. Randomized clinical trial of early laparoscopy in the management of acute non-specific abdominal pain. *Br J Surg* 1999;**86**(11): 1383-1386.
22. Heaton KW. Diagnosis of acute non-specific abdominal pain. *Lancet* 2000;**355**(9215): 1644.
23. de Dombal FT, Matharu SS, Staniland JR, Wilson DH, MacAdam WA, Gunn AA, Allan WR, Bjerregaard B. Presentation of cancer to hospital as 'acute abdominal pain'. *Br J Surg* 1980;**67**(6): 413-416.
24. Petroianu A. Diagnosis of acute appendicitis. *Int J Surg* 2012;**10**(3): 115-119.
25. Shelton T, McKinlay R, Schwartz RW. Acute appendicitis: current diagnosis and treatment. *Curr Surg* 2003;**60**(5): 502-505.
26. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990;**132**(5): 910-925.
27. Multicentre observational study of performance variation in provision and outcome of emergency appendectomy. *Br J Surg* 2013;**100**(9): 1240-1252.
28. Gronroos JM, Gronroos P. Leucocyte count and C-reactive protein in the diagnosis of acute appendicitis. *Br J Surg* 1999;**86**(4): 501-504.
29. Xharra S, Gashi-Luci L, Xharra K, Veselaj F, Bicaj B, Sada F, Krasniqi A. Correlation of serum C-reactive protein, white blood count and neutrophil percentage with histopathology findings in acute appendicitis. *World J Emerg Surg* 2012;**7**(1): 27.
30. Ortega-Deballon P, Ruiz de Adana-Belbel JC, Hernandez-Matias A, Garcia-Septiem J, Moreno-Azcoita M. Usefulness of laboratory data in the management of right iliac fossa pain in adults. *Dis Colon Rectum* 2008;**51**(7): 1093-1099.
31. Cole MA, Maldonado N. Evidence-based management of suspected appendicitis in the emergency department. *Emerg Med Pract* 2011;**13**(10): 1-29; quiz 29.
32. Flum DR, McClure TD, Morris A, Koepsell T. Misdiagnosis of appendicitis and the use of diagnostic imaging. *J Am Coll Surg* 2005;**201**(6): 933-939.
33. Unlu C, de Castro SM, Tuynman JB, Wust AF, Steller EP, van Wagenveld BA. Evaluating routine diagnostic imaging in acute appendicitis. *Int J Surg* 2009;**7**(5): 451-455.
34. van Breda Vriesman AC, Kole BJ, Puylaert JB. Effect of ultrasonography and optional computed tomography on the outcome of appendectomy. *Eur Radiol* 2003;**13**(10): 2278-2282.
35. Rosengren D, Brown AF, Chu K. Radiological imaging to improve the emergency department diagnosis of acute appendicitis. *Emerg Med Australas* 2004;**16**(5-6): 410-416.
36. Poortman P, Oostvogel HJ, Bosma E, Lohle PN, Cuesta MA, de Lange-de Klerk ES, Hamming JF. Improving diagnosis of acute appendicitis: results of a diagnostic pathway with standard use of ultrasonography followed by selective use of CT. *J Am Coll Surg* 2009;**208**(3): 434-441.
37. Nelson DW, Causey MW, Porta CR, McVay DP, Carnes AM, Johnson EK, Steele SR. Examining the relevance of the physician's clinical assessment and the reliance on computed tomography in diagnosing acute appendicitis. *Am J Surg* 2013;**205**(4): 452-456.
38. Raman SS, Lu DS, Kadell BM, Vodopich DJ, Sayre J, Cryer H. Accuracy of nonfocused helical CT for the diagnosis of acute appendicitis: a 5-year review. *AJR Am J Roentgenol* 2002;**178**(6): 1319-1325.
39. Romero J, Sanabria A, Angarita M, Varon JC. Cost-effectiveness of computed tomography and ultrasound in the diagnosis of appendicitis. *Biomedica* 2008;**28**(1): 139-147.
40. Sauerland S, Jaschinski T, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. *Cochrane Database Syst Rev* 2010(10): CD001546.
41. Page AJ, Pollock JD, Perez S, Davis SS, Lin E, Sweeney JF. Laparoscopic versus open appendectomy: an analysis of outcomes in 17,199 patients using ACS/NSQIP. *J Gastrointest Surg* 2010;**14**(12): 1955-1962.
42. Faiz O, Clark J, Brown T, Bottle A, Antoniou A, Farrands P, Darzi A, Aylin P. Traditional and

laparoscopic appendectomy in adults: outcomes in English NHS hospitals between 1996 and 2006. *Ann Surg* 2008;**248**(5): 800-806.

43. Moazzez A, Mason RJ, Katkhouda N. Thirty-day outcomes of laparoscopic versus open appendectomy in elderly using ACS/NSQIP database. *Surg Endosc* 2013;**27**(4): 1061-1071.
44. Masoomi H, Mills S, Dolich MO, Ketana N, Carmichael JC, Nguyen NT, Stamos MJ. Comparison of outcomes of laparoscopic versus open appendectomy in adults: data from the Nationwide Inpatient Sample (NIS), 2006-2008. *J Gastrointest Surg* 2011;**15**(12): 2226-2231.
45. Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, Liu Y. Laparoscopic versus conventional appendectomy--a meta-analysis of randomized controlled trials. *BMC Gastroenterol* 2010;**10**: 129.
46. Wei B, Qi CL, Chen TF, Zheng ZH, Huang JL, Hu BG, Wei HB. Laparoscopic versus open appendectomy for acute appendicitis: a metaanalysis. *Surg Endosc* 2011;**25**(4): 1199-1208.
47. Gaitan HG, Reveiz L, Farquhar C. Laparoscopy for the management of acute lower abdominal pain in women of childbearing age. *Cochrane Database Syst Rev* 2011(1): CD007683.
48. Wilson DG, Bond AK, Ladwa N, Sajid MS, Baig MK, Sains P. Intra-abdominal collections following laparoscopic versus open appendectomy: an experience of 516 consecutive cases at a district general hospital. *Surg Endosc* 2013;**27**(7): 2351-2356.
49. UK guidelines for the management of acute pancreatitis. *Gut* 2005;**54** Suppl 3: iii1-9.
50. Tse F, Yuan Y. Early routine endoscopic retrograde cholangiopancreatography strategy versus early conservative management strategy in acute gallstone pancreatitis. *Cochrane Database Syst Rev* 2012;**5**: CD009779.
51. Gurusamy KS, Nagendran M, Davidson BR. Early versus delayed laparoscopic cholecystectomy for acute gallstone pancreatitis. *Cochrane Database Syst Rev* 2013;**9**: CD010326.
52. Maung AA, Johnson DC, Piper GL, Barbosa RR, Rowell SE, Bokhari F, Collins JN, Gordon JR, Ra JH, Kerwin AJ. Evaluation and management of small-bowel obstruction: an Eastern Association for the Surgery of Trauma practice management guideline. *J Trauma Acute Care Surg* 2012;**73**(5 Suppl 4): S362-369.
53. Di Saverio S, Coccolini F, Galati M, Smerieri N, Biffi WL, Ansaloni L, Tugnoli G, Velmahos GC, Sartelli M, Bendinelli C, Fraga GP, Kelly MD, Moore FA, Mandala V, Mandala S, Masetti M, Jovine E, Pinna AD, Peitzman AB, Leppaniemi A, Sugarbaker PH, Goor HV, Moore EE, Jeekel J, Catena F. Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2013 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group. *World J Emerg Surg* 2013;**8**(1): 42.
54. Schraufnagel D, Rajaei S, Millham FH. How many sunsets? Timing of surgery in adhesive small bowel obstruction: a study of the Nationwide Inpatient Sample. *J Trauma Acute Care Surg* 2013;**74**(1): 181-187; discussion 187-189.
55. Li MZ, Lian L, Xiao LB, Wu WH, He YL, Song XM. Laparoscopic versus open adhesiolysis in patients with adhesive small bowel obstruction: a systematic review and meta-analysis. *Am J Surg* 2012;**204**(5): 779-786.
56. Barrow E, Anderson ID, Varley S, Pichel AC, Peden CJ, Saunders DI, Murray D. Current UK practice in emergency laparotomy. *Ann R Coll Surg Engl* 2013;**95**(8): 599-603.
57. Beattie GC, Peters RT, Guy S, Mendelson RM. Computed tomography in the assessment of suspected large bowel obstruction. *ANZ J Surg* 2007;**77**(3): 160-165.
58. Maras-Simunic M, Druzijanic N, Simunic M, Roglic J, Tomic S, Perko Z. Use of modified multidetector CT colonography for the evaluation of acute and subacute colon obstruction caused by colorectal cancer: a feasibility study. *Dis Colon Rectum* 2009;**52**(3): 489-495.
59. Repici A, De Caro G, Luigiano C, Fabbri C, Pagano N, Preatoni P, Danese S, Fuccio L, Consolo P, Malesci A, D'Imperio N, Cennamo V. WallFlex colonic stent placement for management of malignant colonic obstruction: a prospective study at two centers. *Gastrointest Endosc* 2008;**67**(1): 77-84.
60. Sebastian S, Johnston S, Geoghegan T, Torreggiani W, Buckley M. Pooled analysis of the efficacy and safety of self-expanding metal stenting in malignant colorectal obstruction. *Am J Gastroenterol* 2004;**99**(10):

2051-2057.

61. National Institute for Health and Care Excellence. CG131 Colorectal Cancer: The diagnosis and management of colorectal cancer. London; 2011.

## 7.4 Guide development group for emergency general surgery

A commissioning guide development group was established to review and advise on the content of the commissioning guide. This group met once, with additional interaction taking place via email.

Name	Job Title/Role	Affiliation
<b>Mr Iain Anderson</b>	Consultant General Surgeon/Chair	Association of Surgeons of Great Britain and Ireland (ASGBI)
<b>Ms Emma Barrow</b>	Consultant General Surgeon /Lead Editor and Contributor	ASGBI
<b>Mr Nick Lees</b>	Consultant General Surgeon/Contributor	ASGBI
<b>Mr Jonathan Epstein</b>	Consultant General Surgeon/Contributor	ASGBI
<b>Ms Gill Tierney</b>	Consultant Colorectal and General Surgeon /Contributor	ACPGBI
<b>Mr Iain Cameron</b>	Consultant General Surgeon/Contributor	AUGIS
<b>Mr Lee Dvorkin</b>	Consultant Colorectal Surgeon/Contributor	Association of Coloproctology of Great Britain and Ireland (ACPGBI)
<b>Mr Tan Arulampalam</b>	Consultant Laparoscopic and General Surgeon/Contributor	Association of Laparoscopic Surgeons of Great Britain and Ireland (ALSGBI)
<b>Ms Katherine Pearson</b>	Specialist Registrar Surgery/Contributor	ASGBI
<b>Dr Tia McGregor</b>	General Practitioner Representative	St Bartholomews Medical Centre, Oxford
<b>Dr Mark Spencer</b>	Commissioner Representative	NHS England
<b>Mr Alex Heritage</b>	Director, Greater Manchester Service Transformation/ Commissioner Representative	NHS England
<b>Mr Geoff Dignum</b>	Lay Representative	
<b>Mr Kenneth Appel</b>	Lay Representative	

## 7.5 Funding statement

The development of this commissioning guidance has been funded by the following sources:

- Department of Health Right Care funded the costs of the guide development group, literature searches and contributed towards administrative costs.
- The Royal College of Surgeons of England and the Association of Surgeons of Great Britain and Ireland provided staff to support the guide development.

## 7.6 Conflict of Interest Statement

Individuals involved in the development and formal peer review of commissioning guides are asked to complete a conflict of interest declaration. It is noted that declaring a conflict of interest does not imply that the individual has been influenced by his or her secondary interest. It is intended to make interests (financial or otherwise) more transparent and to allow others to have knowledge of the interest.

No interests have been declared by the group.