The Royal College of Anaesthetists

NIAA HSRC Health Services Research Centre

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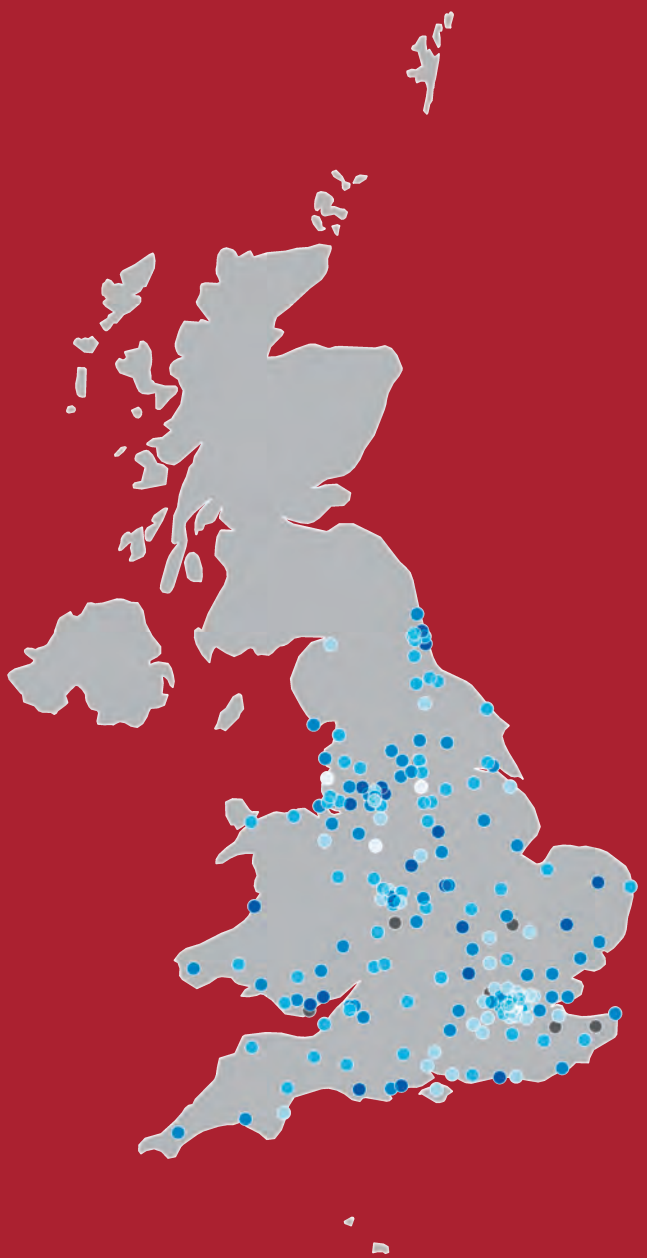
HQIP Healthcare Quality Improvement Partnership

NELA National Emergency Laparotomy Audit

# THE FIRST PATIENT REPORT OF THE NATIONAL EMERGENCY LAPAROTOMY AUDIT

2015



## Legend (front cover)

This map shows all participating NELA hospital sites in the UK. The 14 sites that submitted fewer than ten cases are coloured grey. The remaining sites (n=178) are coloured in shades of blue, depicting the percentage of submitted cases where preoperative risk was documented.

**NELA Hospital Sites (178)**

- 0–20 % (4)
- 20–40 % (37)
- 40–60 % (63)
- 60–80 % (50)
- 80–100 % (24)
- Volume <10 (14)
- UK

This Thematic Map was created by Dr Danny Wong on behalf of the NELA Project Team.

The Royal College of Anaesthetists

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# THE FIRST PATIENT REPORT OF THE NATIONAL EMERGENCY LAPAROTOMY AUDIT (NELA)

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The NELA Project Team and Board would also like to thank the members of the NELA Clinical Reference Group for helping to shape the dataset and report.

We would also like to acknowledge the Emergency Laparotomy Network (ELN) and its members for their enthusiasm in carrying out the first multicentre Audit of outcome following emergency laparotomy.[1] This was instrumental in raising awareness of the variation in mortality following emergency laparotomy, and provided valuable information that contributed to the commissioning of the National Emergency Laparotomy Audit.

# FOREWORD

This is the first report from the National Emergency Laparotomy Audit (NELA) which publishes information about the care given to patients having emergency bowel surgery. The Organisational Audit published in May 2014 highlighted variation in the facilities available at hospitals that perform this surgery. This publication gives data from over 20,000 patients and allows hospitals to see whether they are meeting the published quality standards. Furthermore, it shows whether the facilities available in a hospital are sufficient to deliver the required level of care. It is now essential that commissioners, Trust Boards and clinicians act upon these findings.

Delivering care to patients requiring emergency bowel surgery requires organization and skill. These patients are often extremely ill with many co-existing problems. They need urgent investigations and surgery. The contrast with elective surgery, where there is time to plan and optimize the patient before the operation, is striking. This is one reason why patients undergoing emergency laparotomy have a mortality rate which far exceeds that of patients having elective surgery. Even though this is well known, the resources allocated to emergency surgery fall short of that provided for elective patients. We hope that the results published in this report prompt determined efforts to ensure that patients undergoing an emergency laparotomy are provided with the right care in the right place at the right time by the right teams.

We note the importance of the finding that patients who received an individualized assessment of their risk of death were more likely to receive consultant delivered care and be admitted to a critical care facility. Emergency laparotomy care is a multidisciplinary effort. Communication about patient risk across the clinical team is critical. Better communication alone is likely to bring about major improvements in standards of care.

We are proud of the clinical teams in over 190 hospitals for collecting data on more than 20,000 patients. This represents the majority of hospitals in England and Wales which perform emergency laparotomy. Data collection is ongoing, and we hope that the publication of these results justifies the efforts to date and encourages further collections. This will allow clinicians and managers to use their own data to inform local Quality Improvement programs, to further advance the care and outcomes for this high risk group of surgical patients in the NHS.

We hope that the data and recommendations made in this report will enable patients, their families and friends, to engage with clinical teams in their local hospital, to facilitate change to improve survival and reduce morbidity for this important group of patients.

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# 1 EXECUTIVE SUMMARY

## 1 Overview

**1.1** The National Emergency Laparotomy Audit (NELA) was established to describe and compare inpatient care and outcomes of patients undergoing emergency bowel surgery in England and Wales in order to promote quality improvement. NELA was commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England and the Welsh government.

**1.2** The majority of patients undergoing emergency bowel surgery have potentially life-threatening conditions that require prompt investigation and management. Emergency laparotomy and emergency bowel surgery are terms used to describe the group of surgical procedures that are performed at short notice to treat these conditions. Unlike elective (planned) care, there is often limited time to investigate and prepare these patients before surgery.

**1.3** More than 30,000 patients undergo an emergency laparotomy each year in NHS hospitals within England and Wales.[2,3] These procedures are associated with high rates of postoperative complications and death; recent studies have reported that overall 15% of patients die within one month of having an emergency laparotomy but that this rate varies between hospitals and patient groups.[1,2,4,5] The clinical pathway for patients undergoing emergency bowel surgery is complex, and requires input from clinicians from several specialties. This creates challenges in the delivery of care on a day-to-day basis and in bringing about long-term service improvement.

**1.4** A number of recommendations and Standards have already been developed to safeguard and improve the quality of care of all patients undergoing emergency laparotomy. This NELA report compares each hospital's performance against these Standards (presented alongside abbreviated document names in Appendix 1), as well as the findings and recommendations of the NELA Organisational Audit of hospital infrastructure published in May 2014 (Appendix 5).

**1.5** Standards and recommendations cover the following elements of care:

### i Before surgery

- Clinical review and formulation of a care plan by a consultant surgeon soon after admission to hospital.
- Ready availability of diagnostic investigations to help define the need for and type of surgery.
- Formal assessment of a patient's risk of death and complications.
- Prompt administration of antibiotics where there is evidence of infection.
- Prompt access to an operating theatre.

### ii During surgery

- Direct care by a consultant surgeon and consultant anaesthetist.

### iii After surgery

- Planned admission to critical care for patients when the estimated risk of death exceeds 5%.
- Review of patients older than 70 years by specialists in Medicine for Care of the Older Person (MCOP).

**1.6** The Audit results provide each hospital with an individual breakdown of performance against these Standards. This allows the best performing hospitals to be identified in order that good practice can be disseminated. It also allows hospitals to see areas in which they can bring about improvement through local Quality Improvement initiatives. Differences between hospitals mean that it is unlikely that generic solutions will be applicable to all hospitals. Each hospital should examine its own circumstances to identify reasons for their current situation and solutions that can be implemented to bring about improvement.

**1.7** Some Standards are only applicable to particularly urgent surgery or to patients at high risk of complications and death. Consequently, 100% compliance is not expected for all Standards because of the range of urgency and risk in patients undergoing emergency bowel surgery.

**1.8** The aim of this executive summary is to:

- Provide an overview of findings from the 1st year of patient data collection (December 2013 to November 2014).
- Summarise generic themes.
- Make recommendations for commissioners, hospitals and clinicians.

**1.9** Detailed comparative data for individual hospitals is presented throughout the main report and in Appendix 2.

## 2 Patient characteristics

**2.1** Data were provided on over 20,000 patients (83% of eligible patients) during the first year of data collection (1 December 2013 to 30 November 2014). Data were submitted from 192 of the 195 eligible NHS hospitals in England and Wales.

## 3 Patient outcomes

### 3.1 Mortality

Thirty-day inpatient mortality was 11%. This estimate is based on data provided directly by local reporters in each hospital. This may reflect a real reduction in mortality compared to mortality of around 15% reported by previous studies; however, it is possible that mortality was under-reported in our data. Independently verified mortality data from the Office for National Statistics are not yet available; therefore caution is required in interpreting these results. We will be able to report more fully in this area when this information becomes available.

**3.2** Notwithstanding these caveats, it is evident that the mortality rate for emergency bowel surgery remains up to five times greater than in high-risk elective surgery such as cardiac, cancer and vascular surgery.[6,7]

### 3.3 Length of hospital stay

The time that patients spent in hospital after surgery varied substantially with patient age. While more than half of patients who survived to leave hospital were in hospital for less than 12 days after surgery, more than a quarter had yet to leave 20 days after surgery.

## 4 Key themes

### 4.1 Timeliness of Care

For patients undergoing emergency bowel surgery, survival is improved if delays to diagnosis and treatment are minimised. The urgency with which consultations and treatments should be provided before, during and after surgery is related to the nature and severity of an individual patient's condition.

#### i Early input by senior clinicians

- Early consultant input allows the sickest patients to benefit from experienced decision making. Standards state that a consultant surgeon should review patients who may require emergency bowel surgery within 12 hours of hospital admission.
- Half (48%) of patients who were admitted as an emergency and underwent emergency bowel surgery were reviewed within 12 hours of admission by a consultant surgeon.
- Two-thirds (68%) of patients admitted to hospital between midnight and 8.00 am were reviewed by a consultant surgeon within 12 hours of admission, but only a third (34%) were reviewed within this time if they had been admitted between mid-day and 6.00 pm.
- There was variation between hospitals. A consultant surgeon reviewed more than 80% of patients within 12 hours at only one hospital; in contrast less than 40% of patients were reviewed within 12 hours at 49 hospitals (28%).

#### ii Prompt administration of antibiotics in patients admitted with peritonitis

Some patients requiring emergency bowel surgery will have peritonitis (severe infection within the abdomen) and sepsis. These are life-threatening conditions, in which survival is improved when antibiotics are given and necessary surgical treatment carried out without delay.

- Many patients at high risk of sepsis did not receive timely antibiotic therapy.
- For patients who were admitted as an emergency with peritonitis and had surgery within 24 hours.
  - Almost half waited more than four hours for their first dose of antibiotics.
  - A quarter waited more than seven hours.

## 4.2 Assessment and Appreciation of Risk

The risk of death and complications varies between individuals. Standards state that an objective assessment of risk should be made and documented before surgery. This helps patients and their relatives appreciate the implications of different treatment options. Assessment of risk also aids communication between clinicians, so that plans can be made by the multidisciplinary team to provide appropriate levels of care based on each patient's risk.

- Risk of death was documented before surgery in just over half (56%) of all patients.
- Risk was documented for at least 80% of patients at only 14% of hospitals, and at 22% of hospitals risk was documented for less than 40% of patients.

Where risk was documented before surgery, more patients received the required standards of care:

- Two-thirds of high-risk patients were reviewed before surgery by both a consultant surgeon and a consultant anaesthetist, but only half of similarly high-risk patients were reviewed by both consultants if risk had not been documented before surgery.
- Two-thirds of high-risk patients were admitted directly to a critical care unit following surgery if risk had been documented, but half of similarly high-risk patients were cared for on a general ward directly after surgery if risk had not been documented before surgery.

## 4.3 Resources

Mortality following emergency bowel surgery is up to five times greater than that seen in patients undergoing major elective surgery (cardiac, cancer, vascular). It is well established that these high-risk elective patients benefit from consultant-delivered care and admission to critical care following surgery, but what is less well appreciated is that the same applies to patients undergoing high-risk emergency surgery, including emergency bowel surgery. These key resources also need to be available without delay in order to maximise the chances of survival, due to the time sensitive nature of the surgery.

### i Input by consultant surgeons, anaesthetists and radiologists

Patients who need emergency bowel surgery often require complex management decisions. Standards state that any patient with a predicted risk of death of 5% or more should have active input from a consultant surgeon and consultant anaesthetist.

- Overall, two thirds of operations were directly supervised by both a consultant surgeon and a consultant anaesthetist.
- Both consultants were present for at least 80% of operations at only a quarter (27%) of hospitals; and at ten hospitals at least 20% of operations were performed without either consultant being present.
- More high- and highest-risk patients had emergency bowel surgery 'out of hours'. Despite this both consultants were present for just 41% of operations carried out after midnight and 61% of operations started in the evenings and at weekends , whereas 'in hours' (8.00 am to 6.00 pm, Monday to Friday) both were present for 75% of operations.

Preoperative CT scanning and reporting by a consultant radiologist aids diagnosis and treatment planning and is associated with improved survival. The majority of patients received a CT scan, but not all were reported by a consultant radiologist.

- Two-thirds (68%) of patients had a CT scan which had been reported by a consultant radiologist before surgery.
- More than 80% of patients had a CT scan that was reported by a consultant radiologist before surgery at a quarter (26%) of hospitals. This was achieved in less than 40% of patients at 4% of hospitals.

### ii Access to theatres

Many operations are time sensitive and survival is increased if delays to arrival in theatre can be minimised. For patients with peritonitis, delay of a few hours can substantially increase the risk of death. Clinicians typically categorise patients according to urgency. When the time between decision to operate and arrival in theatre was compared with operative urgency, the Audit found:

- Overall, one in six patients did not arrive within the appropriate timeframe.
- 80% of patients arrived in theatre within a timescale appropriate to their operative urgency at 75% of hospitals.
- Clinicians had the greatest difficulty getting the most urgent patients to theatre; 77% of patients requiring surgery within two hours reached theatre within the recommended timeframe, compared with those patients who required surgery within either six or 18 hours (86% and 84% of patients respectively).

### iii Critical care after surgery

Critical care allows close observation of those at risk of deterioration following surgery, and, when necessary, offers advanced treatments or organ support. It is well established that high-risk elective surgical patients should not be nursed on a general ward immediately after surgery, and the same standards of care should be provided for patients undergoing emergency bowel surgery.

- 60% of all patients were admitted directly to a critical care unit following emergency bowel surgery.
- There was variation between hospitals. At 12% of hospitals more than 80% of patients were admitted directly to a critical care unit after surgery, whereas at 9% of hospitals fewer than 40% were.

## 5 Older people

**5.1** Almost half of patients undergoing emergency laparotomy were over 70 years of age. One in five patients over the age of 70 died within 30 days of surgery, making their mortality rate six times greater than that of patients aged 50 and under. They also had a longer length of stay. Comorbidity, disability and frailty are common and older people tolerate acute surgical illness less well. Recommendations state that there should be early involvement of a Medicine for Care of the Older Person (MCOP) specialist in the care of older patients.

- Provision of MCOP support was generally poor. Only one in ten (10%) of patients over the age of 70 and one in five (21%) of patients over the age of 90 had an assessment by an MCOP specialist after surgery.
- At 94% of hospitals fewer than 40% of individuals aged 70 years or older were assessed postoperatively by an MCOP specialist.

## 6 Seven-day services

**6.1** There was little variation in provision of care by day of week or time of day for the following measures:

- Preoperative CT scanning and reporting by a consultant radiologist.
- Time to delivery of antibiotics after emergency hospital admission.
- Time to arrival in theatre for surgery after a decision was made to operate.
- Direct admission to a critical care unit after surgery.

However, variation in the delivery of the following processes of care was seen by time of day of admission and if surgery was started 'in-hours' rather than 'out-of-hours':

- Review by a consultant surgeon within 12 hours of emergency hospital admission.
- A decision to operate made in person by a consultant surgeon and preoperative review by a consultant anaesthetist.
- Presence of consultant surgeons and consultant anaesthetists in theatre for emergency laparotomy.

## 7 Bringing about improvement

**7.1** This is the first time that emergency laparotomy care has been investigated in a consistent fashion across all providers. Compared to the data published by the Emergency Laparotomy Network (ELN), there have been improvements in care.[1] Consultant presence during surgery has increased such that perioperative care is now largely consultant driven, a substantial change from historical practice. Some hospitals are consistently delivering very high levels of service, meeting Standards for over 80% of their patients; therefore these standards are achievable within the NHS. Examples of good practice have been collated within this report and on the NELA website so that hospitals can adapt them for their own use.

**7.2** However, variation exists between hospitals. With regard to future improvement, many hospitals currently meet standards of care for 60–70% of patients. Clinicians, hospital managers and commissioners need to determine why Standards are met on some occasions, but not others. The existence of a hospital policy does not guarantee that the patient will actually receive the intended care. Multidisciplinary teams should be collecting data to ensure that Standards of care are being provided to all patients. Clinicians should aim to study and improve local practice to reduce variability and to ensure that every patient's care meets recognised Standards. The NELA dataset facilitates this, since it collects data on key processes and outcomes, and provides hospitals with the facility to explore their own data (via the NELA website) to support local Quality Improvement initiatives. However, if data are missing, hospitals cannot properly evaluate their own care.

**7.3** In order to reduce variation in care, hospitals should implement appropriate pathways for the care of emergency general surgical patients, starting at the time of admission to hospital or of referral by another team. Care pathways should prioritise emergency resources and ensure that **all** processes of care are provided for every patient. Standardised pathways of care also facilitate audit and thereby highlight key areas for improvement.

**7.4** Several hospitals have made their pathways available to NELA. These are provided on the NELA website: www.nela.org.uk/Pathway-Examples.

# 2 RECOMMENDATIONS

Emergency laparotomy carries a higher overall mortality than any adult elective surgery. The following 24 recommendations are based on published Standards and our findings of wide variation in the provision of care between hospitals. They are aimed at addressing the themes outlined above and described in this NELA Report.

### For Commissioners and provider Chief Executives

There is inter-hospital variation in the provision of important elements of care, and in many cases provision falls short of that provided for high-risk elective patients. Commissioners and Chief Executives should review the Audit results for their hospital to assure themselves of the quality of care provided to patients undergoing emergency laparotomy.

1 Hospital-level audit data should be examined to determine if national Standards for **postoperative critical care admission** are being adhered to. Where compliance is poor, a change of local policies and reconfiguration of services should be considered to enable all high-risk emergency laparotomy patients to be cared for on a critical care unit after surgery (Chapter 14).

2 Increased **Medicine for Care of the Older Person** input may require service level agreements with other hospitals if expertise is not available on site (Chapter 15).

### For Medical and Clinical Directors

Medical and clinical directors should review the Audit data for their own hospitals to ensure that sufficient resources and personnel are available and appropriately allocated to provide high-quality care for this high-risk surgical population.

3 Local protocols should be developed which ensure a **consultant-delivered service** for emergency laparotomy patients. This includes consultant-delivered preoperative decision making and direct intraoperative management. Rotas, job plans and staffing levels for surgeons and anaesthetists should allow a consultant-delivered service 24 hours per day, seven days per week (Chapter 7 and 12).

4 **Consultant surgeon rota patterns and job plans** should be reviewed to ensure a consultant surgeon is always available to see patients within 12 hours of emergency admission, seven days per week (Chapter 7).

5 Departments of surgery should use local NELA data to determine if the **availability of on-call consultant surgeons** could be improved by relieving them of elective duties (Chapters 7 and 12).

6 Any areas of the hospital that admit emergency general surgical patients need to have robust mechanisms in place to **identify patients with signs of sepsis and ensure prompt prescription and administration of antibiotics** (Chapter 10).

7 **Pathways for the identification and escalation of care** of patients who would benefit from the opinion of a consultant surgeon before the next scheduled ward round should be implemented. In almost all units, this will require duty consultant surgeons to be freed of routine commitments such as clinics or elective operating lists (Chapter 7).

8 Policies should be developed and implemented which use **individual risk assessment to allocate resources** (e.g. critical care) appropriate to the patient's need (Chapter 9).

9 Pathways should be developed locally which require **consultant anaesthetist and surgeon presence for all high-risk patients undergoing emergency laparotomy**, 24 hours per day, seven days per week (Chapter 12).

10 Facilitating a **consultant-delivered anaesthetic service** 24 hours per day, seven days per week may require an increase in the number of consultants available for emergency operating theatre work. This may be of particular relevance to hospitals in which on-call anaesthetists also cover other busy emergency services such as trauma, maternity or critical care (Chapter 12).

11 Medical and clinical directors should examine their **emergency theatre provision** in the context of their local Audit results, in order to determine whether sufficient resources are available to enable patients to receive emergency surgical treatment without undue delay (Chapters 10 and 11).

### For Multidisciplinary Teams

Improved communication within multidisciplinary teams (MDTs) and implementation of protocols which cover the entire patient pathway can help to improve compliance with established Standards for emergency laparotomy patients.

12 Pathways should be implemented which facilitate rapid **request and conduct of CT scans** for patients who may require emergency laparotomy. These pathways should also support contemporaneous reporting by consultant or senior radiologists with expertise in interpreting emergency abdominal CT scans, so as not to delay subsequent treatment (Chapter 8).

13 Any areas of the hospital that admit emergency general surgical patients need to have robust mechanisms in place to **identify patients with signs of sepsis and ensure prompt prescription and administration of antibiotics** (Chapter 10).

14 Multidisciplinary Teams should review their pathways of care for the **administration of antibiotics** in order to identify why delays occur (Chapter 10).

15 Pathways should be developed locally which require **consultant anaesthetist and surgeon presence for all high-risk patients undergoing emergency laparotomy**, 24 hours per day, seven days per week (Chapter 12).

16 When surgery is contemplated, a **formal assessment of the risk of death and complications** should be undertaken by a clinician and documented in the patient record. This information should be communicated to all members of the MDT in order to prioritise care and allocate appropriate resources. If surgery is undertaken, this risk assessment should be documented on the patient consent form (Chapters 9 and 14).

17 **Multidisciplinary pathways** should be established to prevent inappropriate delays in a patient undergoing surgery, especially once a consultant decision has been made. This will require cross disciplinary cooperation between surgeons, anaesthetists, radiological and laboratory services and theatre and critical care staff (Chapters 8 and 11).

18 All patients aged over 70 years should undergo an **assessment of multimorbidity, frailty and cognition** to guide further input from MCOP (Chapter 15).

19 Pathways should be implemented to ensure that **all patients aged over 70 years who undergo an emergency laparotomy receive postoperative screening and assessment by an MCOP consultant** (Chapter 15).

20 **Clinicians should regularly review Audit data** on timing of administration of antibiotics and time to theatre in order to ensure that aims are being achieved (Chapter 10).

21 **Multidisciplinary teams should hold regular joint meetings** to continuously review essential processes of care (using the NELA Quality Improvement Dashboard[❞]) and review perioperative morbidity and mortality in emergency laparotomy.

### For NELA Leads

We are grateful to NELA participants for ensuring that data completeness was generally good. However, at some hospitals data entry for many cases was started but not completed. In addition, fields relating to the timing of key points in the patient pathway (including time of consultant surgeon review, decision to operate and arrival in theatre) were poorly completed by many hospitals (Chapter 17).

22 NELA leads should review their local data to ascertain **case-submission and data completeness** (Chapter 17)**.**

23 NELA Leads should actively promote **completion of P-POSSUM data fields** to ensure that risk estimation is accurate and avoid falsely elevated risk adjusted hospital mortality rates (Chapter 17).

24 **Where data completeness is a problem**, NELA Leads should work with clinical teams to improve this, to facilitate future audit and quality improvement (Chapter 17).

[❞]Available on the NELA website https://data.nela.org.uk/Reports.aspx.

# 3 EXAMPLES OF BEST PRACTICE ACROSS ENGLAND AND WALES

After initial review of patient process data, the NELA Project Team contacted hospitals who were 'high performers' for compliance with indicators where marked variation had been observed between hospitals. These organisations were kind enough to share their experiences with us, so that other organisations might be able to consider and potentially adopt their methods.

## General themes

### Teamwork

**Creating a strong culture of safety:** 'If they are sick enough to go to theatre in the night then they are sick enough to need a consultant'.

**Supporting your staff:** 'If the consultant anaesthetist is working all night, they would not be expected to come in to do a list the next morning. This means that we can cover the 'out-of-hours' emergencies as they deserve'.

**Strong leadership of a well-functioning team:** 'Our ability to enable consultant presence in theatre is multifactorial, but depends on good leadership and standards being adhered to by the all teams involved: theatre managers, anaesthetists and surgeons all talking to each other and working together. We also very much rely on strong support from senior management to provide the conditions and flexibility to let the system function'.

### Good governance

**Allocating sufficient resources to be able to use data for local improvement:** several hospitals reported the availability of dedicated staff to collect and present NELA data, thereby facilitating quality improvement; this ensured good compliance with data completeness and enabled the use of local data for improvement.

**Sharing results and learning:** several hospitals reported that they routinely discuss NELA at weekly departmental meetings and joint Morbidity and Mortality meetings (with input from anaesthesia, critical care and surgery). Regular meetings and presentations of NELA data enable problems to be discussed and solutions created, and keep NELA and its aims of improving quality of care for emergency surgical patients at the forefront of clinicians' minds.

**Empowering support staff:** support from the departmental Personal Assistant in one hospital, ensured that even with sickness and other unexpected absences, there would always be a consultant anaesthetist to cover the 8.00 am to 6.00 pm emergency list. This assistant has been empowered by the anaesthetic directorate to reassign consultants to emergencies even if an elective list has to be cancelled or someone called in from home.

**Identifying care of emergency surgical patients as a quality priority:** one organisation reported that optimisation of the care of emergency surgical patients was locally identified as a key NHS marker of quality. Regular feedback of audit data enabled this to be kept 'on the agenda', which they felt was especially important for them as a smaller centre which might be at threat of rationalisation of services if not seen to be delivering an efficient and high-quality care package.

## Strategies for specific indicators

### Improving processes to ensure patients undergo preoperative risk stratification (with documentation) (Chapter 9)

Changing processes for operating theatre booking so that a risk-score (e.g. P-POSSUM) must be calculated and documented on the booking form before the request can be considered.

Developing a 'boarding card' to be completed by the surgical team before booking of patient into theatre prompting assessment of sepsis risk and risk stratification.

### Optimising staffing levels to enable high rates of consultant input for emergency laparotomy care (Chapters 7 and 12)

A number of hospitals confirmed the necessity for a dedicated consultant surgeon to be allocated **solely** for emergency surgery duties 24 hours per day, every day of the week.

Such 'ring-fencing' of both consultant surgeons and anaesthetists for emergency duties was cited several times as an important factor for ensuring consultant presence in theatre for emergency laparotomies.

One effective mechanism for optimising consultant surgeon involvement was a 'consultant of the week' model, where all other commitments (e.g. elective operating and clinics) are cancelled; thus continuity of care and routine availability of a consultant surgeon may be assured.

Twice-daily consultant surgeon rounds can ensure that all emergency patients are seen within 12 hours of admission.

A solution for ensuring consultant anaesthetist presence, was to provide at least two on-call consultant anaesthetists at nights and weekends (first and second tier), so that even if one consultant is busy elsewhere, there is always a consultant anaesthetist available to cover emergency laparotomies.

Some hospitals reported that they had policies stating that no patient can be taken to theatre without consultant involvement, and that no patient can be taken to theatre after 10.00 pm without the presence of a consultant surgeon and consultant anaesthetist at the time of surgery.

### Developing systems for appropriate triage and prioritisation of emergency surgical cases (Chapters 9 and 11)

A number of high-performing hospitals had policies for prioritisation of unstable patients requiring emergency laparotomies over other emergency cases during the day.

Similarly, policies dictating that only life- or limb-saving operations should be started after 10.00 pm had been established in some hospitals and, recognising the increased risk of adverse outcomes in these patients, with local agreement that these cases should always have consultant presence (both anaesthesia and surgery).

One hospital reported that, as a result of better daytime prioritisation of emergency surgical cases, they were able to save money by putting the night-time theatre team on standby from home. The team would be called in for any case needing to be done after midnight (but these would be only the life-, limb- or organ-threatening cases, and were therefore uncommon). Agreement to start these cases was required by the consultant anaesthetist and consultant surgeon on-call, who would both have to be physically present at the start of surgery.

### Optimising resource utilisation to enable a high proportion of patients to be admitted to critical care after surgery (Chapter 14)

Several high performing hospitals reported that they had a local policy in place which stated that all emergency laparotomies are admitted to critical care after surgery, unless a consultant decision was made that this is not required (for example, because the patient was for palliation only).

Some hospitals have developed a dedicated surgical facility, akin to a surgical HDU or a Post Anaesthetic Care Unit in order to accommodate this workload. Key principles are that it is a dedicated postoperative surgical unit (no cross-over with 'standard' critical care facility) and that it is staffed with a minimum nurse: patient ratio of 1:3, with a job-planned consultant anaesthetist. Required facilities include the expertise to manage epidurals, invasive monitoring and simple cardiovascular support (e.g. for hypotension secondary to an epidural). These units are used for all high-risk emergency and appropriately triaged elective cases, thus freeing-up capacity on the critical care unit.

### Establishing systems to enable Medicine for Care of the Older Person input for all high-risk older patients (Chapter 15)

One hospital has appointed a dedicated MCOP physician with enhanced interest in General Surgical patients. This consultant attends weekly surgical Ward MDT and is easily accessible throughout the week to assess patients both before and after surgery. As well as enhancing the optimisation of medical comorbidities, this enables the early assessment of rehabilitation potential, facilitating early rehabilitation and discharge planning.

A different hospital reported a similar system, with a consultant MCOP physician responsible only for general surgical and orthopaedic patients, whose junior support was provided by the team of the consultant surgeon responsible for surgical aspects of the pathway: therefore facilitating improved care while minimising additional staffing requirements.

Where limited resources mean that a dedicated perioperative MCOP service is not possible, other hospitals have established agreements between surgery/anaesthesia/critical care and MCOP teams, that same-day MCOP review can be provided as required. Routine postoperative care on a critical care unit may facilitate this strategy, because the location of patients on a critical care unit clearly identifies them as 'high-risk'.

### Creating solutions to facilitate easier data entry (Chapter 17)

One hospital placed a dedicated laptop in their emergency theatre for data entry and a link on the hospital intranet site for easy access to the database, thereby facilitating contemporaneous data entry.

**The NELA Project Team would like to thank the following organisations who contributed to these examples of best practice:**

Blackpool Victoria Hospital
Bronglais General Hospital
Conquest Hospital
Cumberland Infirmary
Hillingdon Hospital
Leicester Royal Infirmary
Northwick Park/St Mark's Hospital
Queen's Hospital, Romford
Queens Medical Centre, Nottingham
Royal Derby Hospital
Royal United Hospital Bath
St Helier Hospital
St Richard's Hospital
The Royal Oldham Hospital
Wansbeck General Hospital
West Suffolk Hospital
Weston General Hospital
Yeovil District Hospital

# 4

# INTRODUCTION TO THE FIRST NELA PATIENT AUDIT REPORT

### What is an emergency laparotomy?

Emergency laparotomy and emergency bowel surgery are terms used to describe a wide range of emergency operations on the bowel. These may be performed for a variety of conditions, including complications of elective (planned) surgery. Approximately 30,000 emergency laparotomies are performed annually in England alone.[2,3]

The majority of patients undergoing emergency laparotomy have potentially life-threatening conditions that require prompt investigation and treatment. Unlike elective surgery, there is often limited time to carry out investigations. These operations frequently need to be performed at short notice, and delays can lead to increased complications and risk of death.

Death, complications, prolonged in-hospital recovery and long-term debilitation are far more common after emergency bowel surgery than after many other operations.[6,7] Data from across the world have consistently shown that about 15% of patients die within a month of emergency bowel surgery. [1,2,4,5] This is five to ten times greater than for 'high-risk' elective surgery such as cardiac, vascular and cancer surgery, including elective bowel surgery.

### Why was the audit commissioned?

The National Emergency Laparotomy Audit (NELA) was commissioned in 2011 by the Healthcare Quality Improvement Partnership (HQIP), and funded by NHS England and the Welsh government. Its aims are to collect and publish high-quality comparative information from all hospitals in England and Wales at which emergency laparotomies are performed, in order to drive quality improvement in the care of these patients. It was established in response to the comparatively high death rate after emergency laparotomy, and the substantial variation in this rate between hospitals.[1] Groups of doctors, including the Emergency Laparotomy Network, had become concerned that variation in the quality of delivered care might explain these figures and lobbied for a national Audit.

The contract to run NELA was awarded to the Royal College of Anaesthetists (RCoA). The Audit commenced in December 2012 and is now funded to run until November 2017. It is being run with significant input from the Clinical Effectiveness Unit of the Royal College of Surgeons (RCS) of England. Additional information about its governance and organisational arrangements are presented in Appendix 7.

### What factors contribute to patient outcomes?

Adverse patient outcomes after emergency laparotomy (such as death and complications) may result from pre-existing health conditions of the patient having surgery, the nature of the surgery, or a variety of factors that affect the quality of care administered.[8] The latter may relate to the structural factors of a hospital- or process-factors of care delivery.

Structural factors include both the presence and prompt availability of hospital facilities and the appropriately trained personnel who are required to staff them. Without timely access to essential staffed facilities, a patient's treatment options may be limited and essential care delayed. NELA's first report was an Organisational Report that highlighted variation in the provision of facilities for emergency laparotomy provided by hospitals across England and Wales and was published in May 2014.[9]

Process factors describe the quality and speed with which assessments, diagnoses and treatments are made or delivered to individual patients. These may include:

- The type of operation performed, how promptly it is arranged after admission to hospital, and the seniority of supervising surgeons and anaesthetists.
- How quickly antibiotics are given.
- Whether patients are cared for in a critical care unit directly after surgery.

Underpinning all these decisions is the assessment, interpretation and communication of the risks of death and serious complications for each individual patient. Communication is important both between clinicians to ensure that the best care is delivered, and between clinicians and patients and their next of kin, to ensure that the right decisions are agreed for each patient in the context of their individual situation.

A variety of standards exist that set out how these processes should be delivered in hospitals in order that patients receive high quality care. NELA assesses delivery of care against these standards. A full list of these standards is provided in Appendix 1.

### What are the overall aims of the patient audit?

- To audit the delivery of key processes of care for patients undergoing emergency laparotomy, and to report hospital-level information in order to:
  - Highlight variation.
  - Identify hospitals providing high levels of compliance with existing standards of care.
  - Share best practice.
  - Support quality improvement efforts locally, regionally and nationally.
- To report outcomes for patients undergoing emergency laparotomy in England and Wales at hospital level, including:
  - 30-day and 90-day mortality.
  - Length of postoperative hospital stay.
  - Unplanned returns to theatre.
  - Unplanned escalation in the level of required postoperative care.

### What does this audit report cover?

This report is the first to publish patient data, and covers patients who underwent an emergency laparotomy between 1 December 2013 and 30 November 2014. All NHS hospitals in England and Wales that perform emergency bowel surgery were invited to participate, and staff from these hospitals submitted process and outcome data using the NELA webtool: https://data.nela.org.uk.

Without robustly collected process and outcome data it has until now been difficult to know where improvement work should be focused. This report describes how well hospitals are providing care, and provides each hospital with an individual breakdown of performance against published standards. This allows the best performing hospitals to be identified in order that good practice can be disseminated. It also allows hospitals to see areas in which they can bring about improvement through local Quality Improvement initiatives. Differences between hospitals mean that it is unlikely that generic solutions will be applicable to all hospitals. Each hospital should examine its own circumstances to identify reasons for its current situation and solutions that can be implemented to bring about improvement.

Hospital-level mortality, including information about outlier hospitals, is not presented in this report because data about patient deaths not available from the Office for National Statistics (ONS) at the time of publication of this Report. Risk-adjusted mortality data will be presented in a subsequent report once ONS data is available. Collection of patient-level data is ongoing, with the results published annually. Subsequent reports will focus on specific clinical issues such as subgroups of patients, or particular diseases.

### Overview of audit methods

All NHS hospitals in England and Wales that undertake emergency laparotomy were invited to participate in the NELA patient Audit. Audit leads were identified at each hospital to coordinate collection of patient data. Specific inclusion and exclusion criteria were developed to define exactly which patients should be included in the Audit. The Audit dataset was designed by the NELA project team with input from clinical stakeholders, and was designed to collect data that will allow comparison of care with published standards. Data were submitted to NELA via a webtool. At the end of the data-collection window, all data were downloaded from the webtool and analysed to provide the results. Comprehensive information is available in Appendix 4.

### Participating hospitals and case ascertainment

The Audit collects data on all patients aged 18 years or over undergoing emergency bowel surgery in an NHS hospital in England and Wales. Of the 195 hospitals that perform emergency laparotomy surgery, data was received from 192. A list of these hospitals is shown in Table 1 below.

Using historical data from Hospital Episode Statistics (HES), it is possible to calculate the total number of emergency laparotomies that are expected to take place annually in the NHS and also in each hospital in England (equivalent data was not available for Wales). This calculation also allows us to compare the total number of cases submitted by each hospital with the total number expected, known as the case ascertainment rate (Appendix 6). This report includes details for 20,183 patients, representing approximately 83% of all patients that underwent emergency bowel surgery. There was considerable variation in case ascertainment rates across hospitals, ranging from 100%, to less than 20%. This has important implications when considering the quality of care provided by each hospital. For hospitals with a high case ascertainment rate (e.g. greater than 70–80%), we can be reasonably confident that the results of the Audit provide a good indication of the quality of care in that hospital. However, hospitals with low case ascertainment rates may not have provided information on enough patients for the Audit results to accurately reflect the quality of patient care. We have shown the case ascertainment rates for each hospital in Figure 18. Additional information on the methods of case ascertainment is provided in Appendix 3.

## How to read this report

This report is divided into sections, each covering a different part of the patient's care pathway. Each section is set out as follows:

- A brief summary of why that aspect of the care pathway is important.
- Standards against which processes of care were measured (Appendix 1).
- The specific Audit questions.
- The results, providing:
  - An overall description of the extent to which a standard was met for all patients.
  - A description of the results at hospital level, including comment on variability of care. In general, we have reported the number of hospitals that have achieved a standard of care for over 80% of their patients, in keeping with accepted Quality Improvement methodology.
- Clinical commentary explaining the implications of the results.
- A patient vignette (Elizabeth's Story) to illustrate the impact of Standards of care to an individual patient.

We have produced graphs that show each hospital's performance against its peers. Each hospital has been allocated an individual three letter code. The list of hospitals and codes is shown in Table 1. In order to find each hospital within the report, we recommend that the reader views an electronic version of the report and uses the 'find' function found in most PDF readers. This can usually be accessed by pressing 'Ctrl' + 'F' key, typing the three letter code into the box and pressing the 'Enter' key. Please also use the dropdown under the search box to select 'whole words only'. This will indicate the position of a hospital within hospital-level graphs throughout the report (e.g. Figure 1) and the tables in Appendix 2. This function may only work if the report is downloaded rather than viewed within a web browser.

The results of additional analyses are provided in Appendix 3. Hospitals that submitted less than ten cases have been highlighted in grey within figures throughout this report. Given their low caseload, caution is required when interpreting their data.

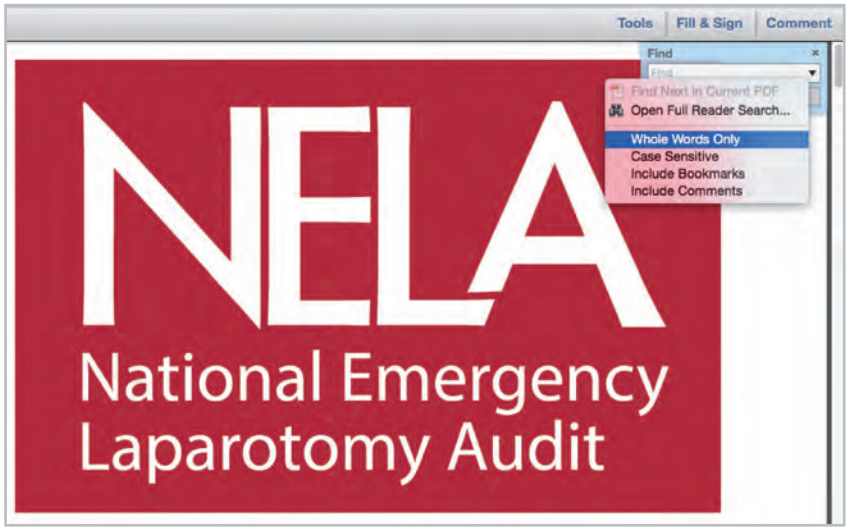

**Table 1**
**Participating hospitals and case ascertainment key**

| Hospital | Identifier | Hospital | Identifier |
|---|---|---|---|
| Addenbrookes Hospital | ADD | Derriford Hospital | PLY |
| Aintree University Hospital | FAZ | Dewsbury and District Hospital | DDH |
| Airedale General Hospital | AIR | Diana Princess of Wales Hospital | GGH |
| *Alexandra Hospital** | *RED* | Doncaster Royal Infirmary | DID |
| Arrowe Park Hospital | WIR | Dorset County Hospital | WDH |
| Barnet Hospital | BNT | *Ealing Hospital* | *EAL* |
| Barnsley Hospital | BAR | East Surrey Hospital | ESU |
| Basildon University Hospital | BAS | Freeman Hospital | FRE |
| Basingstoke and North Hampshire Hospital | NHH | Frenchay Hospital* | FRY |
| Bedford Hospital | BED | Friarage Hospital | FRR |
| Birmingham Heartlands Hospital | EBH | Frimley Park Hospital | FRM |
| Blackpool Victoria Hospital | VIC | Furness General Hospital | FGH |
| Bradford Royal Infirmary | BRD | George Eliot Hospital | NUN |
| Bristol Royal Infirmary | BRI | Glan Clwyd District General Hospital | CLW |
| Bronglais General Hospital | BRG | Glangwili General Hospital | GLG |
| Broomfield Hospital | BFH | Gloucestershire Royal Hospital | GLO |
| Castle Hill Hospital | CAS | Good Hope Hospital | GHS |
| Charing Cross Hospital | CHX | *Harefield Hospital* | *HHX* |
| Chelsea and Westminster Hospital | WES | Harrogate District Hospital | HAR |
| Cheltenham General Hospital | CGH | Hereford County Hospital | HCH |
| Chesterfield Royal Hospital | CHE | Hillingdon Hospital | HIL |
| *Churchill Hospital* | *CCH* | Hinchingbrooke Hospital | HIN |
| City Hospital | CTY | Homerton Hospital | HOM |
| Colchester General Hospital | COL | Huddersfield Royal Infirmary | HUD |
| Conquest Hospital | CON | Hull Royal Infirmary | HUL |
| Countess of Chester Hospital | COC | Ipswich Hospital | IPS |
| County Hospital** | MSH | James Paget University Hospital | JPH |
| Croydon University Hospital | MAY | John Radcliffe Hospital | RAD |
| Cumberland Infirmary | CMI | *Kent and Canterbury Hospital* | *CKH* |
| Darent Valley Hospital | DVH | Kettering General Hospital | KGH |
| Darlington Memorial Hospital | DAR | King George Hospital | KNG |

## Key

**Green**
Case ascertainment ≥70%

**Blue**
Case ascertainment ≥50%

**Red**
Case ascertainment <50%

**Purple**
Case ascertainment unknown

**Black**
No cases entered

*Italicised*
Fewer than ten cases included in year 1 NELA patient dataset

*
Emergency laparotomies no longer performed (Incomplete year of cases submitted)

**
County Hospital was formally Stafford Hospital. It no longer performs emergency laparotomies

***
Royal Stoke University Hospital was formally City General Hospital – Stoke

| Hospital | Identifier | Hospital | Identifier |
|---|---|---|---|
| Kings Mill Hospital | KMH | Poole Hospital | PGH |
| Kingston Hospital | KTH | Prince Charles Hospital | PCH |
| *Leeds General Infirmary* | *LGI* | Princess Alexandra Hospital | PAH |
| Leicester General Hospital | LEI | Princess of Wales Hospital | POW |
| Leicester Royal Infirmary | LER | Queen Alexandra Hospital | QAP |
| Leighton Hospital | LEG | Queen Elizabeth Hospital - Gateshead | QEG |
| Lincoln County Hospital | LIN | Queen Elizabeth Hospital (Lewisham and Greenwich NHS Trust) | QEL |
| Lister Hospital | LIS | Queen Elizabeth Hospital Birmingham | QEB |
| *Liverpool Heart and Chest Hospital* | *LHC* | Queen Elizabeth The Queen Mother Hospital | QEQ |
| Luton and Dunstable Hospital | LDH | Queen's Hospital - Burton | BRT |
| Macclesfield District General Hospital | MAC | Queen's Hospital - Romford | QHR |
| *Maidstone Hospital* | *MST* | Queens Medical Centre - Nottingham | QMC |
| Manchester Royal Infirmary | MRI | Rotherham Hospital | ROT |
| Medway Maritime Hospital | MDW | Royal Albert Edward Infirmary | AEI |
| Milton Keynes Hospital | MKH | Royal Berkshire Hospital | RBE |
| Morriston Hospital | MOR | Royal Blackburn Hospital | BLA |
| Musgrove Park Hospital | MPH | Royal Bolton Hospital | BOL |
| Nevill Hall Hospital | NEV | *Royal Brompton Hospital* | *BMP* |
| New Cross Hospital | NCR | Royal Cornwall Hospital | RCH |
| *Newham University Hospital* | *NWG* | Royal Derby Hospital | DER |
| Norfolk and Norwich University Hospital | NOR | Royal Devon and Exeter Hospital | RDE |
| North Devon District Hospital | NDD | Royal Free Hospital | RFH |
| North Manchester General Hospital | NMG | Royal Glamorgan | RGH |
| North Middlesex University Hospital | NMH | Royal Gwent Hospital | GWE |
| North Tyneside General Hospital | NTY | Royal Hampshire County Hospital | RHC |
| Northampton General Hospital | NTH | Royal Lancaster Infirmary | RLI |
| Northern General Hospital | NGS | Royal Liverpool University Hospital | RLU |
| Northwick Park/St Marks Hospital | NPH | Royal Marsden Hospital, London | MAR |
| *Papworth Hospital* | *PAP* | Royal Preston Hospital | RPH |
| Peterborough City Hospital | PET | Royal Shrewsbury Hospital | RSS |
| Pilgrim Hospital | PIL | Royal Stoke University Hospital*** | STO |
| Pinderfields Hospital | PIN | Royal Surrey County Hospital | RSU |

## Key

**Green**
Case ascertainment ≥70%

**Blue**
Case ascertainment ≥50%

**Red**
Case ascertainment <50%

**Purple**
Case ascertainment unknown

**Black**
No cases entered

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*
Emergency laparotomies no longer performed (Incomplete year of cases submitted)

**
County Hospital was formally Stafford Hospital. It no longer performs emergency laparotomies

***
Royal Stoke University Hospital was formally City General Hospital – Stoke

| Hospital | Identifier | Hospital | Identifier |
|---|---|---|---|
| Royal Sussex County Hospital | RSC | The Queen Elizabeth Hospital - King's Lynn | QKL |
| Royal United Hospital Bath | BAT | The Royal Bournemouth Hospital | BTH |
| Royal Victoria Infirmary | RVN | The Royal London Hospital | LON |
| Russells Hall Hospital | RUS | The Royal Oldham Hospital | OHM |
| Salford Royal Hospital | SLF | *The Walton Centre* | *WLT* |
| Salisbury District Hospital | SAL | Torbay District General Hospital | TOR |
| Sandwell General Hospital | SAN | Tunbridge Wells Hospital | TUN |
| Scarborough Hospital | SCA | University College Hospital | UCL |
| Scunthorpe General Hospital | SCU | University Hospital Lewisham | LEW |
| South Tyneside District Hospital | STD | *University Hospital Llandough* | *UHL* |
| Southampton General Hospital | SGH | University Hospital North Durham | DRY |
| Southend University Hospital | SEH | University Hospital of North Tees | NTG |
| Southmead Hospital | SMH | University Hospital of Wales | UHW |
| Southport District General Hospital | SPD | University Hospital, Coventry | UHC |
| St George's Hospital | GEO | Walsall Manor Hospital | WMH |
| St Helier Hospital | SHC | Wansbeck General Hospital | ASH |
| St James's University Hospital | SJH | Warrington Hospital | WDG |
| St Mary's Hospital | STM | Warwick Hospital | WAW |
| St Mary's Hospital - IOW | MIW | Watford General Hospital | WAT |
| St Peter's Hospital | SPH | West Middlesex University Hospital | WMU |
| St Richards Hospital | STR | West Suffolk Hospital | WSH |
| *St Thomas' Hospital* | *STH* | Weston General Hospital | WGH |
| Stafford Hospital | MSH | Wexham Park Hospital | WEX |
| Stepping Hill Hospital | SHH | Whipps Cross University Hospital | WHC |
| Stoke Mandeville Hospital | SMV | Whiston Hospital | WHI |
| Sunderland Royal Hospital | SUN | Whittington Hospital | WHT |
| Tameside General Hospital | TGA | William Harvey Hospital | WHH |
| The Christie | CHR | Withybush General Hospital | WYB |
| The Great Western Hospital | PMS | Worcestershire Royal Hospital | WRC |
| The James Cook University Hospital | SCM | Worthing Hospital | WRG |
| *The Princess Royal Hospital* | *PRS* | Wrexham Maelor Hospital | WRX |
| The Princess Royal University Hospital | BRO | Wythenshawe Hospital | WYT |
| Yeovil District Hospital | YEO | Ysbyty Gwynedd Hospital | GWY |
| York Hospital | YDH | | |

## Key

**Green**
Case ascertainment ≥70%

**Blue**
Case ascertainment ≥50%

**Red**
Case ascertainment <50%

**Purple**
Case ascertainment unknown

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# 5 PATIENT AND SURGICAL CHARACTERISTICS

Descriptive information, including age, urgency of surgery and American Society of Anesthesiologists (ASA) Physical Status classification*** are used throughout this report to stratify processes of care and outcomes after surgery so that patterns can be investigated. In this chapter, we present tables and figures that summarise the characteristics of the patients included in this report, predicted risk of death and patterns of emergency hospitalisation.

Roughly equal numbers of men and women underwent surgery and more than nine out of ten patients were admitted to hospital as emergencies (Table 2). One in ten patients had an emergency laparotomy for a complication of a previous surgical procedure within same admission.

The patients undergoing surgery tended to be older people, almost half were over the age of 70 at the time of hospital admission (median age 67 years). The physical health of patients tended to be poor, with many rated as suffering from a severe health condition (more than half were scored as ASA 3 or above) and more than half required surgery within six hours of the decision being made to operate. Almost half of patients were calculated to have a greater than 10% likelihood of death within 30 days of surgery (Table 2).

In keeping with the 1990 NCEPOD directive that only life- or limb-preserving surgery should be performed outside routine working hours,[10] patients arriving in theatre after 6.00 pm were found to be at a higher risk of death within 30 days than patients who arrived between 8.00 am and 6.00 pm (Table 3). Predicted risk was highest among patients arriving in theatre after midnight.

***The American Society of Anaesthesiologists Physical status classification (commonly referred to as ASA grade) is a subjective score which ranges from 1-5 and is commonly collected in clinical practice. It is used to classify the disease-status of patients from: the absence of systemic disease (1) to the presence of severe and life-threatening disease (5).

## 5.1 Patient characteristics

**Table 2**
**Characteristics of patients included in this Report**

| Characteristic | Group | Number of patients | Frequency (%) |
|---|---|---|---|
| **Gender** | *Female* | 10,375 | 51 |
| | *Male* | 9,808 | 49 |
| **Age in years** | *18–39* | 2,188 | 11 |
| | *40–49* | 1,939 | 10 |
| | *50–59* | 2,707 | 13 |
| | *60–69* | 4,197 | 20 |
| | *70–79* | 5,084 | 25 |
| | *80–89* | 3,537 | 18 |
| | *≥90* | 531 | 3 |
| **Hospital admission type** | *Emergency* | 18,693 | 93 |
| | *Elective* | 1,490 | 7 |
| **ASA grade** | *1* | 2,097 | 10 |
| | *2* | 6,793 | 34 |
| | *3* | 7,108 | 35 |
| | *4* | 3,747 | 19 |
| | *5* | 438 | 2 |
| **Urgency of surgery**[π] | *<2 hours* | 1,976 | 14 |
| | *2–6 hours* | 5,498 | 39 |
| | *6–18 hours* | 4,213 | 30 |
| | *18–24 hours* | 2,247 | 16 |
| **Procedure** | *Primary procedure* | 18,034 | 89 |
| | *Surgery for a complication of a recent procedure* | 2,149 | 11 |
| **Preoperative predicted risk of death within 30 days of surgery (P-POSSUM)**[Σ] | *<5%* | 7,709 | 38 |
| | *5.0–9.9%* | 3,315 | 16 |
| | *10.0–24.9%* | 3,828 | 19 |
| | *25.0–49.9%* | 2,589 | 13 |
| | *≥50%* | 2,742 | 14 |

[π]As a result of modification of the dataset during the first year of data collection (Appendix 4), 13,934 patients were included in sub-group analyses by operative urgency reported throughout this Patient Report.

[Σ]The Portsmouth modified POSSUM (Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity) is a model validated for the estimation of individual risk of 30-day mortality in emergency general surgery.

**Table 3**
**Median preoperative P-POSSUM estimation of death within 30 days of surgery by time of day of arrival in operating theatre for emergency laparotomy (* p≤0.05, **p≤0.005, ***p≤0.001)**

| Time of day | Number of patients | P-POSSUM Predicted risk of death (%)[§] |
|---|---|---|
| **0800–1159** | 4,606 | 7*** |
| **1200–1759** | 8,091 | 7 |
| **1800–2359** | 4,995 | 10 |
| **0000-0759** | 1,660 | 17 |
| *(missing)* | *(831)* | *(9)* |
| ***Overall*** | ***20,183*** | ***8*** |

## 5.2 Surgical characteristics

For each patient, hospital staff selected the indication for surgery from a list of common indications (Table 4). More than one indication could be selected and some are likely to co-exist, for example perforation and peritonitis.

The most common indication for surgery, occurring in 49% of patients, was intestinal obstruction. Intestinal perforation precipitated surgery in 24% and a further 20% underwent surgery for peritonitis. Abdominal sepsis is a feature of many of the indications for surgery (Table 4). Three percent of emergency laparotomies were performed as a result of anastomotic leak following prior gastrointestinal surgery.

The primary operative procedure was selected from a list of commonly performed emergency gastrointestinal procedures (Table 5). Only one option could be chosen, although secondary and tertiary procedures could be selected in subsequent questions, and limited free text was available for primary procedures not listed. The most commonly performed procedures were small bowel resection and adhesiolysis, which were performed with equal frequency. Colorectal resections comprised the majority of the remainder of emergency laparotomies. A minority of procedures (9%) were upper gastrointestinal subspecialty specific; however this in part reflects the NELA exclusion criteria, as laparotomy for pathology of the oesophagus, gallbladder, biliary tree, liver, pancreas and spleen are all excluded from the Audit (Appendix 4).

While some advocate laparoscopy for emergency gastrointestinal surgery, the vast majority of emergency laparotomies in England and Wales were performed by a primary open approach (Table 6). It is notable that 13% were commenced laparoscopically, but only 7% were completed by this approach.

Finally, participants could select more than one option from a list of common operative findings (Table 7). Of these, adhesions were the most commonly found pathology (28%), although this may reflect a common secondary finding co-existing with another primary pathology. Intestinal (peptic, small bowel or colonic) perforation was found in a quarter of emergency laparotomies. Localised or disseminated malignancy was found in a fifth of cases.

[§]The Portsmouth modified POSSUM (Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity) is a model validated for the estimation of individual risk of 30-day mortality in emergency general surgery.

There is relatively little existing literature on the distribution of procedure and pathology in emergency laparotomy. The smaller data collection exercise overseen by the Emergency Laparotomy Network revealed a similar distribution of commonly performed primary procedures.[11]

The heterogeneity of these surgical characteristics – in presentation, operative findings and procedure performed – illustrates some of the difficulties in applying a 'one size fits all' pathway to all patients undergoing emergency laparotomy. As a result of this, some Standards will not be applicable across the board. Whilst patients with perforation or peritonitis are likely to require immediate surgical intervention, there will be groups of patients for whom an early 'watch-and-wait' policy is entirely appropriate. The times from admission to surgery and length of stay are likely to be longer for this group. Notable deviations from the pathway are as follows:

- Intestinal obstruction secondary to adhesions can be safely managed conservatively for up to 72 hours in the absence of ischaemia,[12] and gastrografin contrast studies may be more appropriate than CT, with both diagnostic and therapeutic intent.[13]
- CT or USS guided percutaneous drainage is commonly utilised in the primary treatment of patients with a localised diverticular abscess,[14] although in a proportion, this will fail and surgery will be required.
- Malignant large bowel obstruction without peritonism or signs of sepsis should await review by a colorectal surgeon; non-surgical options may include colonic stenting.[14]
- Acute severe colitis secondary to inflammatory bowel disease is likely to be treated medically in the first instance. Where medical management fails, subtotal colectomy is required.

Heterogeneity exists even within these subgroups. Intestinal obstruction may, for example, be due to adhesions, malignancy, herniae, inflammatory bowel disease, or diverticular disease. Further detailed analysis is beyond the scope of this Report and these preliminary descriptive data do not currently enable robust conclusions about surgical service provision. For many of these pathologies and procedures, the NELA data represent a substantial body of evidence for further interrogation. Detailed subgroup analysis (for example small bowel obstruction secondary to adhesions, malignant colonic obstruction, or Hartmann's procedure) will be handled by the respective surgical subspecialty associations.

**Table 4**
**Recorded indications for performing emergency laparotomy**

| Indication for surgery | Number of patients | Frequency (%) |
|---|---|---|
| Intestinal obstruction | 9,811 | 49 |
| Perforation | 4,744 | 24 |
| Peritonitis | 4,116 | 20 |
| Ischaemia | 1,720 | 9 |
| Abdominal abscess | 1,332 | 7 |
| Sepsis: other | 1,474 | 7 |
| Haemorrhage | 819 | 4 |
| Colitis | 748 | 4 |
| Anastomotic leak | 618 | 3 |
| Intestinal fistula | 326 | 2 |
| Abdominal wound dehiscence | 116 | 0.6 |
| Abdominal compartment syndrome | 55 | 0.3 |
| Planned relook | 51 | 0.3 |
| Other | 1,758 | 9 |

**Table 5**
**Recorded primary surgical procedure at emergency laparotomy**

| Primary operative procedure | Number of patients | Frequency (%) |
|---|---|---|
| Small bowel resection | 3,420 | 17 |
| Adhesiolysis | 3,379 | 17 |
| Colectomy: right | 2,573 | 13 |
| Hartmann's procedure | 2,562 | 13 |
| Stoma formation | 1,148 | 6 |
| Peptic ulcer – suture or repair of perforation | 1,138 | 6 |
| Colectomy: subtotal | 1,113 | 6 |
| Drainage of abscess/collection | 588 | 3 |
| Colectomy: left (including anterior resection) | 578 | 3 |
| Washout only | 532 | 3 |
| Repair of intestinal perforation | 454 | 2 |
| Colorectal resection – other | 440 | 2 |
| Exploratory/relook laparotomy only | 408 | 2 |
| Gastric surgery – other | 327 | 2 |
| Intestinal bypass | 302 | 2 |
| Haemostasis | 245 | 1 |
| Peptic ulcer oversew of bleed | 210 | 1 |
| Not amenable to surgery | 185 | 1 |
| Enterotomy | 159 | 1 |
| Stoma revision | 161 | 1 |
| Abdominal wall closure | 121 | <1 |
| Laparostomy formation | 77 | <1 |
| Resection of other intra-abdominal tumour(s) | 63 | <1 |

**Table 6**
**Operative approach at emergency laparotomy**

| Operative approach | Number of patients | Frequency (%) |
|---|---|---|
| Open | 17,573 | 87 |
| Laparoscopic | 1,208 | 6 |
| Laparoscopic converted to open | 1,215 | 6 |
| Laparoscopic-assisted | 187 | 1 |

**Table 7**
**Surgical findings at emergency laparotomy**

| Operative findings | Number of patients | Frequency (%) |
|---|---|---|
| Adhesions | 5,592 | 28 |
| Perforation: small bowel/colonic | 3,893 | 19 |
| Intestinal ischaemia | 2,543 | 13 |
| Malignancy: localised | 2,480 | 12 |
| Abscess | 2,332 | 12 |
| Malignancy: disseminated | 1,443 | 7 |
| Incarcerated hernia | 1,224 | 6 |
| Perforation: peptic ulcer | 1,212 | 6 |
| Diverticulitis | 1,158 | 6 |
| Volvulus | 715 | 4 |
| Crohn's disease | 658 | 3 |
| Colitis | 654 | 3 |
| Anastomotic leak | 591 | 3 |
| Haemorrhage: postoperative | 300 | 1 |
| Haemorrhage: peptic ulcer | 228 | 1 |
| Normal intra-abdominal findings | 215 | 1 |
| Haemorrhage: intestinal | 207 | 1 |
| Abdominal compartment syndrome | 45 | 0.2 |
| Other | 3,375 | 17 |

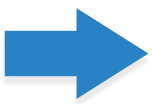
# 6 ELIZABETH'S STORY

A Report that presents a series of results on how hospitals are performing on a number of performance indicators can become a little removed from the delivery of care to patients. In order to keep the patient experience at the centre of the Report's narrative, chapters are interspersed with illustrations of the care delivered to an individual patient.

Elizabeth's story is a representative case, aspects of which are based on the experiences of a real patient who had an emergency laparotomy.

Elizabeth is an 85-year-old woman who up until recently had been very fit and well. She has had some minor abdominal operations in the past, but has no significant heart or lung problems. She enjoyed an active life, doing her own cooking, shopping and driving short distances. She lived alone and did not require carers. Elizabeth was admitted as an emergency with worsening abdominal pain and vomiting that had gone on for a couple of days.

On admission to her local hospital, Elizabeth was seen within two hours by a junior doctor from the surgical team. He examined her, and finding her to have a distended abdomen made a diagnosis of bowel obstruction. Her pulse was a little fast and he noted her to have an Early Warning Score of three. She had some blood tests and some X-rays and was given some intravenous fluids. Around six hours after admission, in the evening, she was seen by the on-call registrar, who placed a nasogastric tube but arranged no further investigations at this point



An important part of the evaluation of critically ill patients is the use of an Early Warning Score, which is based on observations such as pulse and blood pressure. These scores are widely used in hospital to monitor a patient's condition and alert the clinical team to any deterioration in order to trigger a timely clinical response. They are recommended by the National Institute for Health and Care Excellence (NICE CG50) and the Royal Colleges (Appendix 1).

# 7

# REVIEW WITHIN 12 HOURS OF HOSPITAL ADMISSION BY A CONSULTANT SURGEON

**Why is this important?**

Emergency general surgical admissions constitute a large workload in comparison to the number of patients requiring surgery. Only one in every ten patients who are admitted with acute abdominal pain ultimately undergo an emergency laparotomy, and it is not always immediately apparent which patients require surgery at admission. Prompt senior review of emergency general surgical patients is vital because this complex decision making and treatment planning may be required within hours of presenting to hospital. Timely review has been shown to be associated with improved outcomes.[15] Sicker patients require early review, but it is good practice for all patients to be reviewed within 12 hours and not longer than 24 hours.

**KEY STANDARDS**

Patients admitted as an emergency should be seen by a consultant at the earliest opportunity. Ideally this should be within 12 hours and should not be longer than 24 hours.
*NCEPOD EA*

**AUDIT QUESTIONS**

What proportion of patients was reviewed by a consultant surgeon within 12 hours of emergency presentation at hospital?

What variation existed in the proportion of patients reviewed by a consultant surgeon within 12 hours of emergency presentation, by:

1 Hospital?
2 Day and time of admission to hospital?
3 Urgency of surgery?

**KEY FINDINGS**

Half (48%) of patients who were admitted as an emergency and subsequently underwent an emergency laparotomy were reviewed by a consultant surgeon within 12 hours of presentation at hospital.

At only one hospital were more than 80% of patients reviewed within 12 hours of admission, and at 28% of hospitals fewer than 40% of patients were reviewed within 12 hours of admission (Figure 1).

The proportion of these patients who were reviewed by a consultant surgeon within 12 hours of emergency admission varied by the time of day that they were admitted to hospital (Table 8).

A greater number of patients requiring more urgent surgery were reviewed by a consultant surgeon within 12 hours of admission, compared to those requiring less urgent surgery (Table 9).

**Table 8**
**Proportion of patients reviewed by a consultant surgeon within 12 hours of admission to hospital by time of day and day of week of emergency hospital admission (* p≤0.05, **p≤0.005, ***p≤0.001)**

| Time of emergency admission to hospital | Proportion of patients reviewed by a consultant surgeon within 12 hours of emergency admission to hospital | |
|---|---|---|
| | Monday–Friday | Saturday–Sunday |
| 0800–1159 | 55%*** | 46%*** |
| 1200–1759 | 34% | 31% |
| 1800–2359 | 43% | 48% |
| 0000–0759 | 68% | 64% |
| ***Overall*** | ***48%*** | ***46%*** |

**Table 9**
**Proportion of patients reviewed by a consultant surgeon within 12 hours of admission to hospital by operative urgency (* p≤0.05, **p≤0.005, ***p≤0.001)**

| Operative urgency | Number of patients | Proportion of patients reviewed by a consultant surgeon within 12 hours of emergency admission to hospital |
|---|---|---|
| <2 hours | 1253 | 60%*** |
| 2–6 hours | 3802 | 53% |
| 6–18 hours | 3045 | 42% |
| 18–24 hours | 1651 | 36% |
| ***Overall*** | ***9751*** | ***47%*** |

## Clinical commentary

The variation in practice according to time of emergency admission to hospital supports the common perception that consultant-led 'post-take' ward rounds tend to occur only once daily (usually in the morning) at many hospitals (Table 8). Patients admitted in the late-morning may have to wait well beyond 12 hours to be seen by a consultant surgeon unless directed more urgently by the on-call surgical team. The Audit found that more patients were reviewed by a consultant surgeon within 12 hours of emergency admission if surgery was subsequently required within two hours of a decision being made to operate than if surgery was less urgently indicated (Table 9).

Evidence from acute medicine indicates that patient outcomes are better at hospitals at which on-call consultants are free from fixed commitments, and at least two acute ward rounds occur every day.[16] Timely review can be facilitated by appropriate job-planning and ensuring adequate staffing to accommodate workload.

While 95% of patients were reviewed by a consultant surgeon following admission, the time of this review was missing for 24% of cases overall, and was missing in up to 50% of cases submitted by 11 hospitals. Hence these findings may reflect poor record-keeping rather than poor compliance with standards of care.

**RECOMMENDATIONS**

Consultant surgeon rota patterns and job plans should be reviewed to ensure a consultant surgeon is always available to see patients within 12 hours of emergency admission, seven days a week (Clinical Directors).

Departments of surgery should use local NELA data to determine if the availability of on-call consultant surgeons should be improved by relieving them of elective duties (Clinical and Medical Directors).

Local protocols should be developed which ensure a consultant delivered service for emergency laparotomy patients. This includes consultant-delivered preoperative decision making and direct intraoperative management. Rotas, job plans and staffing levels for surgeons and anaesthetists should allow a consultant delivered service 24 hours a day, seven days per week (Clinical and Medical Directors).

Pathways for the identification and escalation of care of patients who would benefit from the opinion of a consultant surgeon before the next scheduled ward round should be implemented. In almost all units, this will require duty consultant surgeons to be freed of routine commitments such as clinics or elective operating lists (Clinical and Medical Directors).

## Additional analyses

The proportion of patients who were reviewed by a consultant surgeon within 12 hours of emergency admission to hospital was also assessed against patient age, ASA and preoperatively documented risk (Table 25).

## Elizabeth's story

It wasn't until the next morning, that Elizabeth was seen by the on-call surgical consultant. Her Early Warning Score had gone up to four, signifying a deterioration in her clinical condition. Her abdomen was slightly more tender. She had continued intravenous fluids and an urgent CT scan was requested.

All patients should be seen within 12 hours of admission to hospital by the consultant responsible for their care. Patients needing emergency bowel surgery often require complex decision making, and early senior involvement is key to ensuring timely treatment. The hospital that Elizabeth was admitted to does have a system of twice-daily consultant ward-rounds for surgical admissions, but on this occasion it did not happen as the surgical consultant was in theatre all night with numerous other emergency cases.

Senior doctors must lead the care of high-risk emergency surgical patients. It is essential that units have a robust system for ensuring that consultant review is always available within 12 hours of admission, regardless of competing responsibilities. Options to achieve this include:

- Separate consultant rota to deal with theatre and ward/admission workload.
- Defined emergency pathways that state when senior input is required as soon as patients are identified as being at high-risk, rather than waiting for the next ward-round.

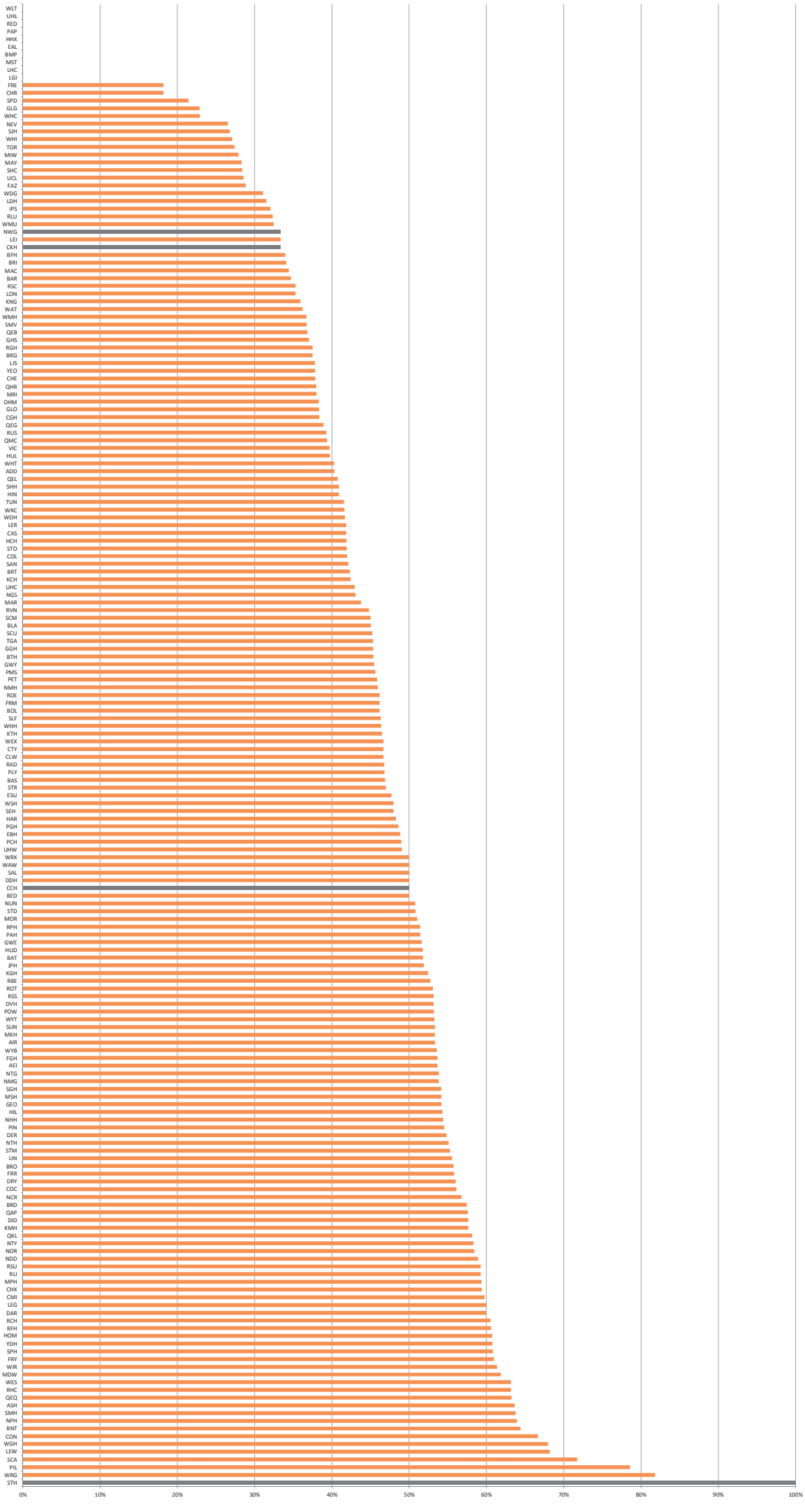



**Figure 1**
**Proportion of cases reviewed by a consultant surgeon within 12 hours of emergency admission to hospital. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Reviewed within 12 hours

# 8 PREOPERATIVE IMAGING

**Why is this important?**

Radiological imaging is a fundamental component of clinical practice which can help clinicians to make diagnoses and formulate treatment plans with patients and their relatives. Modern abdominal CT scanning is extremely accurate and underpins acute surgical practice. Even when the need for surgery is obvious, reported scans can refine disease extent and inform operative urgency, the nature of likely surgery, and even the advisability of having an operation.

Many emergency general surgical conditions require immediate treatment (which may be surgical or non-surgical) to prevent clinical deterioration. Timely reporting by a consultant radiologist may avoid delayed or inappropriate treatment resulting from misinterpretation of scans by non-specialist radiologists or other clinicians.[17,18] The quality of the information provided by CT scanning can be enhanced by discussion between surgical and radiology colleagues in order to better understand the clinical context.

CT scanning is most informative if performed early in the management of acute conditions. Imaging facilities and staff should therefore be available 24 hours per day to ensure patients who require scanning 'out of hours' are not disadvantaged.

**KEY STANDARDS**

Hospitals which admit patients as emergencies must have access to both conventional radiology and CT scanning 24 hours per day, with immediate reporting.
*NCEPOD EA*

The delivery of quality clinical care is dependent on access to supporting facilities. Rapid access to CT imaging, U/S scanning and laboratory analyses are critical to the efficient diagnosis, resuscitation and prioritisation of these patients.
*ASGBI EGS*

**AUDIT QUESTIONS**

What proportion of patients had a CT scan before surgery?

What proportion of patients had a CT scan reported by a consultant radiologist before surgery?

What variation existed in the proportion of patients who had a CT scan that was reported by a consultant radiologist before surgery, by:

1. Hospital?
2. Day and time of admission to hospital?
3. Day and time of surgery?
4. Urgency of surgery?
5. Patient characteristics, including documented risk of death?

## KEY FINDINGS

80% of all patients had a CT scan before surgery.

68% of all patients had a CT scan which was reported by a consultant radiologist before surgery.

At a quarter (26%) of hospitals, at least 80% of patients were scanned and their images reported by a consultant radiologist before surgery. Fewer than 40% of scans were reported preoperatively by a consultant radiologist at 4% of hospitals (Figure 2).

A consultant reported scan was available before surgery for only 53% of patients requiring immediate surgery, despite 70% of these patients being scanned before surgery (Table 10).

**Table 10**
**Preoperative CT scanning and reporting by a consultant radiologist by documented urgency of surgery. The smaller denominator in this table reflects the change in the wording of the question regarding operative urgency (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients who had a CT scan before surgery (%) | Proportion of patients who had a CT scan reported by a consultant radiologist before surgery (%) |
|---|---|---|---|
| **Urgency of surgery** | | | |
| <2 hours | 1,976 | 70*** | 53 |
| 2–6 hours | 5,498 | 81 | 67 |
| 6–18 hours | 4,213 | 86 | 74 |
| 18–24 hours | 2,247 | 80 | 73 |
| ***Overall*** | ***13,934*** | ***81%*** | ***68%*** |

## Clinical commentary

Given the value of CT scanning, it is perhaps surprising that a fifth of patients were not scanned before surgery, and that a consultant-reported CT scan was not available before surgery for a third of patients. There was marked variability in scanning and reporting practices between hospitals. At 47 hospitals (26%) at least 80% of patients were scanned and their images reported by a consultant radiologist before surgery, whereas at seven hospitals consultant radiologist reported CT scans were only achieved in 40% or less of patients preoperatively (Figure 2).

The Audit also found that a consultant-reported CT scan was available before surgery for only half (53%) of patients requiring surgery within two hours (Table 10), despite the fact that 70% of these patients had been scanned preoperatively. This contrasts with the care of patients who have suffered trauma for whom a reported scan within 30 minutes is the standard as part of a consultant-based pathway.

Reporting is most informative where complex surgical conditions and pre-existing diseases must be considered and balanced against the risks of surgery. However, almost a third of older patients and those documented as being highest risk did not have a CT scan reported by a consultant radiologist before surgery (Table 26).

Follow up of the NELA Organisational Audit by the Royal College of Radiologists[†††] determined that 24-hour contemporaneous CT reporting by a radiologist was available at all hospitals at which emergency laparotomies were performed. The disparity between apparent availability of facilities and variation in clinical practice may therefore reflect local differences in workload, commitments, or formalised pathways of care.

Very rarely, patients are so clinically unstable that the risks of scanning outweigh the benefits, and surgery is immediately indicated but, because misinterpretation of imaging has the greatest potential to cause harm in this population, specialist reporting before surgery is particularly vital.

**RECOMMENDATIONS**

Pathways should be implemented which facilitate rapid request and conduct of CT scans for patients who may require emergency laparotomy. These pathways should also support contemporaneous reporting by consultant or senior radiologists with expertise in interpreting emergency abdominal CT scans, so as not to delay subsequent treatment (MDT, Medical Directors).

Multidisciplinary pathways should be established to prevent inappropriate delays in a patient undergoing surgery especially once a consultant decision has been made. This will require cross disciplinary cooperation between surgeons, anaesthetists, radiological and laboratory services and theatre and critical care staff (MDT).

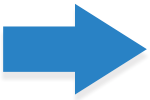
### Additional analyses

The proportions of patients who had a CT scan reported by a consultant radiologist before surgery was also assessed against patient age, ASA, admission type and preoperatively documented risk (Table 26).

[†††]An addendum to the Report available is at: www.nela.org.uk/reports.

## Elizabeth's story

The CT scan was carried out later on that afternoon, about a day after admission and about six hours after it was requested. This showed a large bowel obstruction secondary to a colon cancer, but with no evidence that the cancer had spread. The scan result took a couple of hours to be reported by a consultant radiologist and it was then several hours before the on-call surgical registrar reviewed the scans. He felt that surgery wasn't immediately required, as Elizabeth was opening her bowels a small amount, but planned for her to go to theatre the next day. Elizabeth had been in hospital for almost a day and a half before a diagnosis was reached. Her son felt that there was an unnecessary delay before the CT scan was performed .



Rapid access to abdominal CT is critical to the diagnosis and appropriate management of patients who may require emergency bowel surgery. Particularly compared to the time of her admission, there was a delay for Elizabeth to have this test performed. Delays to CT will introduce delays to theatre which will increase length of stay and may impact on patient outcome.

Best practice/recommended practice include:

- Systems in place to ensure that patients who present as an emergency with undifferentiated abdominal pain receive a CT within two hours of the scan request.
- Scans reported by a consultant radiologist and results communicated directly to the surgical team upon reporting.

A consultant radiologist reported Elizabeth's CT scan, which is best practice. The benefit of abdominal CT is greater if reported by a consultant radiologist, and units should ensure that they have 24 hour access to such reporting.

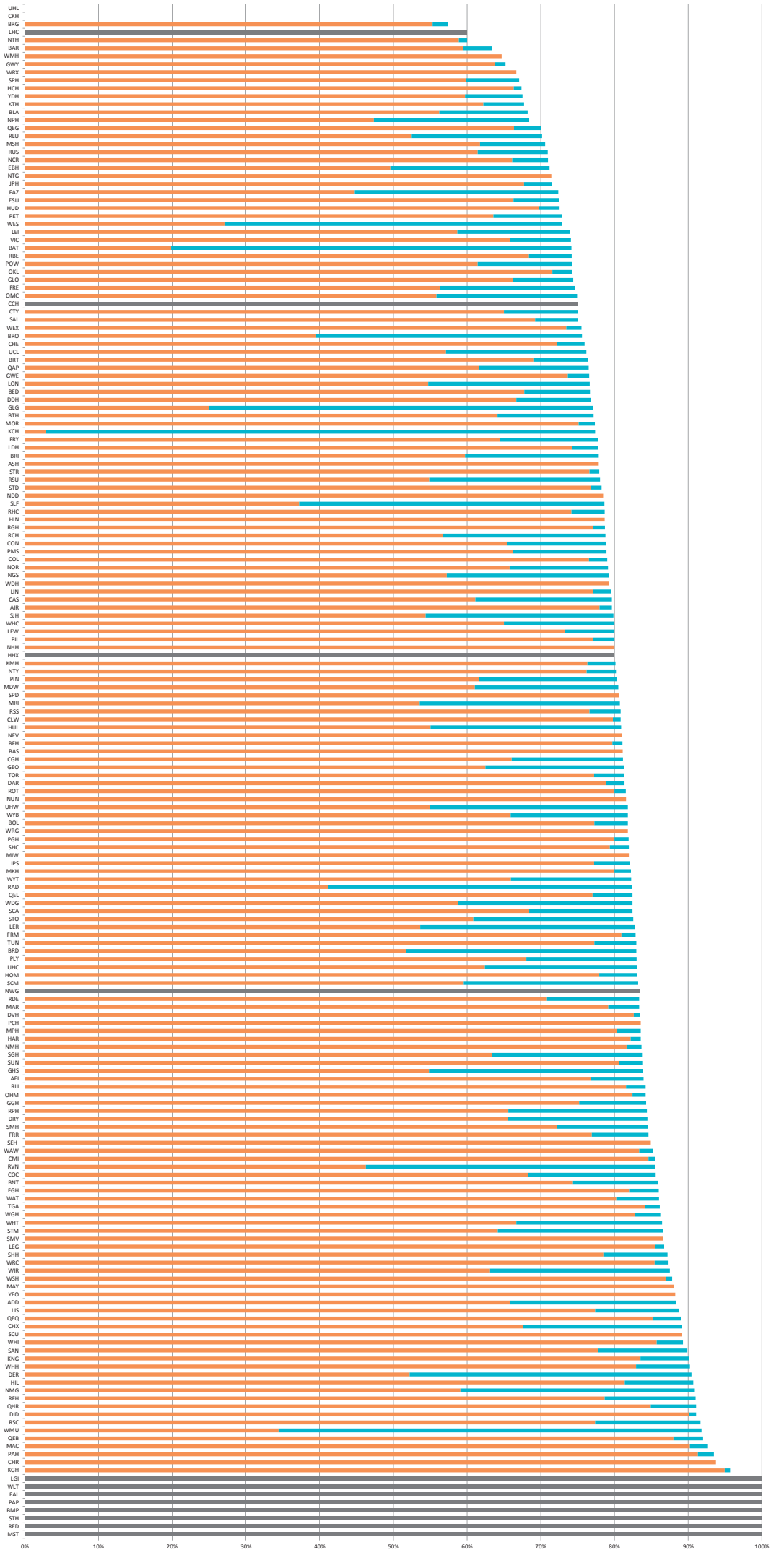



**Figure 2**
**Proportion of patients who had a CT scan performed and reported by a consultant radiologist before emergency laparotomy. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

CT reported by a consultant radiologist

CT not reported by a consultant radiologist

# 9 PREOPERATIVE DOCUMENTATION OF RISK

## Why is this important?

Death, complications, long-term debilitation and prolonged in-hospital recovery are far more common after emergency bowel surgery than after many other operations, including elective bowel surgery.[6,7]

Because risks of these outcomes vary between individuals, and because the risks posed by an operation sometimes outweigh proposed benefits, it is essential that they are quantified and documented before surgery for every patient. Doing so helps doctors to guide patients and their relatives in deciding which course of treatment is most appropriate, and allows clinicians to tailor care to the needs of each person requiring surgery. If risk has not been evaluated, it makes it harder for patients to reach an informed decision and for clinicians to target appropriate specialist care to high-risk and highest-risk patients.

**Figure 3**
**Categories of risk of death**

The following categories are used in the Audit:

| | |
|---|---|
| Highest risk | (>10% risk of death) |
| High risk | (5–10% risk of death) |
| Lower risk | (<5% risk of death) |

**KEY STANDARDS**

An assessment of mortality risk should be made explicit to the patient and recorded clearly on the consent form and in the medical record.
*NCEPOD KTR*

Patients must be actively involved in shared decision making and supported by clear information from healthcare professionals to make fully informed choices about treatment and on-going care that reflect what is important to them. This should happen consistently, seven days a week.
*NHS 7 Day Services*

We recommend that objective risk assessment become a mandatory part of the preoperative checklist to be discussed between surgeon and anaesthetist for all patients. This must be more detailed than simply noting the ASA score.
*RCS HR*

## AUDIT QUESTIONS

What proportion of patients had risk of death documented before surgery?

What were the relative proportions of patients documented to be at lower, high and highest risk of death?

Which methods were used to evaluate risk before surgery?

What variation existed in the proportion of patients who had a risk of death documented before surgery by:

1 Hospital?
2 Urgency of surgery?
3 Patient characteristics?

## KEY FINDINGS

Risk of death was documented before surgery for just over half of all patients (56%) (Table 11).

Risk had been documented for at least 80% of patients at 14% of hospitals. However, risk was documented for fewer than 40% of patients at 22% of hospitals (Figure 4).

Of the 56% of patients for whom risk had been documented:

- 45% of patients were highest risk (Table 11).
- 21% were high risk.
- 34% were lower risk.

Where risk was documented before surgery, more patients received other required Standards of care such as consultant presence and admission to critical care.

**Table 11**
**Preoperative documentation of category of risk of death and corresponding median calculated preoperative P-POSSUM predicted risk of death within 30 days of surgery (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Proportion of patients (%) | P-POSSUM Predicted risk of death within 30 days of surgery (%) |
|---|---|---|
| Lower (<5%) | 19 | 3*** |
| High (5–10%) | 12 | 8 |
| Highest (>10%) | 25 | 33 |
| Not documented | 44 | 7 |

## Clinical commentary

Risk of death should be estimated and documented in the medical record for all patients, and risks should be discussed with patients and their relatives to inform shared decision making. However, despite the fact that evaluation of risk had most commonly been informed by clinical judgement alone (69% of patients, whereas formal assessment was used in 43% of cases), risk had not been documented for 44% of patients.

Where risk has been documented, it follows that at least one clinician has thought about the individual perioperative needs of that patient. It is, therefore, of concern that in cases where it was not documented, risks of adverse outcomes may not have been appreciated by clinicians or discussed with patients as part of the consent process.

The Audit found considerable variation between hospitals (Figure 4). In addition, risk was more comprehensively documented for higher risk patients; whether defined by age (64% of patients over the age of 80, 51% of patients under 50); by greater surgical urgency (67% of patients requiring immediate surgery, 51% requiring surgery in 6–18 hours); or by higher ASA scores (73% of ASA 4–5 patients, 51% of ASA 1–3 patients) (Table 12 and Table 13).

These findings suggest that the documentation of risk is routine practice at some hospitals, that at others it is documented only when prompted by other markers of risk, and that in up to a fifth of hospitals risk is documented only in a minority of patients.

**Table 12**
**Proportion of patients for whom risk was documented before surgery by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients who had risk documented before surgery (%) |
|---|---|---|
| **Age (years)** | | |
| 18–39 | 2,188 | 52*** |
| 40–49 | 1,939 | 50 |
| 50–59 | 2,707 | 53 |
| 60–69 | 4,197 | 54 |
| 70–79 | 5,084 | 57 |
| 80–89 | 3,537 | 63 |
| ≥90 | 531 | 70 |
| **ASA** | | |
| 1 | 2,097 | 51*** |
| 2 | 6,793 | 50 |
| 3 | 7,108 | 53 |
| 4 | 3,747 | 72 |
| 5 | 438 | 78 |
| **Admission type** | | |
| Emergency | 18,693 | 56 (p=0.07) |
| Elective | 1,490 | 54 |
| ***Overall*** | ***20,183*** | ***56%*** |

**Table 13**
**Proportion of patients for whom risk was documented preoperatively by documented urgency of surgery (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients who had risk documented before surgery (%) |
|---|---|---|
| **Urgency of surgery** | | |
| <2 hours | 1,976 | 67*** |
| 2–6 hours | 5,498 | 60 |
| 6–18 hours | 4,213 | 51 |
| 18–24 hours | 2,247 | 52 |
| ***Overall*** | ***13,934*** | ***57%*** |

Participants provided sufficient data to allow us to calculate the P-POSSUM predicted risk of death for all patients, including those who had no risk documented prior to surgery (Table 11). This allowed us to examine how the Standards of care provided to this latter group compared to an equivalent group of patients in whom the risk of death had been documented before surgery.

The Audit found that the risk profile of the group for whom risk of death had not been documented before surgery was most similar to the group who clinicians categorised as being at high risk of death (Table 11). In fact, more than a third (68%) of these individuals were at greater than 10% risk of death (Figure 5). Standards of care (including presence of consultant surgeon and a consultant anaesthetist for surgery) were better met and appropriate levels of care (e.g. critical care admission) were better provided if risk had been documented. This is expanded upon in relevant sections throughout this Report.

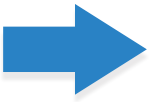
**RECOMMENDATIONS**

When surgery is contemplated, a formal assessment of the risk of death and complications should be undertaken by a clinician and documented in the patient record. This information should be communicated to all members of the multidisciplinary team in order to prioritise care and allocate appropriate resources. If surgery is undertaken, this risk assessment should be recorded on the patient consent form (MDT).

Policies should be developed and implemented which use individualised risk assessment to allocate resources (e.g. critical care) appropriate to the patient's need (Clinical Directors).

## Elizabeth's story

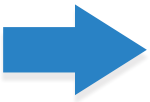
The following morning, Elizabeth was seen by the surgical consultant on-call, who felt that an emergency operation was required to remove the bowel cancer and relieve the obstruction. Such surgery carries a substantial risk to life. Elizabeth was felt to be at high risk, with an estimated mortality of around 20%. This was discussed frankly with Elizabeth and her family, and a decision was made to proceed with surgery urgently as without an operation she would have deteriorated rapidly. Elizabeth was counselled by a stoma specialist as this was a probable outcome of the operation. In retrospect, Elizabeth couldn't remember giving consent for the operation, as she was too unwell and drowsy from morphine. She felt that her family had made an informed choice on her behalf.



The risks of death and substantial debilitation after emergency bowel surgery are high. Older people are also at risk of losing their independence after such an event. Estimating risk and conveying this to the patient and relatives is an important part of the consent process, as well as informing decisions about postoperative critical care admission. The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) 2011 Report: 'Perioperative Care – Knowing the Risk' states that an assessment of risk of death should be made explicit to the patient and recorded clearly in the notes and on the consent form.

As illustrated by Elizabeth's case, the patient may be too unwell to comprehend the intricacies of this process, and what surgery, or no surgery, really means. However as long as the patient has the capacity to consent, it is essential that they are offered the opportunity to discuss their risk of death and disability.

Before Elizabeth went to theatre she was reviewed by first a senior registrar and then a consultant anaesthetist, who jointly planned her perioperative anaesthetic care. The requirement for critical care postoperatively was anticipated and a bed requested.



The fact that Elizabeth's risk of death was calculated before surgery prompted the anaesthetic team to ask for a critical care bed before she went to surgery, and informed decisions regarding intraoperative monitoring. Such planning is essential to ensure adequate utilisation of critical care resources.

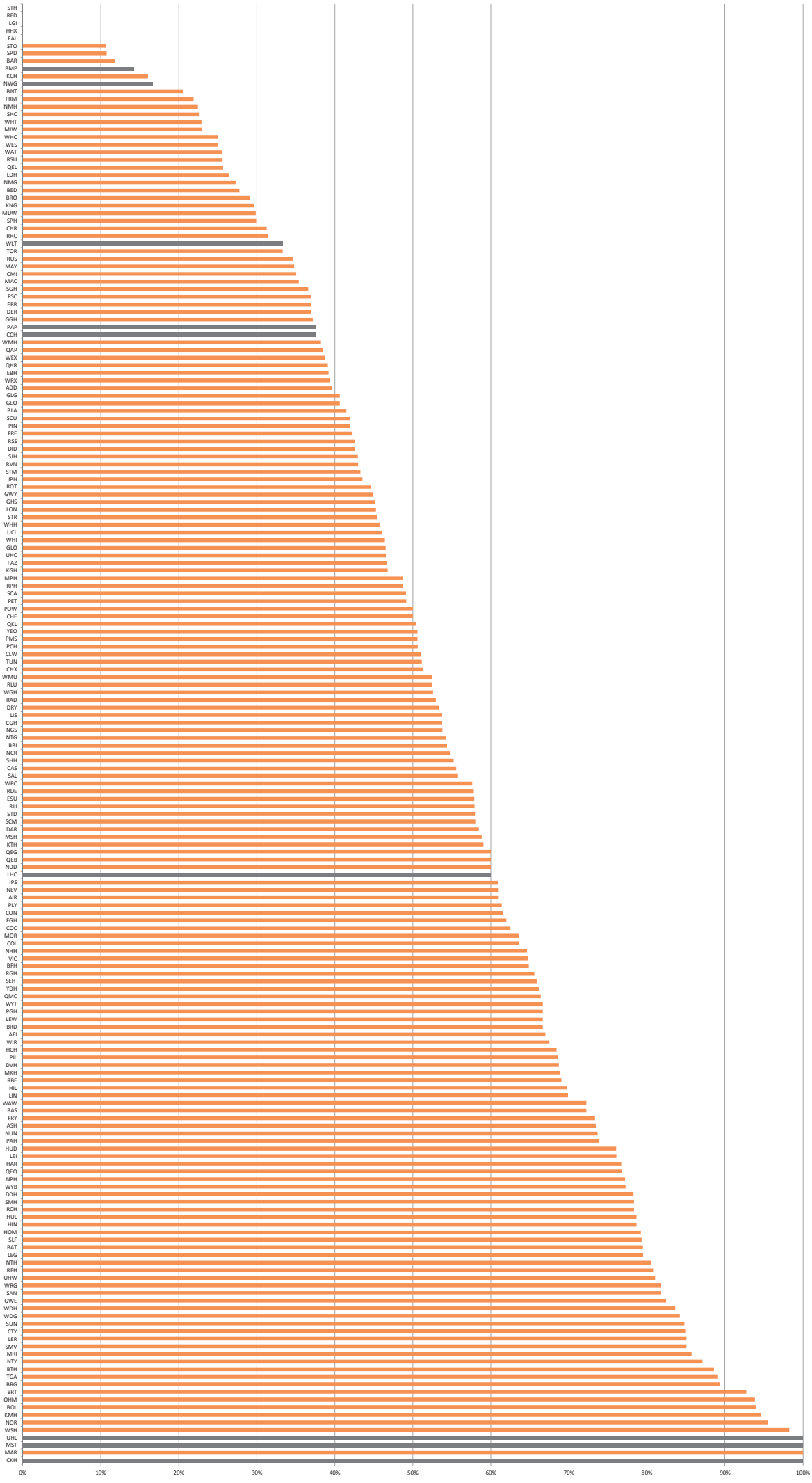
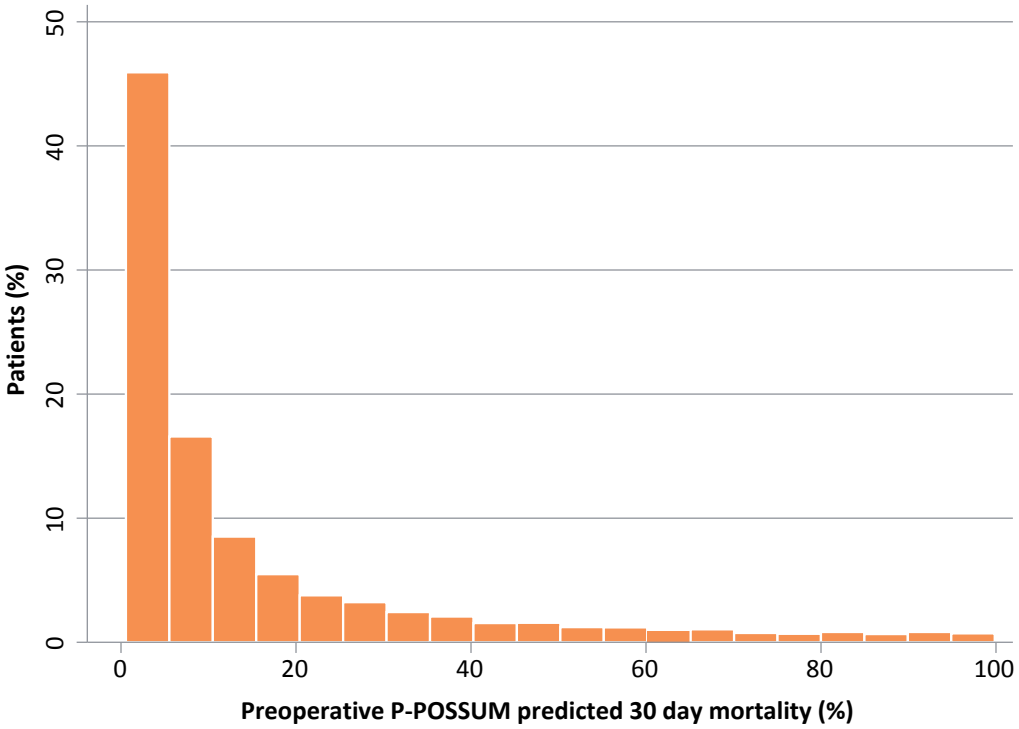



**Figure 4**
**Proportion of patients who had risk documented preoperatively. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Preoperative documentation of risk

**Figure 5**
**Distribution of preoperative P-POSSUM estimated 30-day postoperative mortality in patients who had no preoperative documentation of risk**



# 10

# TIMELINESS OF EMERGENCY CARE: TIME FROM HOSPITAL ADMISSION TO ADMINISTRATION OF ANTIBIOTICS AND SURGERY IN PATIENTS WITH PERITONITIS

## Why is this important?

Many patients requiring an emergency laparotomy have signs of sepsis. Sepsis is a term used to describe widespread, severe inflammation in the body resulting from infection. Intra-abdominal sepsis is life-threatening and early administration of antibiotics, before surgery, has been shown to improve the likelihood of survival.[19,20] The ability of a hospital to deliver this treatment rapidly is dependent on reliable pathways of care and good communication between staff across different departments. In order to evaluate this, we selected the group of patients admitted as an emergency with the diagnosis of peritonitis who were subsequently deemed to require surgery within six hours of a decision being made to operate, and who had sugery within 24 hours of admission. This constitutes a relatively clearly defined group that requires both urgent antibiotic therapy and urgent surgery.

### KEY STANDARDS

Those with septic shock require immediate broad-spectrum antibiotics with fluid resuscitation and source control.
*RCS HR*

The number of patients who present to emergency departments and other wards/units that directly admit emergencies with severe sepsis, Red Flag Sepsis or Septic Shock who received intravenous antibiotics within one hour of presenting.
*CQUIN 2015/2016*

Trusts should ensure emergency theatre access matches need and ensure prioritisation of access is given to emergency surgical patients ahead of elective patients whenever necessary as significant delays are common and affect outcomes.
*RCS HR*

### AUDIT QUESTIONS

For patients admitted as an emergency who were scheduled for emergency laparotomy for suspected peritonitis within six hours of the decision to operate:

1. What was the interval between admission to hospital and administration of antibiotics?
2. What was the interval between admission to hospital and arrival in an operating theatre?
3. Did this vary according to day of surgery?

## KEY FINDINGS

1,302 patients were scheduled for emergency laparotomy (within six hours of a decision to operate) for suspected peritonitis. Descriptive characteristics are provided in Table 14.

More than half of patients had received the first dose of an antibiotic within four hours of emergency admission to hospital, but a quarter had yet to receive antibiotics seven hours after admission.

Half of patients arrived in theatre for surgery within two hours of the decision being made to operate and three quarters within 3.5 hours.

However, eight hours after admission half of these patients had not arrived in theatre for surgery and almost a quarter waited more than 13 hours.

Neither time to antibiotic administration nor time to operation varied significantly with the day of the week in this sub-group.

**Table 14**
**Characteristics of patients admitted as an emergency who were scheduled for emergency laparotomy within six hours and underwent surgery within 24 hours of admission to hospital for suspected peritonitis**

| Characteristic | Group | Number of patients | Frequency (%) |
|---|---|---|---|
| **Gender** | Female | 641 | 49 |
| | Male | 661 | 51 |
| **Procedure** | Primary procedure | 1,279 | 98 |
| | Repeat surgery | 23 | 2 |
| **Antibiotic therapy** | Received | 1,288 | 99 |
| | Did not receive | 14 | 1 |

## Clinical commentary

Some aspects of emergency abdominal surgery are time-critical, but studying them is difficult due to the mix of cases, conditions and urgency. A fifth of patients had peritonitis as their indication for surgery (Table 4), and selecting a subgroup of these patients who required surgery within six hours of decision-making enable us to evaluate how successful teams were in delivering these treatments rapidly.

Almost half of these patients had yet to receive the first dose of antibiotics 3.5 hours after emergency admission to hospital (Median: 3.6 hours, IQR: 1.8-7.0). Antibiotics are the first-line treatment for sepsis, and well-known international guidelines state that they should be given within one hour of hospitalisation.[21] In this sub-group of patients, the time from admission to administration of antibiotics is too long and needs to be improved. The Department of Health has recently introduced a CQUIN incentive[‡‡‡] to be awarded to trusts on the basis of early screening for sepsis and administration of an intravenous antibiotic for severe sepsis or septic shock within one hour of presentation to hospital.[22]

[‡‡‡]Commissioning for Quality and Innovation (CQUIN). Guidance for 2015/2016. NHSE, 2015 www.england.nhs.uk/wp-content/uploads/2015/03/9-cquin-guid-2015-16.pdf).

Patients took eight hours from admission on average to reach an operating theatre, with one quarter taking more than 13 hours (median: 8.1 hours, IQR: 5.0–13.3). Even allowing for the mix of diagnoses and risk levels in these cases, this appears to be inappropriately slow for this patient group. This was substantially greater than the time from decision to operate to arrival in theatre (Median: 2.0 hours, IQR: 1.3–3.5), suggesting that delays predominantly occur during the initial assessment of patients, rather than in relation to access to operating theatres.

Clinicians should review pathways of care, prioritisation, staff education, and point of senior involvement in time-critical cases. Pathways with clearly defined time to treatment targets are effectively delivered in other common clinical situations, including acute myocardial infarction, stroke and trauma.

Preliminary analysis of hospital-level data shows substantial variation between hospitals. We have not been able to report on this at hospital-level due to the small case numbers in some hospitals, but plan to do so in future reports when caseload has increased.

**RECOMMENDATIONS**

Multidisciplinary Teams should review their pathways of care for the administration of antibiotics in order to identify why delays occur (Multidisciplinary Teams).

Any areas of the hospital that admit emergency general surgical patients need to have robust mechanisms in place to identify patients with signs of sepsis and ensure prompt prescription and administration of antibiotics (Medical Director, Clinical Director, Multidisciplinary Teams).

Clinicians should regularly review Audit data on timing of administration of antibiotics and time to theatre in order to ensure that aims are being achieved (Multidisciplinary Teams).

Hospitals should examine emergency theatre availability in the context of their local Audit results in order to determine whether sufficient resources are available to enable patients to receive emergency surgical treatment without undue delay (Clinical/Medical Directors).

### Additional analyses

The interval between admission to hospital and administration of antibiotics and between admission and arrival in theatre was assessed against patient age, ASA, documented risk and operative urgency (Table 27).

# 11

# TIMELINESS OF ARRIVAL IN AN OPERATING THEATRE

## Why is this important?

Delay to emergency surgery has been associated with lower rates of survival.[20] Once patients and their doctors have agreed to proceed to emergency laparotomy, it is essential that patients arrive in theatre for surgery without undue delay. Surgeons frequently report difficulties gaining timely access to theatre for sick patients.[23]

The urgency with which surgery is required varies between individuals. It is therefore essential that triage is included in initial clinical assessment. This is usually based on evaluation of clinical condition, surgical disease and individual risk.

**Figure 6**
**NELA Operative urgency categories**

Operative urgency categories used in the NELA Patient Audit:

| | |
|---|---|
| 1 | Immediate (<2 hours) |
| 2A | Urgent (2–6 hours) |
| 2B | Urgent (6–18 hours) |
| 3 | Expedited (>18 hours) |

**KEY STANDARDS**

Trusts should ensure emergency theatre access matches need and ensure prioritisation of access is given to emergency surgical patients ahead of elective patients whenever necessary as significant delays are common and affect outcomes.
*RCS HR*

The time from decision to operate to actual time of operation is recorded in patient notes and audited locally.
*RCS USC*

Delays in surgery for the elderly are associated with poor outcome. They should be subject to regular and rigorous audit and this should take place alongside identifiable agreed standards.
*NCEPOD Age*

## AUDIT QUESTIONS

What proportion of patients arrived in theatre within a timescale appropriate to their operative urgency? (Figure 6).

What variation existed in the proportion of patients arriving in theatre within a timescale appropriate to their operative urgency, by:

1 Hospital?
2 Day and time of admission to hospital and of surgery?
3 Urgency of surgery?
4 Patient characteristics, including documented risk of death?

## KEY FINDINGS

Arrival in theatre was delayed in 16% of patients overall.

When assessed against documented operative urgency, the proportion of patients arriving within appropriate timescales was:

- 77% – 1: Immediate (<2 hours).
- 86% – 2A: Urgent (2–6 hours).
- 84% – 2B: Urgent (6–18 hours).

Arrival in theatre was therefore most frequently delayed in patients requiring immediate surgery.

At 133 hospitals (75%), at least 80% of patients arrived in theatre within a timescale appropriate to their operative urgency (Figure 7A).

At no hospitals was arrival in theatre delayed in more than 60% of patients (Figure 7A).

Relative proportions of operative urgency categories varied between hospitals (Figure 7B).

No substantial variation was observed by time of day or day of week of either surgery or hospital admission.

## Clinical commentary

Prompt arrival in theatre for surgery is fundamental to high quality care in emergency laparotomy. Despite this, significant numbers of patients did not arrive in theatre within a timeframe requested by the clinical team. The NELA Organisational Audit[8] found that theatre capacity was unlikely to be sufficient in at least a fifth of hospitals routinely admitting emergency general surgical patients. In addition, the NHS 7 Day Services survey identified theatre capacity as the principle cause of delayed emergency surgery in 90% of cases.[24] These results confirm that theatre access remains an issue.

It is concerning that clinicians had the greatest difficulty getting the most urgent patients to theatre (the 'Immediate' category), where the delays would arguably have the greatest impact on survival. In other time-sensitive surgery where patients need surgery within very short timeframes (such as major trauma and abdominal aneurysm surgery or neurosurgery for intracranial haemorrhage), it is accepted practice for surgery to take place in the next available theatre rather than wait for a specific emergency theatre to become available.

Policies can guide prioritisation of patients according to safety when there are competing demands for resources. However, the NELA Organisational Audit[8] found that policies for the timing of surgery according to clinical urgency were not available at two-thirds of hospitals, and that formal arrangements for the deferment of elective activity in order to appropriately prioritise unscheduled admissions were available at only a third of hospitals.

Neither the time of decision to operate nor time of booking for theatre were submitted in 12% of cases. At hospital level, both time points were missing in up to 50% of submitted cases (Figure 20). Hospitals with significant levels of missing data will have difficulty improving quality of care surrounding access to theatres without accurate data with which to assess delivery of care.

**RECOMMENDATIONS**

Hospitals should examine emergency theatre provision in the context of their local Audit results, in order to determine whether sufficient resources are available to enable patients to receive emergency surgical treatment without undue delay (Clinical/Medical Directors).

Multidisciplinary pathways should be established to prevent inappropriate delays in a patient undergoing surgery, especially once a consultant decision has been made. This will require cross disciplinary cooperation between surgeons, anaesthetists, radiological and laboratory services and theatre and critical care staff (MDT).

### Additional analyses

Timeliness of arrival in theatre was also assessed against patient age, ASA, admission type, documented risk and operative urgency (Table 28).

### Elizabeth's story

Elizabeth was assessed as requiring urgent surgery within six hours, and her booking form in theatre clearly documented this. Her anaesthetic started just under six hours after the decision to operate was made.

Once a decision to operate has been made, prompt intervention is required to prevent further deterioration. In Elizabeth's case her operation was categorised under the 2004 NCEPOD classification as 'urgent' or within six hours. This preoperative classification ensures that patients are operated on within a time-frame appropriate for their condition. For Elizabeth, with a bowel cancer which was partially obstructing, with no signs of perforation, it was appropriate for surgery to be performed within six hours of the decision to operate.

Hospitals should ensure that there are mechanisms in place that allow patients to reach theatre without delays in order to avoid unnecessary increase in mortality. This may require postponing elective surgery so that patients can receive emergency surgery within the required time-frames.

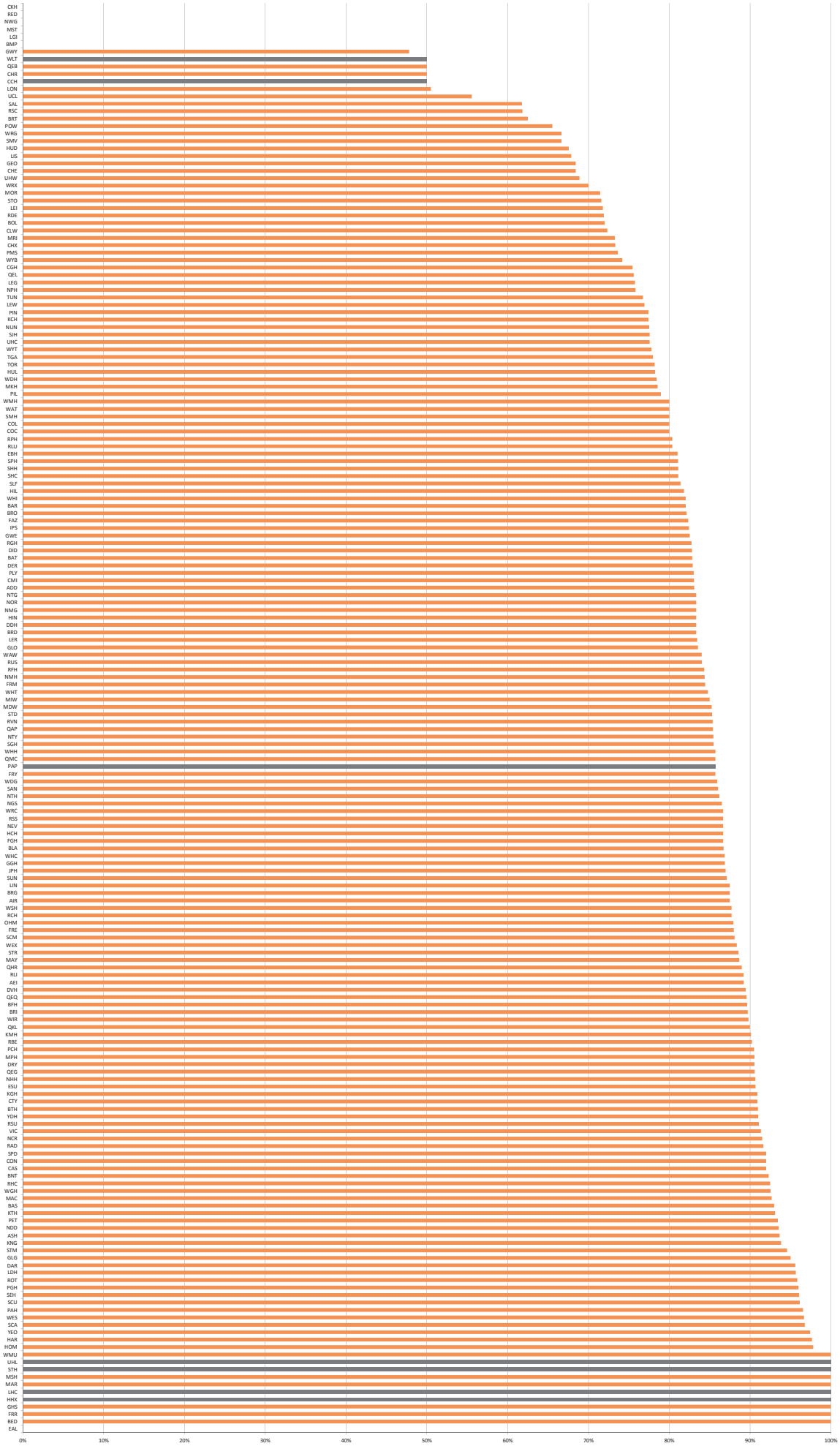



**Figure 7**
**(A) Proportion of cases where interval from decision to operate (or time of booking) to arrival in theatre was appropriate to operative urgency. This excludes expedited cases (category3) Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Patients arriving in theatre in a time commensurate with operative urgency

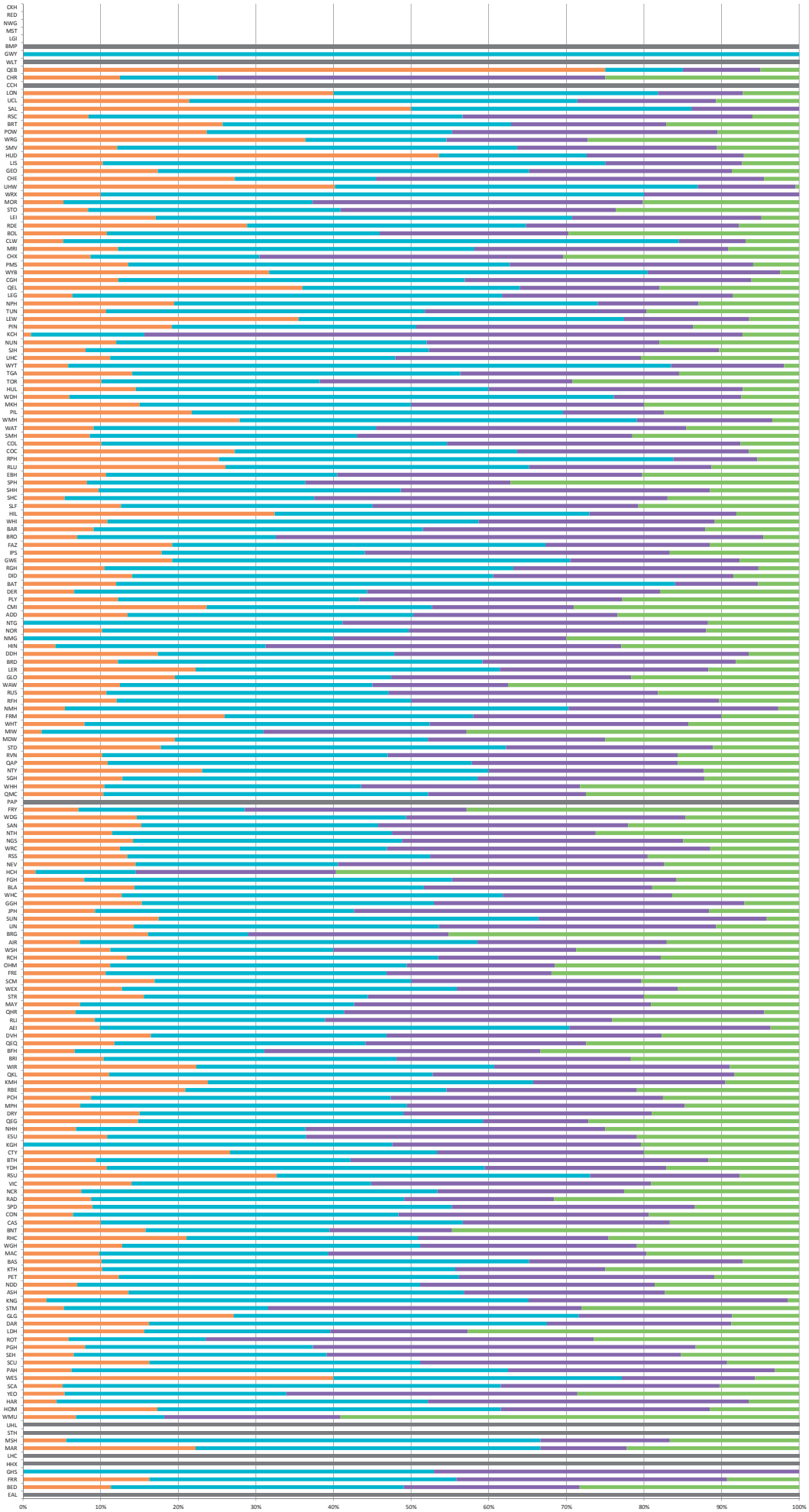



**Figure 7**
**(B) Proportion of cases in each operative urgency category by hospital excluding expedited cases (category3). Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Urgency <2 hours

Urgency <6 hours

Urgency <18 hours

Urgency >18 hours

# 12
# CONSULTANT-DELIVERED PERIOPERATIVE CARE

**Why is this important?**

Consultant delivered care for any high-risk surgical procedure has become an accepted cornerstone of clinical practice. Hence the management of patients requiring emergency bowel surgery should be directed by consultant surgeons and consultant anaesthetists throughout the perioperative period. These principles are reflected in various Standards of care and are in keeping with the level of service that high-risk elective patients receive.

## Preoperative care

The need for complex decision making before surgery, including weighing-up patient wishes against the risks and benefits of a variety of treatment options, requires consultant expertise. It is therefore essential that consultant surgeons and consultant anaesthetists have the opportunity to review patients before surgery.

For the purpose of the Audit, we asked whether a consultant surgeon was present in person at the time the decision was made to operate. For consultant anaesthetists, we asked whether they reviewed the patient before surgery.

## Intraoperative care

The management of patients during emergency bowel surgery can be challenging and experience is required for the complex decision making required to identify and deliver the next steps in care. Patients can also deteriorate very quickly during surgery and these time-pressured situations similarly require consultant presence.

Standards state that, as a minimum, both a consultant surgeon and a consultant anaesthetist should directly supervise patient care during surgery for all individuals whose predicted risk of death within 30 days exceeds 10% and that both consultant bodies should provide active input into the care of all patients whose predicted risk of death exceeds 5%.

## KEY STANDARDS

***Preoperative care***

Each higher risk case (predicted mortality ≥5%) should have the active input of consultant surgeon and consultant anaesthetist.

*RCS HR*

***Intraoperative care***

A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% and for cases with predicted mortality >5% except in specific circumstances where adequate experience and manpower is otherwise assured.

*RCS USC*

Each higher risk case (predicted mortality ≥5%) should have the active input of consultant surgeon and consultant anaesthetist. Surgical procedures with a predicted mortality of ≥10% should be conducted under the direct supervision of a consultant surgeon and a consultant anaesthetist unless the responsible consultants have actively satisfied themselves that junior staff have adequate experience and manpower and are adequately free of competing responsibilities.

*RCS HR*

## AUDIT QUESTIONS

***Preoperative care***

What proportion of patients was reviewed before surgery by a consultant surgeon (in person when making the decision to operate) and a consultant anaesthetist?

***Intraoperative care***

What proportion of patients had a consultant surgeon and a consultant anaesthetist directly supervising care during surgery?

What variation in these process-measures existed, by:

1. Hospital?
2. Day and time of surgery?
3. Patient characteristics, including documented risk of death?

## KEY FINDINGS

***Preoperative care***

Overall, 58% of patients were reviewed by a consultant surgeon and a consultant anaesthetist before emergency laparotomy (Table 15).

*Hospital-level variation:* At 13% of hospitals at least 80% of patients were reviewed before surgery by both consultants; but at 14% of hospitals less than 40% of patients were reviewed by both consultants (Figure 8).

*Documentation of risk:* 63% of patients were reviewed by both a consultant surgeon and a consultant anaesthetist if risk had been documented before surgery, but if risk had not been documented 53% were reviewed by both consultant bodies (Table 15).

*Time of day variation:* Two thirds (67%) of patients whose surgery started 'in hours' (8.00 am to 6.00 pm, Monday to Friday), were reviewed before surgery by both a consultant surgeon and a consultant anaesthetist before surgery. During the daytime at weekends, this dropped to half (56%) of patients and to a quarter (26%) after midnight (Table 16).

The decision to operate was made in person by a consultant surgeon for 72% of patients overall. But while this occurred for 79% of patients 'in hours' (8.00 am to 6.00 pm Monday to Friday), the proportion dropped to 38% after midnight (Table 16).

Overall, 77% of patients were reviewed by a consultant anaesthetist before surgery. But while 85% were reviewed during weekday daytime hours, this dropped to 55% after midnight (Table 16).

**Table 15**
**Proportion of patients receiving input before surgery by consultant surgeons and consultant anaesthetists by category of documented risk (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Decision to operate made in person by a consultant surgeon and patient reviewed preoperatively by a consultant anaesthetist | Decision to operate made in person by a consultant surgeon | Preoperative review by a consultant anaesthetist | Decision to operate not made in person by a consultant surgeon and patient not reviewed preoperatively by a consultant anaesthetist |
|---|---|---|---|---|---|
| Lower | 3,826 | 61%*** | 77%*** | 76%*** | 8%*** |
| High | 2,386 | 65% | 77% | 81% | 8% |
| Highest | 5,059 | 63% | 72% | 84% | 7% |
| Not documented | 8,912 | 53% | 69% | 73% | 11% |
| ***Overall*** | ***20183*** | ***58%*** | ***72%*** | ***77%*** | ***8%*** |

**Table 16**
**Proportion of patients receiving input before surgery by consultant surgeons and consultant anaesthetists by time of day of arrival in theatre for emergency laparotomy (* p≤0.05, **p≤0.005, ***p≤0.001)**

| Time of arrival in operating theatre | Monday–Friday | | | Saturday–Sunday | | |
|---|---|---|---|---|---|---|
| | Both consultants | Consultant surgeon | Consultant anaesthetist | Both consultants | Consultant surgeon | Consultant anaesthetist |
| 0800–1159 | 66%*** | 77%*** | 85%*** | 55%*** | 76%*** | 70%*** |
| 1200–1759 | 69% | 80% | 85% | 57% | 78% | 72% |
| 1800–2359 | 55% | 70% | 76% | 43% | 62% | 66% |
| 0000–0759 | 26% | 39% | 55% | 26% | 38% | 54% |
| ***Overall*** | ***61%*** | ***73%*** | ***80%*** | ***50%*** | ***69%*** | ***68%*** |

## KEY FINDINGS

***Intraoperative care***

### 1 All patients

Care during surgery was directly supervised by both a consultant surgeon and a consultant anaesthetist for two thirds (65%) of patients.

*Hospital-level variation:* At a quarter (27%) of hospitals, at least 80% of patients had their operation supervised directly by both a consultant surgeon and a consultant anaesthetist (Figure 9).

*Time of day variation:* Both consultants were present for 75% of operations 'in hours' (8.00 am to 6.00 pm, Monday to Friday). This dropped to 61% in the evenings and at weekends and 41% of operations started after midnight (Table 18).

Consultant surgeons directly supervised 85% of operations overall. While this occurred for 88% of patients 'in hours', the proportion dropped to 69% after midnight (Table 18).

Overall, consultant anaesthetists directly supervised care during surgery for 74% of patients. This occurred for 85% of patients 'in hours', but dropped to 68% at weekends and to 50% after midnight (Table 18).

### 2 Highest risk patients

Care during surgery was not directly supervised by both a consultant surgeon and a consultant anaesthetist for a quarter of highest risk patients (Table 17).

*Hospital-level variation:* For highest risk patients, more than 40% of operations were not supervised by both consultants at a fifth (22%) of hospitals (Figure 10).

Consultant surgeons directly supervised 89% of operations in highest-risk patients (Table 17).

Consultant anaesthetists directly supervised intraoperative care for 81% of highest-risk patients (Table 17).

**Table 17**
**Proportion of patients whose care during surgery was directly supervised by consultant surgeons and consultant anaesthetists by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Both consultants present in theatre | Consultant surgeon present | Consultant anaesthetist present | Neither consultant present in theatre |
|---|---|---|---|---|---|
| Lower | 3,826 | 61%*** | 82%*** | 71%*** | 9%*** |
| High | 2,386 | 67% | 85% | 76% | 6% |
| Highest | 5,059 | 73% | 89% | 81% | 4% |
| Not documented | 8,912 | 62% | 83% | 71% | 8% |
| ***Overall*** | ***20,183*** | ***65%*** | ***85%*** | ***74%*** | ***7%*** |

**Table 18**
**Proportion of patients whose care during surgery was directly supervised by consultant surgeons and consultant anaesthetists by time of day of arrival in operating theatre (* p≤0.05, **p≤0.005, ***p≤0.001)**

| Time of arrival in operating theatre | Monday–Friday | | | Saturday–Sunday | | |
|---|---|---|---|---|---|---|
| | Both consultants | Consultant surgeon | Consultant anaesthetist | Both consultants | Consultant surgeon | Consultant anaesthetist |
| 0800–1159 | 76%*** | 87%*** | 86%*** | 62%*** | 89%*** | 67%*** |
| 1200–1759 | 75% | 88% | 84% | 60% | 85% | 68% |
| 1800–2359 | 61% | 83% | 70% | 52% | 80% | 61% |
| 0000–0759 | 41% | 69% | 49% | 41% | 71% | 50% |
| ***Overall*** | ***69%*** | ***85%*** | ***78%*** | ***57%*** | ***83%*** | ***64%*** |

## Clinical commentary

The Audit found that, regardless of the day of surgery, the highest-risk patients undergo surgery after midnight (Table 3). However, despite these findings and a widespread understanding that only 'life or limb' saving surgery should be performed overnight, the Audit has found not only a 'weekend effect' but also an 'out of hours' effect across these measures of consultant-led care (Table 16, Table 18 and Table 31).

The higher levels of consultant input during daytime hours are likely to be in part a reflection of the availability of 'NCEPOD' emergency theatres that are staffed by consultants with job-planned sessions in emergency theatres. This suggests that this has been effective at increasing levels of consultant delivered care.

Staffing levels and the availability of facilities have traditionally been lowest at weekends. It has been suggested that this might account for the slightly increased mortality rate that has been observed at weekends in other studies.[24,25] However, patterns of staffing look to be changing; the current Dr Foster Hospital Guide reported a greater availability of senior clinicians at weekends and that this was associated with a reduction in the weekend emergency mortality rate.[26]

However, reduction of any increased mortality rate resulting from weekend admission or surgery is unlikely to be solved solely by maintaining staffing levels across the week. Evidence from acute medicine suggests that work patterns, rather than just numbers of on-call consultants, influence patient outcomes;[16] with reduced mortality rates at hospitals where on-call consultants were free from fixed-commitments, were on-call for blocks of at least two consecutive days or where at least two consultant ward rounds occurred every day.

Intraoperative input by both a consultant surgeon and a consultant anaesthetist has improved over the last five years.[1] This may be due to a greater appreciation of the magnitude of adverse outcomes after emergency laparotomy. However, it is concerning that 35% of patients did not receive this level of care during surgery (Table 17) and that even where risk had been documented, 37% of highest-risk patients were not cared for during surgery by both a consultant surgeon and a consultant anaesthetist.

The Audit found that inpatient 30-day mortality in patients who had no risk documented before surgery was 7%, categorising them as high risk of death (Figure 15). However, across each of these measures of consultant-led care, input was substantially less frequent if risk had not been documented preoperatively than in patients who had been assessed as being at high risk of death (Table 15 and Table 17). These findings have led to our recommendation that risk of death should be assessed for every patient undergoing an emergency laparotomy.

It is likely that a multitude of factors are responsible for the varying degrees of consultant input found across hospitals and by time-of-day. Each hospital will need to determine its own reasons for any shortfall in provision. This may include exploring the impact of elective commitments on the ability of consultants to provide direct input into the care of emergency patients.

**RECOMMENDATIONS**

Local protocols should be developed which ensure a consultant-delivered service for emergency laparotomy patients. This includes consultant-delivered preoperative decision making and direct intraoperative management. Rotas, job plans and staffing-levels for surgeons and anaesthetists should allow a consultant-delivered service, 24 hours per day, seven days per week (Clinical/Medical Directors).

Pathways should be developed locally which require consultant anaesthetist and surgeon presence for all high-risk patients undergoing emergency laparotomy, 24 hours per day, seven days per week (Clinical/Medical Directors).

Departments of surgery should use local NELA data to determine if the availability of on-call consultant surgeons should be improved by relieving them of elective duties (Clinical/Medical Directors).

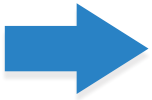
Facilitating a consultant-delivered anaesthetic service 24 hours per day, seven days per week may require an increase in the number of consultants available for emergency operating-theatre work. This may be of particular relevance to hospitals in which on-call anaesthetists also cover other busy emergency services such as trauma, maternity or critical care (Clinical/Medical Directors).

### Additional analyses

These markers of consultant-led perioperative care were also assessed against patient age, ASA, admission type and day of surgery (Table 29, Table 30 and Table 31).

## Elizabeth's story

The operating surgeon was a colorectal consultant, and the anaesthetist was a senior registrar. Her bowel was obstructed but there was no sign of perforation. The operation took just over two hours, the bowel cancer was removed and a colostomy formed.



Intraoperative management of patients undergoing emergency bowel surgery is complex and is best conducted under the direct supervision of a consultant surgeon and anaesthetist.

In Elizabeth's case a senior registrar performed the anaesthetic under consultant guidance. This may be appropriate, but there will be times when consultant presence is essential due to the high-risk nature of surgery or when tasks become complex. Patients with sepsis requiring drugs to support their blood pressure during surgery would be a common example.

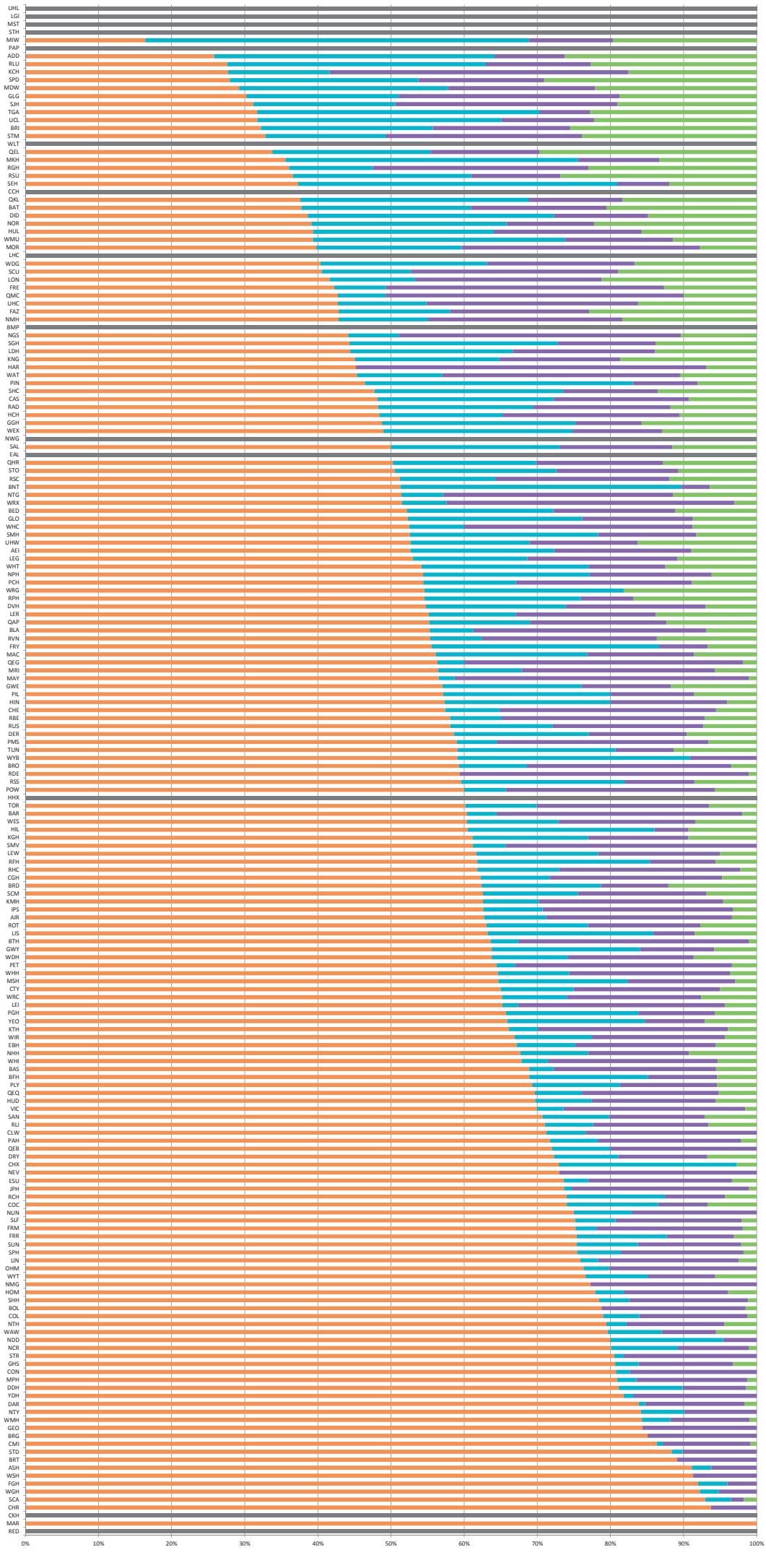



**Figure 8**
**Proportion of patients reviewed by consultant surgeons and consultant anaesthetists before emergency laparotomy. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Both consultants

Consultant surgeon only

Consultant anaesthetist only

Neither consultant

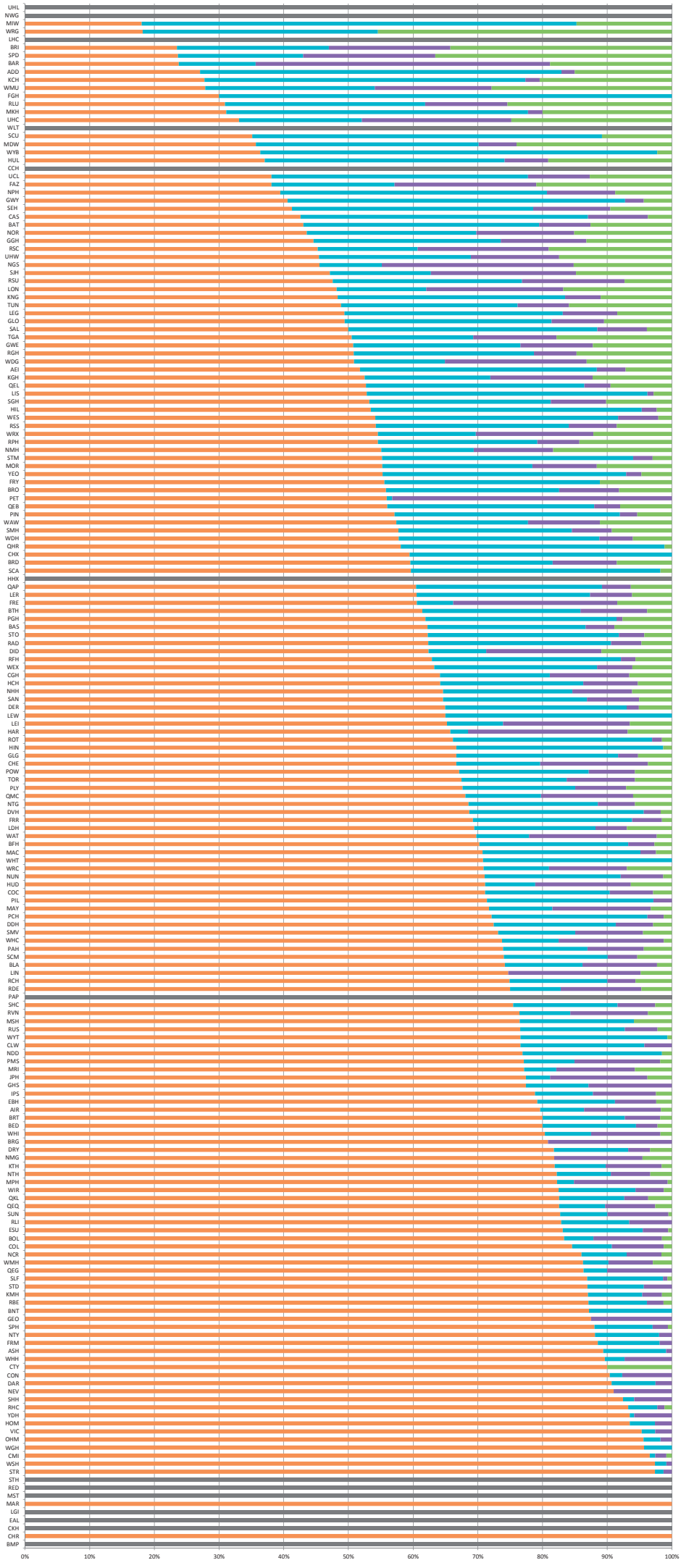



**Figure 9**
**Proportion of patients for whom surgery was directly supervised by consultant surgeons and consultant anaesthetists. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Both consultants

Consultant surgeon only

Consultant anaesthetist only

Neither consultant


**Figure 10**
**Proportion of highest risk patients (documented preoperatively) for whom surgery was directly supervised by consultant surgeons and consultant anaesthetists. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Both consultants

Consultant surgeon only

Consultant anaesthetist only

Neither consultant

# 13
# GOAL DIRECTED FLUID THERAPY

**Why is this important?**

Goal directed fluid therapy (GDFT) describes a variety of techniques for administering intravenous fluids during surgery based on the individual needs of each patient defined by measured physiological goals. Reported benefits include fewer complications after surgery and reduced length of hospital stay, but this data is mainly derived from studies of patients undergoing elective surgery. The evidence base for GDFT in patients undergoing emergency laparotomy is very limited. Because of this, we report use of GDFT, but have not made firm recommendations over its use.

**KEY STANDARDS**

There should be clear strategies for the management of intraoperative low blood pressure in the elderly to avoid cardiac and renal complications. Non-invasive measurement of cardiac output facilitates this during major surgery in the elderly.
NCEPOD Age

**AUDIT QUESTIONS**

What proportion of patients received goal directed fluid therapy during surgery?

Which methods of goal directed fluid therapy were used?

What variation existed in the proportion of patients who received goal directed fluid therapy during surgery, by:

1 Hospital?
2 Patient characteristics, including documented risk of death?

**KEY FINDINGS**

Goal directed fluid therapy was used in the care of half (52%) of patients during surgery.

A cardiac output monitor was used in the perioperative management of 37% of patients, whereas alternative methods were used in the remaining 15%.

At 12% of hospitals, goal directed fluid therapy was used in at least 80% of patients, whereas at 28% of hospitals it was used in less than 40% of cases (Figure 11).

Goal directed fluid therapy was more commonly used in the care of higher-risk patients (Table 32 and Table 33).

- 56% of patients aged over 80 years.
- 62% of patients documented preoperatively to be highest-risk.
- 60% of those requiring immediate surgery.

## Clinical commentary

The use of GDFT has increased since the Emergency Laparotomy Network Audit where it was used in 15% of patients.[1] While the evidence base for the use of GDFT is very limited in patients undergoing emergency surgery, evidence from other surgical subspecialties suggests that GDFT is likely to be beneficial in high-risk patients.[27] The findings of the Audit suggest that this is borne out in the clinical management of patients undergoing emergency laparotomy (Table 32 and Table 33).

**RECOMMENDATIONS**

Until the evidence base is better defined, it is difficult to make firm recommendations about the use of GDFT in emergency laparotomy. Analysis when outcome data becomes available from ONS may provide useful information on the role of GDFT in this group of patients.

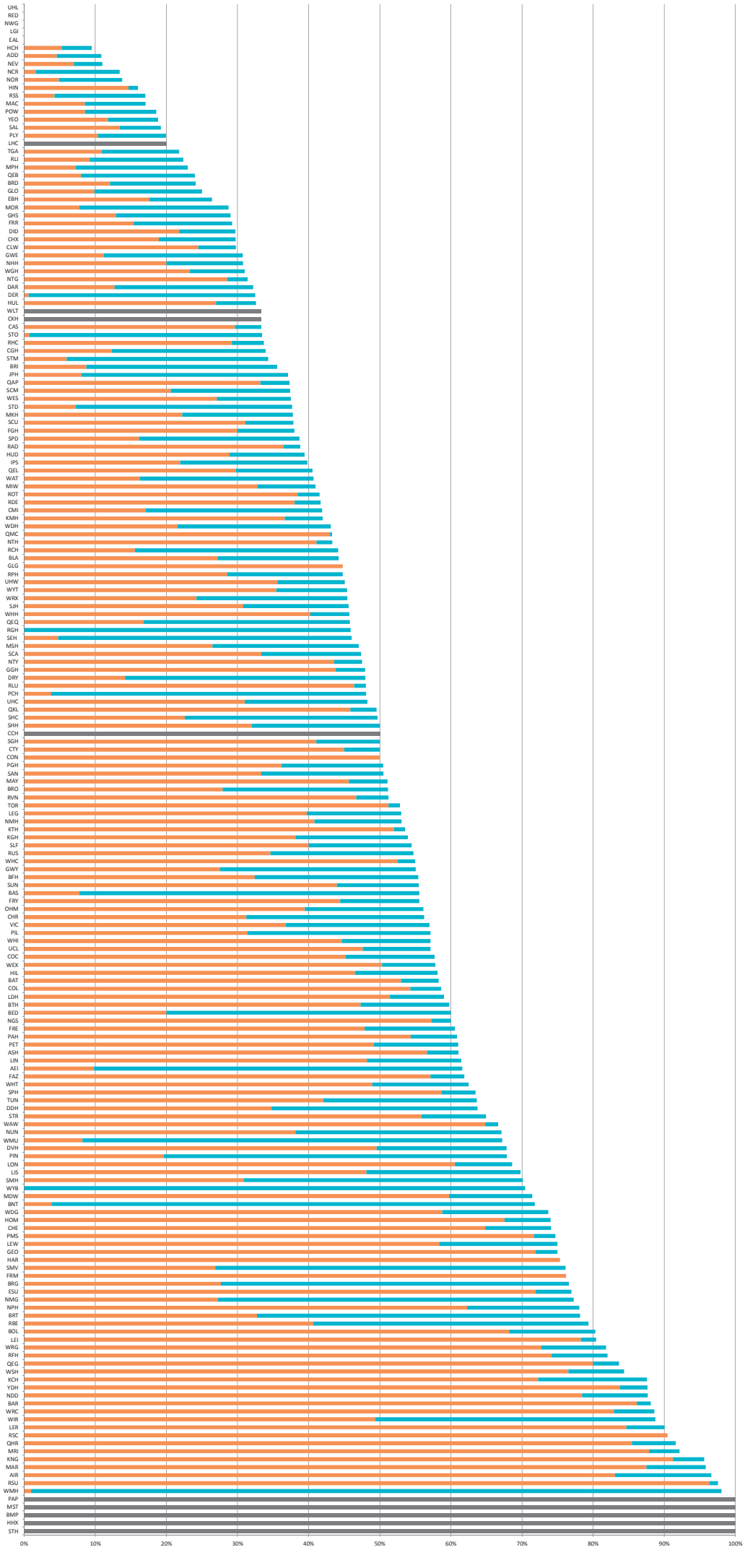



**Figure 11**
**Proportion of patients for whom goal directed fluid therapy was used in theatre by hospital. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Cardiac output monitoring

Other method

# 14

# DIRECT POSTOPERATIVE ADMISSION TO CRITICAL CARE

**Why is this important?**

Critical care units include high dependency and intensive care units. These are special wards that can provide patients with advanced treatments to support life and/or the function of bodily organs. These treatments are frequently required by patients having emergency bowel surgery, and cannot be provided on general wards. Some patients are admitted to critical care units because they need these treatments immediately. Others are at high risk of deteriorating to a point where they may require such treatment, and should therefore be admitted for close observation and to avoid delay if treatment is subsequently required.

There is increasing evidence that more patients die if they are initially cared for on a general ward and then subsequently require treatment on a critical care unit, than if they are transferred directly to a critical care unit.[5] Therefore, Standards state that clinicians should, at the time of surgery, assess risk for all patients in order to identify individuals who need to be cared for on a critical care unit, and ensure that those in need are transferred directly after surgery. However, some hospitals have adopted the approach that all patients who have had an emergency laparotomy should be considered as being at high risk of death and should therefore be cared for on a critical care unit.

**KEY STANDARDS**

All high risk patients should be considered for critical care and as minimum, patients with an estimated risk of death of ≥10% should be admitted to a critical care location.
*RCS HR*

Intensive care requirements are considered for all patients needing emergency surgery. There is close liaison and communication between the surgical, anaesthetic and intensive care teams perioperatively with the common goal of ensuring optimal safe care in the best interests of the patient.
*RCS USC*

The outcome of high-risk general surgical patients could be improved by the adequate and effective use of critical care in addition to a better preoperative risk stratification protocol.
*ASGBI pt safety*

**AUDIT QUESTIONS**

What proportion of patients was admitted directly to a high dependency or intensive care unit following surgery?

What variation existed in the proportion of patients admitted directly to a high dependency or intensive care unit following surgery, by:

1 Hospital?

2 Assessed risk of death?

## KEY FINDINGS

Overall, 60% of patients were admitted directly to a high dependency or intensive care unit directly after surgery.

At 12% of hospitals at least 80% of all patients went directly to a critical care unit after surgery; whereas at 9% of hospitals, fewer than 40% of patients went directly to a critical care bed (Figure 12).

***Variation according to risk***

The proportion of patients admitted directly to critical care varied according to the category of risk documented *before surgery* (Table 19).

57% of patients were identified as being at highest risk (≥10%) *at the end of surgery* (Table 19). 88% of these patients were admitted directly to a critical care bed after surgery.

At 82% of hospitals, more than 80% of patients identified as highest risk (≥10%) *at the end of surgery* were admitted directly to critical care after surgery (Figure 13).

Critical care admission rates did not vary by day of surgery (Table 36).

**Table 19**
**Proportion of patients admitted directly to a critical care unit after surgery by assessment of risk (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Frequency (%) | Proportion of patients admitted directly to a high dependency or intensive care unit after surgery (%) |
|---|---|---|---|
| **Preoperative documentation of risk** | | | |
| Lower | 3,826 | 19 | 34 *** |
| High | 2,386 | 12 | 64 |
| Highest | 5,059 | 25 | 89 |
| Not documented | 8,912 | 44 | 53 |
| **Postoperative classification of risk** | | | |
| Lower risk | 8,592 | 43 | 21 *** |
| Highest risk | 11,591 | 57 | 88 |
| ***Overall*** | ***20,183*** | ***100*** | ***60%*** |

## Clinical commentary

The Audit has shown across a variety of measures that half of patients who had an emergency laparotomy were at greater than 10% risk of death within 30 days of surgery (Table 2, Table 11 and Table 19, and Figure 15 and Figure 17). Standards state that all such patients should be admitted to a critical care unit. An even greater number were classified as high-risk (>5% risk of death), for whom critical care admission after surgery should be considered. There was variation across hospitals in the extent to which these Standards were met.

Failure to admit high-risk surgical patients to critical care has been highlighted in a number of previous studies and reports.[7,29,30] While the reasons for this continued pattern of poor care are unclear, it is unlikely to be due to any single factor. Possible reasons include:

- Failure to routinely assess and appreciate individual risk, as demonstrated by this Audit (Table 11 and Table 19) resulting in failure to direct appropriate resources to high risk patients.
- Insufficient resources (beds and staff), as suggested by the observed variation in provision in the NELA Organisational Audit.[8]
- Setting of appropriate treatment limits with agreement of the patient and their family, which preclude critical care admission.

As has been highlighted throughout this report, both expected and observed mortality in patients for whom there was no preoperative documentation of risk was equivalent to the high-risk group of patients (Table 11 and Table 38). However, rates of critical care admission were lower in the group of patients for whom risk had not been documented before surgery (Table 19). This strongly suggests that clinicians are less likely to appropriately prioritise resources, such as critical care, if risk has not been assessed.

In contrast, where patients were documented as being highest-risk *at the end of surgery*, 88% were admitted to critical care (Table 19).

**RECOMMENDATIONS**

When surgery is contemplated, a formal assessment of the risk of death and complications should be undertaken by a clinician and documented in the patient record. This information should be communicated to all members of the multidisciplinary team, in order to prioritise care and allocate appropriate resources. If surgery is undertaken, this risk assessment should be documented on the patient consent form (MDT).

Hospital-level Audit data should be examined to determine if national Standards on critical care admission after emergency laparotomy are being met. (Critical Care Unit Directors and Medical Directors).

If these Standards are not met, a change of local policies and reconfiguration of services should be considered to enable all high-risk emergency laparotomy patients be cared for on a critical care unit after surgery (Medical Directors, Chief Executives, Commissioners).

### Additional analyses

The proportion of patients directly admitted to a critical care unit after surgery was also assessed against patient age, ASA, admission type, operative urgency and day of surgery (Table 34, Table 35 and Table 36).

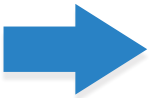
## Elizabeth's story

Elizabeth was monitored closely intraoperatively. Her risk of death was re-assessed at the end of her operation and, being considered high-risk, she was transferred to the High Dependency Unit.

As is best practice, a repeat postoperative risk assessment was performed at the end of surgery. This is a key part of the patient pathway, and is an opportunity for a team evaluation of response to surgery and planning of further care.

Elizabeth was admitted to critical care postoperatively, not because she required organ support at that moment, but because her estimated risk of death made it likely she may deteriorate and require such treatment in the future.

Elizabeth spent one night on the High Dependency Unit, with close monitoring. As she was stable, and there was pressure for beds in critical care, she was discharged to a general surgical ward 24 hours after her operation. She was reviewed daily by the critical care outreach team for a further three days.



Critical care offers close monitoring which will pick up subtle signs of deterioration in a high-risk patient. It is not unusual for such deterioration to occur some days after emergency surgery, so arguably the longer the patient can spend on the critical care unit the better. However, there are commonly insufficient critical care beds to meet demand.

General wards must be able to reliably monitor and report key features of critical illness emerging following transfer from the High Dependency Unit. The use of critical care outreach provides a valuable opportunity for patients to receive continued follow-up by the critical care team to watch for signs of deterioration once discharged to the ward.

Hospitals should ensure that critical care outreach is available (24 hours per day)

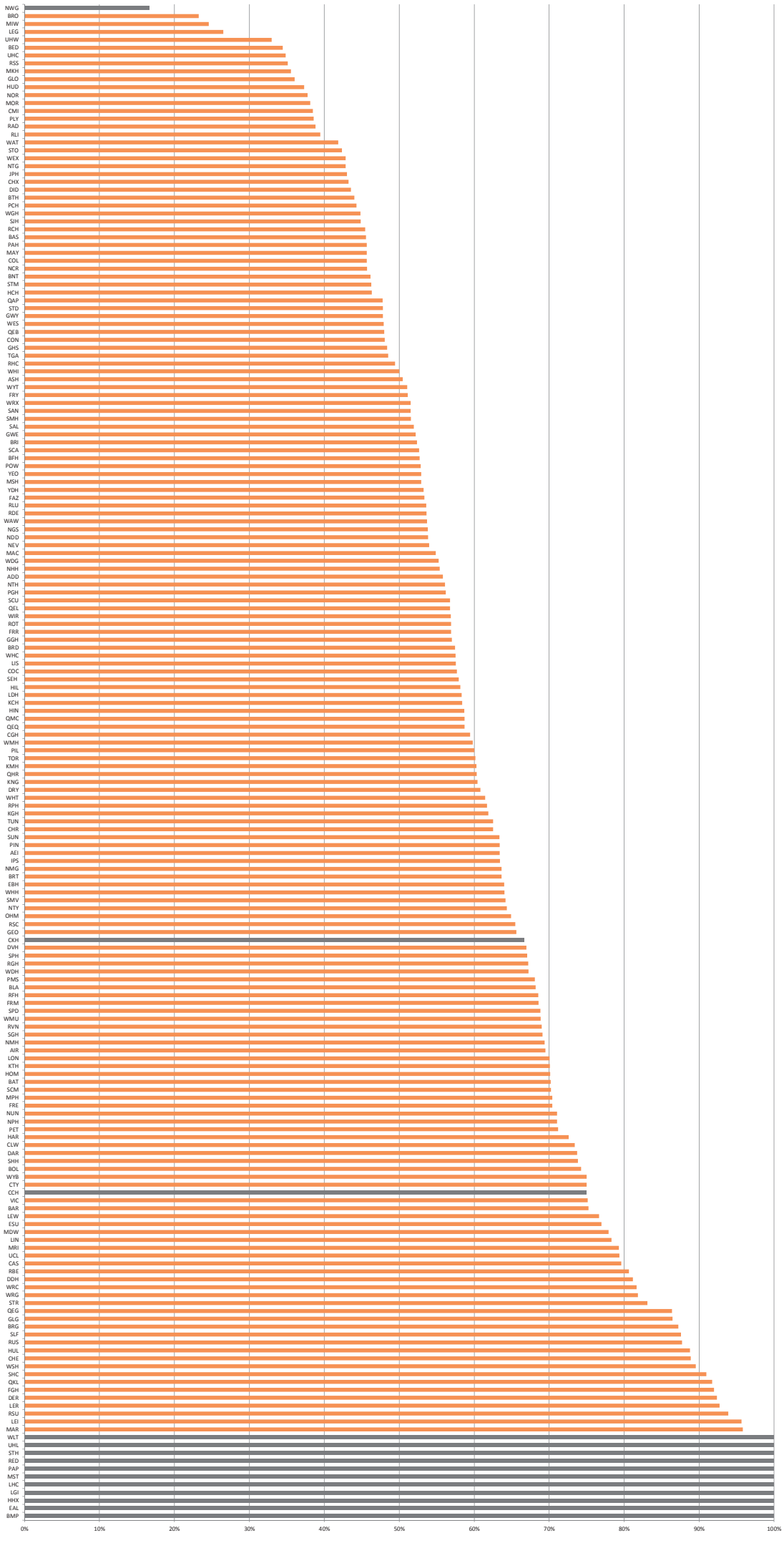



**Figure 12**
**Proportion of all patients admitted directly to a critical care unit following emergency laparotomy. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Direct to critical care

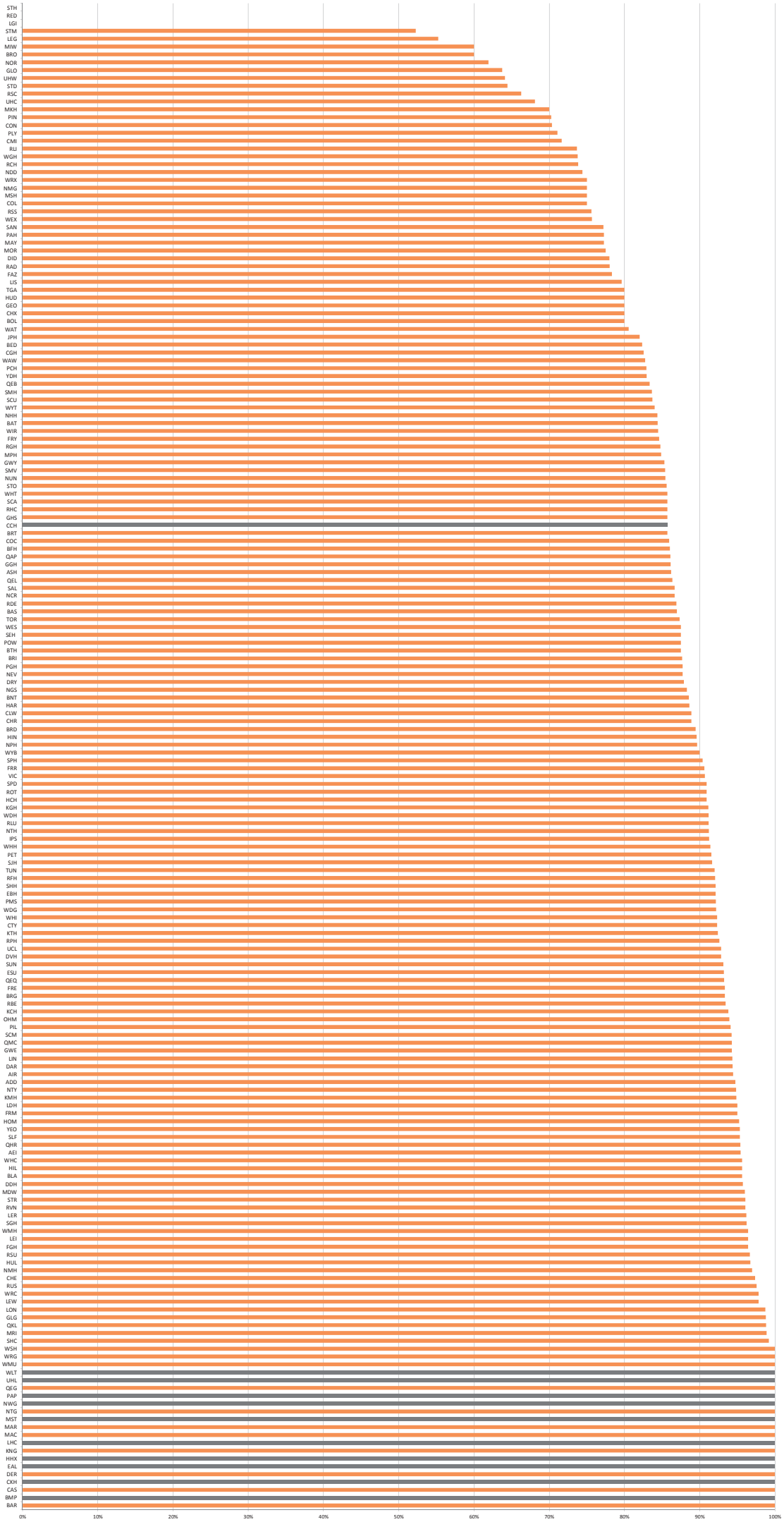



**Figure 13**
**Proportion of highest risk patients (when assessed at the end of surgery) who were transferred directly to a critical care unit from theatre. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Direct to critical care (high risk patient)

# 15

# ASSESSMENT BY A MEDICINE FOR THE CARE OF OLDER PEOPLE SPECIALIST

**Why is this important?**

Ageing is associated with reduced physiological reserve, increasing multi-morbidity and increasing prevalence of frailty.[31] All of these factors reduce the ability of older people to compensate for the physiological stress of surgery and anaesthesia, and increase the risk of an adverse outcome after major emergency surgery.[32]

As increasing numbers of older people undergo emergency surgery, and because they present with complex medical, nursing and social issues, the need for specialist input by Medicine for the Care of Older People (MCOP) teams in the perioperative period is increasingly being recognised.[31]

While there is no standard definition of older age, the Audit has used 70 years as the lower limit to explore postoperative assessment by a Medicine for the Care of Older People (MCOP) specialist.[§§§]

**KEY STANDARDS**

Clear protocols for the postoperative management of elderly patients undergoing abdominal surgery should be developed which include, where appropriate, routine review by an MCOP (Medicine for Care of Older People) consultant and nutritional assessment.
*NCEPOD Age*

Comorbidity, disability and frailty need to be clearly recognised as independent markers of risk in the elderly. This requires skill and multidisciplinary input, including early involvement of Medicine for the Care of Older People.
*NCEPOD Age*

All emergency inpatients must have prompt assessment by a multi-professional team to identify complex or on-going needs, unless deemed unnecessary by the responsible consultant.
*NHS 7 Day Services*

**AUDIT QUESTIONS**

What proportion of patients undergoing emergency laparotomy was aged over 70 years?

How did outcomes of patients aged 70 years and over compare with those of younger patients?

What proportion of patients aged 70 years or over was assessed by an MCOP specialist following surgery?

Is there variation between hospitals in the proportion of patients aged 70 years or over who were assessed postoperatively by an MCOP specialist?

[§§§]This should be considered with the caveat that using an age-based approach may mean that younger patients who are living with multimorbidity and frailty do not receive MCOP expertise.

## KEY FINDINGS

Ten percent of individuals aged 70 years or over and 21% of patients aged 90 years or over were assessed by a Medicine for the Care of Older People (MCOP) specialist after surgery (Table 20).

At 1% of hospitals, more than 80% of patients aged 70 years or over were assessed postoperatively by an MCOP specialist. However, at 94% of hospitals, less than 40% of patients aged 70 years or over at each hospital were assessed postoperatively by an MCOP specialist (Figure 14).

**Table 20**
**Proportion of patients assessed after surgery by a Medicine for Care of the Older Person (MCOP) specialist following emergency laparotomy by patient age (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients assessed after surgery by a MCOP specialist (%) |
|---|---|---|
| 50–59 | 2,707 | 1*** |
| 60–69 | 4,197 | 3 |
| 70–79 | 5,084 | 7 |
| 80–89 | 3,537 | 13 |
| ≥90 | 531 | 21 |
| ***Overall*** | ***16,056*** | ***7%*** |

## Clinical commentary

The Audit has demonstrated that around half of patients undergoing emergency laparotomy are aged over 70 years (Table 2), that unadjusted mortality and length of hospital stay is higher in older cohorts than younger (Figure 15 and Figure 17), that specialist MCOP postoperative care is infrequent, and that national Standards for MCOP involvement in surgical pathways are not being met (Table 20 and Table 37).

Whilst it is established that older patients are at higher risk of adverse postoperative outcomes, there is increasing evidence that perioperative MCOP input can improve outcomes in frail, older patients in other surgical settings, such as emergency hip fracture surgery.[33,34] However, despite this the Audit found that less than one in ten of patients over-70 years of age and one in five of those over-90 years of age were reviewed by MCOP in the postoperative period (Table 20).

These findings are supported by those of the NELA Organisational Audit,[8] which found that explicit arrangements for MCOP postoperative review were in place at only 14% of hospitals, with a proactive approach provided at 6% of hospitals. This was despite the availability of on-site MCOP at 98% of participating hospitals. These results suggest that despite the large numbers of older patients undergoing emergency laparotomy, the apparent need on the basis of patient complexity, the presence of MCOP on site, and the presence of national Standards, there are barriers to the provision of routine MCOP involvement in the care of older emergency laparotomy patients. Analysis of these barriers at local level is urgently required in order to improve routine care in this high-risk population.

**RECOMMENDATIONS**

All patients aged over 70 years should undergo an assessment of multimorbidity, frailty and cognition to guide further input from MCOP (Multidisciplinary Teams).

Pathways should be implemented to ensure that all patients aged over 70 years who undergo an emergency laparotomy receive postoperative screening and assessment by an MCOP consultant (Multidisciplinary Teams).

Increased MCOP input may require service level agreements with other hospitals if expertise is not available on-site. (Commissioners, Provider Chief Executives).

## Additional analyses

The proportion of patients over the age of 70 years was also assessed against ASA, admission type and documentation of risk (Table 37).

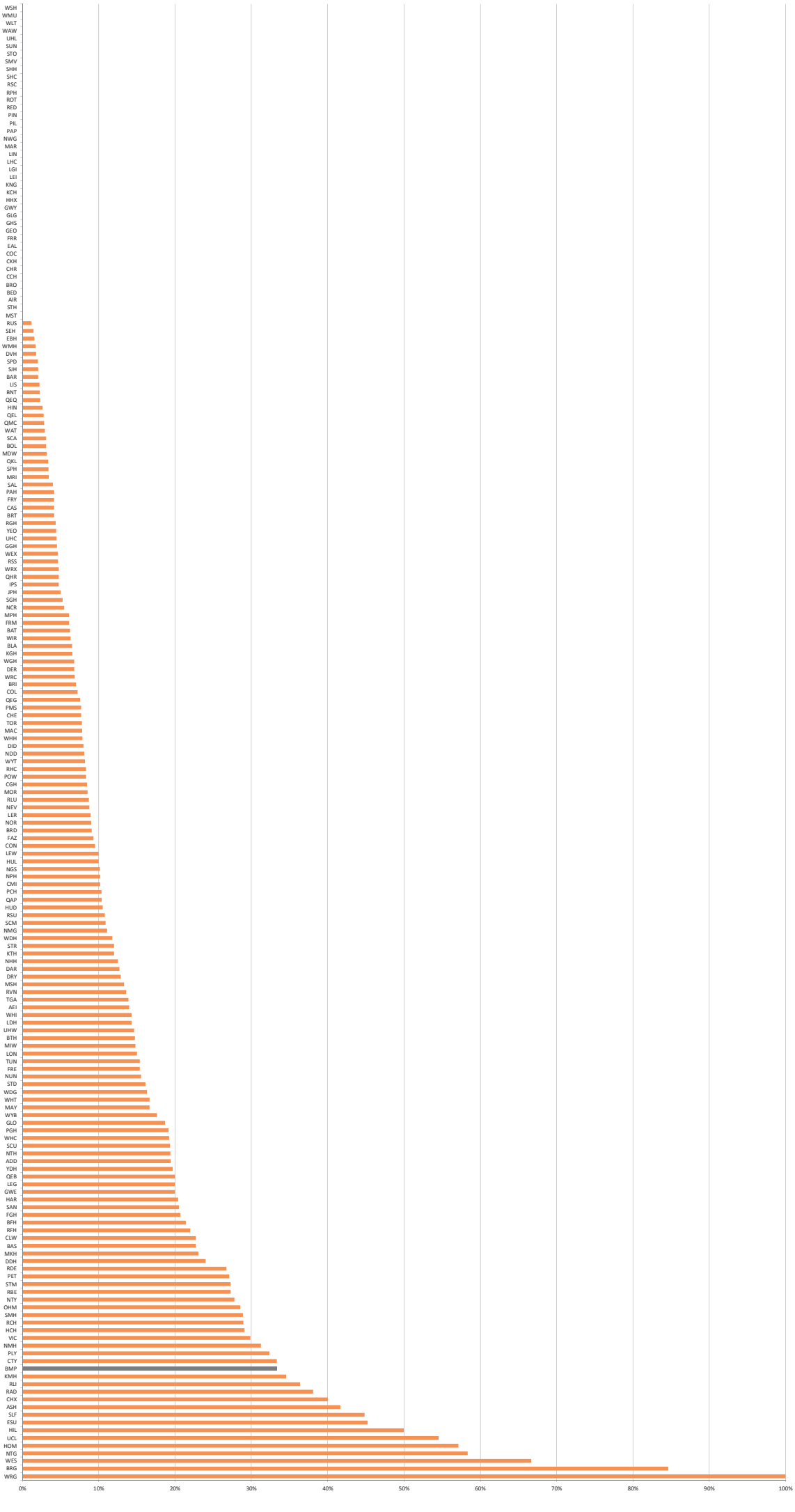



**Figure 14**
**Proportion of patients over the age of 70 who were assessed by an MCOP specialist after surgery, by hospital. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Assessed postoperatively

# 16
# PATIENT OUTCOMES

**Why is this important?**

International mortality rates following emergency laparotomy range from 13–18% at 30 days, equating to one in every five to six people who undergo these procedures dying within a month of surgery.[1,4,5]

NELA is one of several audit and quality improvement projects currently running across the world to improve patient outcomes after surgery.[35,36,37] This cohort of more than 20,000 individuals represents the largest group of patients undergoing emergency laparotomy to have been followed prospectively.

At present, little is known about patients' postoperative course in hospital (including location of care, length of stay and the development of complications) or after discharge from hospital, other than survival beyond the first month after surgery. It is therefore essential that, in addition to assessing variation between hospitals and patient groups, the Audit establish baseline measures of patient outcomes for this group of patients. This information will be helpful for clinicians and patients when discussing treatment options.

Mortality data were not available from The Office for National Statistics (ONS) at the time of publication of this report, so it has not been possible to report 30-day mortality rates, nor hospital-level risk-adjusted outcomes. Without independently verified mortality data from the ONS, only limited analysis of the relationship between process and outcome has been possible. The results of additional analyses will be reported when ONS data is available. Instead, short-term mortality in this cohort was explored using the incidence of inpatient deaths within 30 days of surgery (as entered by participants into the NELA webtool). It should be noted that the 30-day mortality rate from ONS is expected to be higher since this will also include patients who died after they were discharged from hospital.

**AUDIT QUESTIONS**

What proportion of patients who underwent an emergency laparotomy died in hospital within 30 days of surgery?

How long did patients who survived surgery stay in hospital?

What proportion of patients returned to theatre for further surgery?

What variation existed in the above outcomes, by:

1 Patient characteristics, including documented risk of death?
2 Operative urgency?
3 Surgical characteristics, including operation performed?

## 16.1 Death in hospital within 30 days of surgery

**KEY FINDINGS**

Overall, 11% of patients died, but this varied considerably between patient groups.

Mortality increased with:

- Increasing age: Mortality for patients in their 50s was approximately 5%, increasing by approximately 5% per decade (Figure 15). Mortality rate for all patients aged 70 years or older was 18%.
- Increasing ASA grade, surgical urgency and risk category (Figure 15).

Mortality rates varied substantially by the operative procedure performed at emergency laparotomy (Table 21).

### Clinical commentary

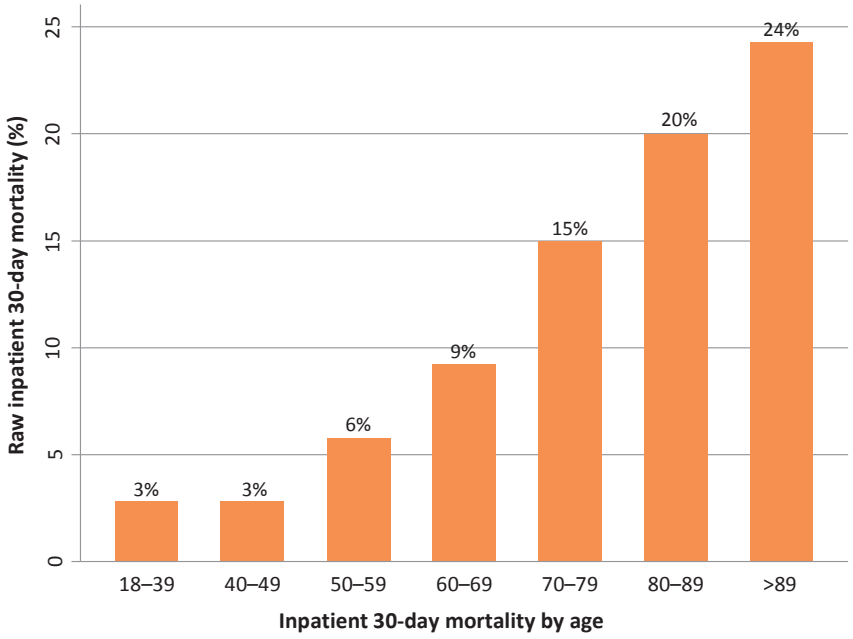
Overall 30-day inpatient mortality was lower than previously reported 30-day mortality following emergency laparotomy, [1,4,5] but remains very high in patients over the age of 70, in those requiring immediate surgery, and for some surgical conditions.

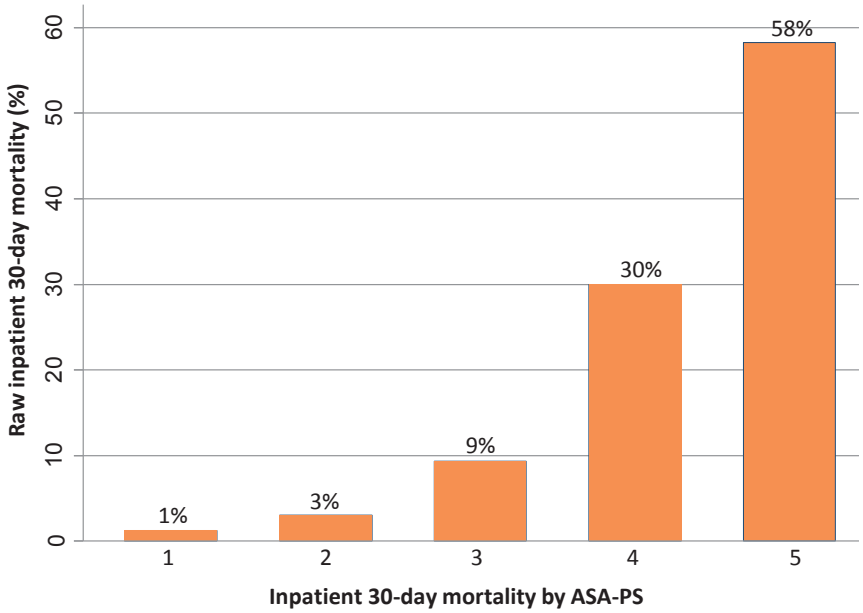
The observed difference in mortality rates could reflect a genuine overall improvement in patient outcomes after surgery, but these data again confirm that death after emergency bowel surgery is far more common than after elective operations that are considered to be high-risk[6,7] and that subgroups of patients are at substantially greater risk of death.

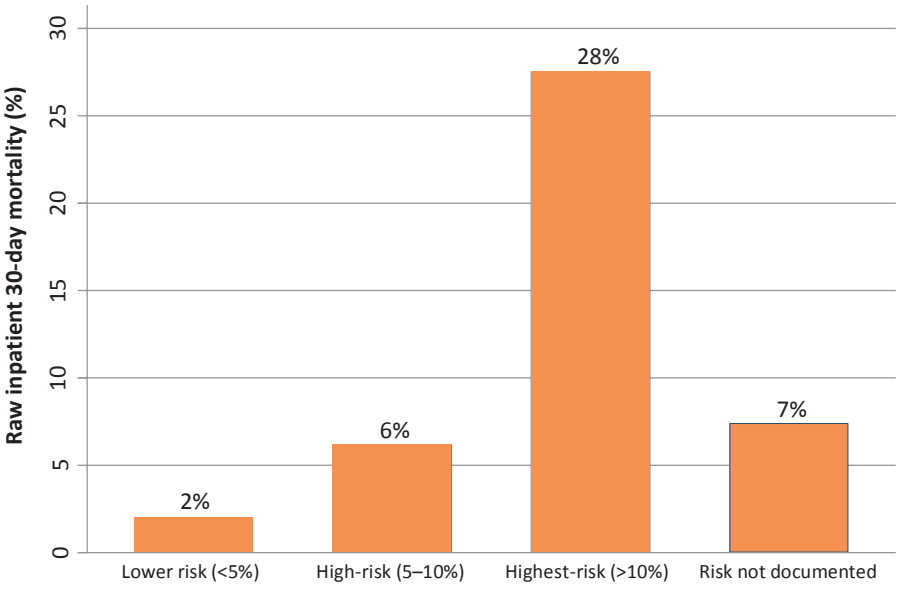
Outcomes varied substantially by the main operation performed (Table 21):

- While performed commonly (Table 5), colonic and small bowel resections were associated with a 30-day inpatient mortality of between 8% and 15%.
- Some procedures were associated with particularly high mortality rates, including: formation of laparostomy (26%), exploratory or relook laparotomy (26%), and pathologies not amenable to surgery (73%). The latter group will include patients for whom palliation was the only appropriate option.
- No emergency laparotomy should be considered low-risk, but the raw mortality rates suggest that outcomes may be better if bowel resection is not required.

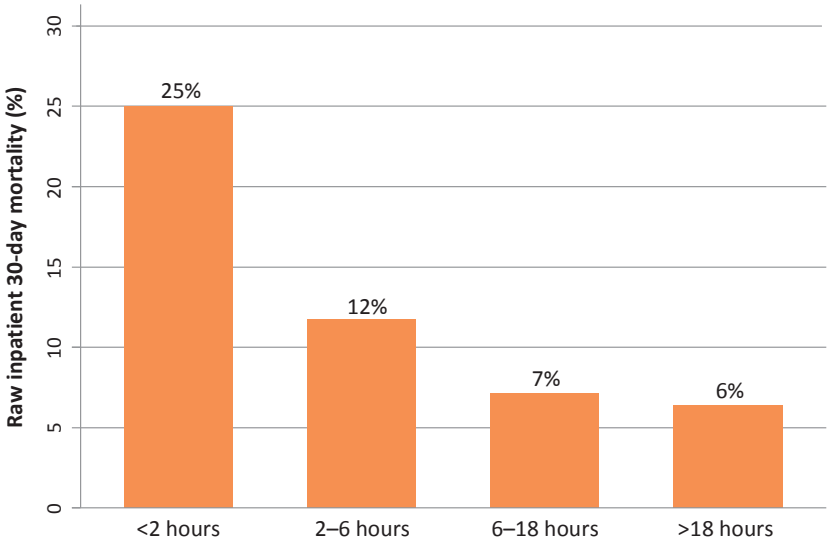
**Figure 15**
**Percentage inpatient 30-day mortality by patient characteristics**






**Inpatient 30-day mortality by preoperative risk stratification**




**Inpatient 30-day mortality by urgency of surgery**

It is notable that the mortality rate in patients for whom risk stratification was not documented was a little higher than in patients who were preoperatively identified as being at 'high-risk', whereas predicted risk was lower (Table 11) and compliance with many performance indicators was less frequent (Table 15, Table 26, Table 30 and Table 32). The starkest contrast was in postoperative critical care admission (64% of high-risk patients based on preoperative documentation, in comparison with 53% of patients for whom preoperative risk was not documented (Table 19).

When risk estimates were documented they aligned with observed inpatient 30 day mortality rates (2%, 6% and 27% for lower, high and highest risk respectively) (Table 11 and Table 38). This finding should reassure clinicians of the value of carrying out a formal assessment of risk to aid the consent process and planning of appropriate care.

It is anticipated that linkage of patient data with ONS mortality information will allow NELA to perform detailed risk-adjusted outcomes analyses to assess variation between hospitals in the variety of patient outcomes collected by the Audit and to investigate associations between perioperative processes of care and patient outcomes after emergency laparotomy.

**Table 21**
**Percentage inpatient 30-day mortality by primary operative procedure performed at emergency laparotomy**

| Primary operative procedure | Number of patients (frequency (%)) | Raw inpatient 30-day mortality(%) |
|---|---|---|
| Small bowel resection | 3,420 (17) | 12 |
| Adhesiolysis | 3,379 (17) | 7 |
| Colectomy: right | 2,573 (13) | 10 |
| Hartmann's procedure | 2,562 (13) | 12 |
| Stoma formation | 1,148 (6) | 10 |
| Peptic ulcer – suture or repair of perforation | 1,138 (6) | 10 |
| Colectomy: subtotal | 1,113 (6) | 15 |
| Drainage of abscess/collection | 588 (3) | 8 |
| Colectomy: left (including anterior resection) | 578 (3) | 8 |
| Washout only | 532 (3) | 11 |
| Repair of intestinal perforation | 454 (2) | 11 |
| Colorectal resection – other | 440 (2) | 11 |
| Exploratory/relook laparotomy only | 408 (2) | 26 |
| Gastric surgery – other | 327 (2) | 14 |
| Intestinal bypass | 302 (2) | 14 |
| Haemostasis | 245 (1) | 7 |
| Peptic ulcer oversew of bleed | 210 (1) | 19 |
| Not amenable to surgery | 185 (1) | 73 |
| Enterotomy | 159 (1) | 4 |
| Stoma revision | 161 (1) | 7 |
| Abdominal wall closure | 121 (<1) | 9 |
| Laparostomy formation | 77 (<1) | 26 |
| Resection of other intra-abdominal tumour(s) | 63 (<1) | 11 |

## Additional analyses

Inpatient 30-day mortality was also assessed against operative urgency, recorded indication for surgery and operative findings (Table 39, Table 40 and Table 41).

## 16.2 Length of hospital stay after surgery

**KEY FINDINGS**

Overall, half of patients had been discharged within 12 days of surgery (Figure 16).

More than a quarter of patients had left hospital within seven days of surgery, but a quarter were still in hospital more than 20 days after their initial operation (Figure 16).

Length of stay after surgery increased with age: half of patients under the age of 40 left hospital within seven days, whereas half of patients over the age of 80 were still in hospital more than 14 days after surgery (Figure 17).

**Table 22**
**Postoperative length of stay (days) in patients surviving to hospital discharge by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Postoperative length of stay in patients surviving to hospital discharge | |
|---|---|---|
| | Number of patients | Median (IQR) Days |
| | **17,578** | **11.3 (6.5–20.4)** |
| **Age (years)** | | |
| 18–39 | 2,120 | 7*** (5–12) |
| 40–49 | 1,869 | 9 (6–15) |
| 50–59 | 2,530 | 9 (6–17) |
| 60–69 | 3,751 | 11 (7–21) |
| 70–79 | 4,223 | 13 (8–23) |
| 80–89 | 2,730 | 16 (9–26) |
| ≥90 | 390 | 16 (10–24) |
| **ASA** | | |
| 1 | 2,068 | 6.5*** (4.6–10.3) |
| 2 | 6,544 | 9.0 (5.6–14.6) |
| 3 | 6,331 | 13.5 (8.3–23.5) |
| 4 | 2475 | 21.1 (12.3–38.4) |
| 5 | 160 | 30.6 (13.5–56.8) |
| **Admission type** | | |
| Emergency | 16,289 | 10.9*** (6.5–19.6) |
| Elective | 1,289 | 15.8 (9.2–30.3) |
| **Documented risk** | | |
| Lower | 3,735 | 7.6*** (5.3–12.6) |
| High | 2,211 | 12.3 (7.5–20.5) |
| Highest | 3,495 | 19.0 (11.0–33.3) |
| Not documented | 8,137 | 10.5 (6.4–19.0) |
| ***Overall*** | ***17,578*** | ***11.3 (6.5–20.4)*** |

## Clinical commentary

Because patient deaths while in hospital can falsely reduce length of stay, only patients who survived to leave hospital were included in the analyses in this section.

These data suggest that the time patients spend in hospital after an emergency laparotomy varies by operative urgency and between patient groups (Table 22).

Postoperative length of hospital stay may be a useful marker of patient outcomes and resource utilisation. A short duration of postoperative hospital stay may reflect efficient care pathways, however in the absence of ONS mortality data and the ability to risk adjust length of stay outcomes, it is premature to comment on length of stay as a quality metric. Hospital level length of stay data will be reported once ONS data is available.

## Additional analyses

Duration of postoperative length of stay in patients surviving to discharge from hospital was also assessed against operative urgency (Table 42).

**Figure 16**
**Distribution of the duration of postoperative length of stay (days) in patients surviving to discharge from hospital (curtailed at 100 days). Median 11.3 days, IQR: 6.5–20.4**

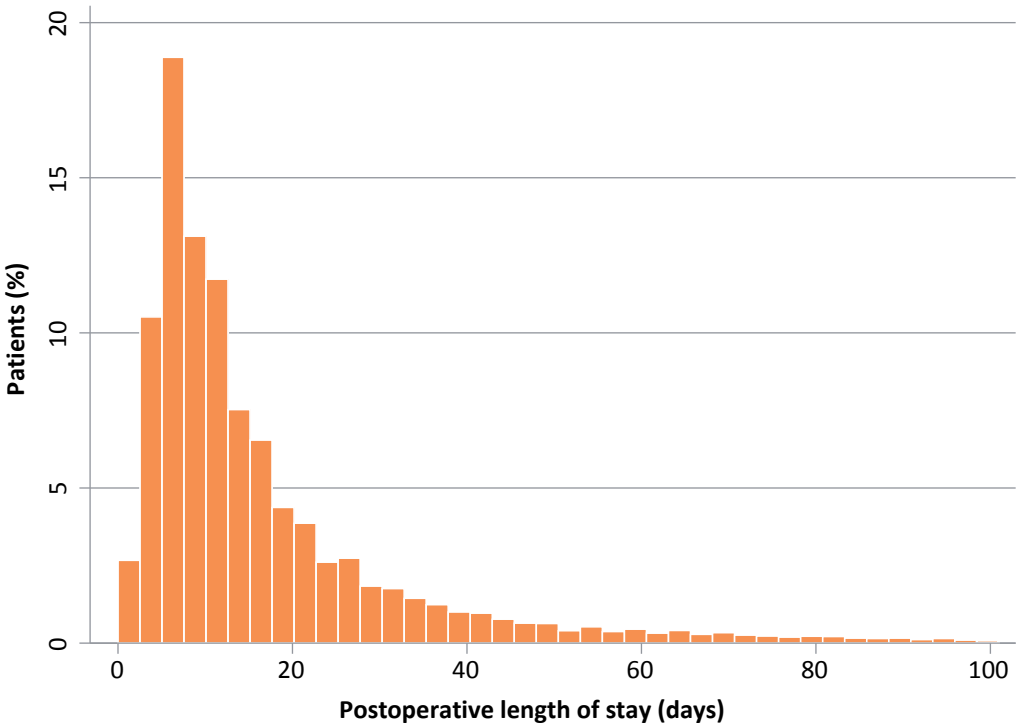
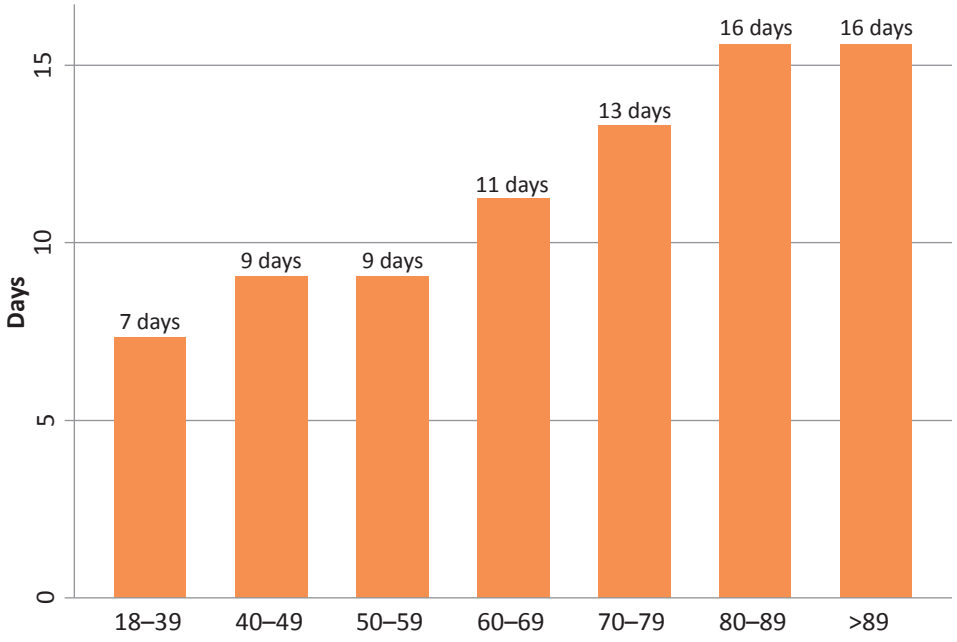


**Figure 17**
**Median postoperative length of stay in patients surviving to hospital discharge by age on admission to hospital**



## 16.3 Return to theatre following an initial emergency laparotomy

**KEY FINDINGS**

Overall, 10% of patients returned to theatre at least once after their initial operation.

The most marked variation was observed by admission type (Table 23): Returns to theatre following an emergency laparotomy were more frequent if the initial emergency laparotomy had been for a complication of elective surgery.

The proportion of patients who returned to theatre also varied by preoperative documentation of risk and operative urgency (Table 23 and Table 24).

**Table 23**
**Proportion of patients who returned to theatre following their initial emergency laparotomy by descriptive patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion patients who returned to theatre following initial emergency laparotomy (%) |
|---|---|---|
| **Admission type** | | |
| Emergency | 18,693 | 9*** |
| Elective | 1,490 | 21 |
| **Preoperatively documented risk** | | |
| Lower | 3,826 | 6*** |
| High | 2,386 | 9 |
| Highest | 5,059 | 14 |
| Not documented | 8,912 | 9 |
| ***Overall*** | ***20,183*** | ***10%*** |

**Table 24**
**Proportion of patients who returned to theatre following their initial emergency laparotomy by documented urgency of surgery (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion patients who returned to theatre following initial emergency laparotomy (%) |
|---|---|---|
| **Urgency of surgery** | | |
| <2 hours | 1,976 | 16*** |
| 2–6 hours | 5,498 | 11 |
| 6–18 hours | 4,213 | 8 |
| 18–24 hours | 2,247 | 8 |
| ***Overall*** | ***13,934*** | ***10%*** |

### Clinical commentary

Overall, one in ten patients returned to theatre on at least one occasion after their initial emergency laparotomy.

Of the patients who were initially admitted electively to hospital, a fifth (21%) returned to theatre on at least one occasion after their initial emergency laparotomy. In contrast, 9% of emergency admissions did so. In 90% of elective admissions who returned to theatre, the initial emergency laparotomy was for a complication of inpatient elective surgery (data not presented).

The proportion of patients who returned to theatre increased with increasing operative urgency and preoperative documented risk of death (Table 23 and Table 24). Substantial further analysis is required to determine underlying reasons. Patients who require immediate surgery have been shown to be at high-risk of death (Figure 15) and the data reported here suggest that this cohort is also at increased risk of surgical complications.

17% of patients who returned to theatre died in hospital within 30 days of their initial operation, whereas 11% of patients who did not return to theatre died within 30 days (Table 38). Risk adjusted outcomes analysis when ONS mortality data becomes available will permit further exploration of these data.

### Additional analyses

The proportion of patients who returned to theatre following their initial emergency laparotomy was also assessed against patient age and ASA (Table 43).

### Elizabeth's story

Elizabeth made a very slow recovery on the ward and the next month was very difficult for her. Small steps forward in her recovery were blighted by further setbacks. She suffered with severe postoperative pain for many weeks, which could not really be explained. She felt sickly and unable to eat for over a month. She was given intravenous nutrition for that time, but lost a huge amount of weight and muscle. She had an abscess that had to drained by X-ray guidance, and had fluid accumulating on her lungs. She felt weak, exhausted, and almost lost the will to go on living. She was seen on a daily basis by a consultant surgeon and in general she was very happy with the standard of nursing and medical care. In particular she felt that communication by the medical team was good, and both she and her family felt well informed regarding her recovery.

Elizabeth had a difficult postoperative course, and this is not unusual. The potential for complications and a prolonged recovery should be discussed frankly with the patient at the time of consent.

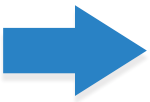
It is fairly common for patients to require X-ray guided drainage of a fluid collection or abscess that develops in the postoperative period. Units must ensure that they have the facilities to provide this service 24 hours per day, seven days per week, in order that any sepsis is rapidly and appropriately treated.

A period where the intestine fails to function properly often occurs after bowel surgery, and is almost inevitable after emergency bowel surgery. This can be prolonged, and nutrition must be provided by an alternative intravenous route.

These common complications of bowel surgery can substantially increase inpatient stay and impede recovery, particularly in older people and those living with frailty. They are statistically associated with worse survival.

Even with the best care, recovery from major bowel surgery can be difficult and unpleasant, especially for older people. Adequate staffing levels and active family input are important.

Slowly, Elizabeth started to show an improvement. A month and a half after her admission she was transferred to a rehabilitation ward, where she remained for a further two weeks before she was discharged home with a re-enablement package. Six months after her operation, she is living at home, with the help of family and friends. She found the colostomy difficult to manage at first, but is now coping with this better. She is still some way off her preoperative quality of life; she goes out less and does not drive any more. However she continues to recover, can enjoy life, and feels fortunate to have regained some independence.



Older people who undergo emergency laparotomy often have complex medical and social needs, and benefit from early MCOP specialist input. In Elizabeth's case this input occurred late, only during rehabilitation.

Despite her prolonged recovery, Elizabeth has had what could be considered a good outcome in that she has returned to independent living in her own home.

# 17 DATA QUALITY

## Case ascertainment

Case ascertainment was determined through comparison of the number of cases included in the final cohort against the expected number of emergency laparotomies to be performed over the 12-month data collection period. Expected case volumes were derived nationally (for English hospitals) and at hospital-level through analysis of the HES database as detailed in Appendix 6.

Following exclusion of ineligible cases, the overall case ascertainment of locked cases at English hospitals was 83%. There was wide variation between institutions: fewer than the expected number of cases were included at 71% of hospitals and less than 50% of the expected number of cases were included at 21% of hospitals (Figure 18).

## Locked cases

More than a thousand cases were started during the period of data collection, but were not locked by the deadline for case submission and were therefore not eligible for inclusion in this report.

These cases represent 5% of records opened during the first year of data collection and the failure to lock them is likely to have significant implications for case ascertainment estimates. The effect on overall and subgroup analyses presented throughout the Report is uncertain.

## Cases excluded based on operative procedure inclusion criteria

The option 'Other' was selected as the primary procedure for 2,017 (10%) locked submissions. Review of accompanying free-text demonstrated that the primary surgical procedure was ineligible for inclusion in 755 cases (www.nela.org.uk/Criteria). These cases, representing 4% of locked cases were then excluded from analyses and assessment of case ascertainment.

The number of ineligible submitted cases varied between hospitals (Figure 19). At 10% of hospitals no cases were excluded for ineligibility, but at 4% of hospitals at least 10% of submitted cases were ineligible for inclusion in the Audit.

## Data completeness

### Time and date values

Standards state that the timing of perioperative care milestones should be documented and documentation is necessary for departments to audit key processes of care. Key timepoints include the decision to operate and time of booking for theatre, since delayed surgical intervention has been shown to be associated with worse patient outcomes and identification may indicate inefficient preoperative processes of care.

Time of decision to operate was not provided for 18% of submitted cases and time of booking for theatre for 22%. Where time of decision was not available, time of booking was used to permit analysis of timeliness

of arrival in theatre (Appendix 4). However, both time points were missing for 12% of all included cases; and at 12% of hospitals neither time point was provided for at least a quarter of submitted cases (Figure 20), effectively excluding these patients from analysis of this key process measure.

### P-POSSUM variables

Estimation of risk of death should be performed and recorded routinely for all emergency general surgical patients. Entry of P-POSSUM variables into the NELA Patient Audit webtool generates a prediction of individual risk of death within 30 days of surgery, driving the timeline for care and matching key clinical interventions to the needs of the individual patient.

Complete preoperative and postoperative P-POSSUM data items were submitted for 93% of all submitted cases (Figure 21). However, at 8% of hospitals, preoperative and postoperative data items were missing for every patient.

## Clinical commentary

Overall, data completeness was high, and estimated case ascertainment greatly exceeded the target of 60% for the first year of national Audits (although the latter should be interpreted with caution until the HES algorithm has been reviewed using linked NELA and HES data (Appendix 4)). However, case ascertainment, submission of ineligible cases and data completeness varied between participating hospitals (Figure 18, Figure 19, Figure 20 and Figure 21).

Where the volume of submitted cases was significantly lower than expected, this is likely to be the result of high numbers of incomplete or excluded cases (Figure 19), or perhaps because HES estimates were not contemporary . There are however clear implications not only for reporting and understanding hospital level process and outcome metrics but also for describing the national burden of emergency laparotomies.

It is good practice to record the time of the decision to operate in the medical record and this will support the quality of data in NELA. Where neither the time of decision to operate nor time of booking for theatre were provided, these cases could not be included in analysis of timeliness of arrival in theatre (Chapters 10 and 11). It was not possible to assess whether there was a systematic cause for this missing data, but the variation between hospitals (Figure 20) suggests that adequacy of documentation of these data in the patient record varies between hospitals.

Failure to input P-POSSUM data items may lead to underestimation of individual risk, since missing data is substituted with the lowest category of risk (Appendix 4). If the generated predicted risk is then used to inform shared decisions and clinical management, higher and highest risk patients will receive substandard care. Furthermore, because P-POSSUM variables will be used in risk adjustment, failure to enter all P-POSSUM data items is also likely to result in falsely elevated hospital-level mortality rates.

**RECOMMENDATIONS**

NELA Leads should review their local data to ascertain case submission and data completeness.

NELA Leads should actively promote completion of P-POSSUM data fields to ensure that risk estimation is accurate and avoid falsely elevated risk adjusted hospital mortality rates.

Where data completeness is a problem, NELA Leads should work with clinical teams to improve this, to facilitate future audit and quality improvement.

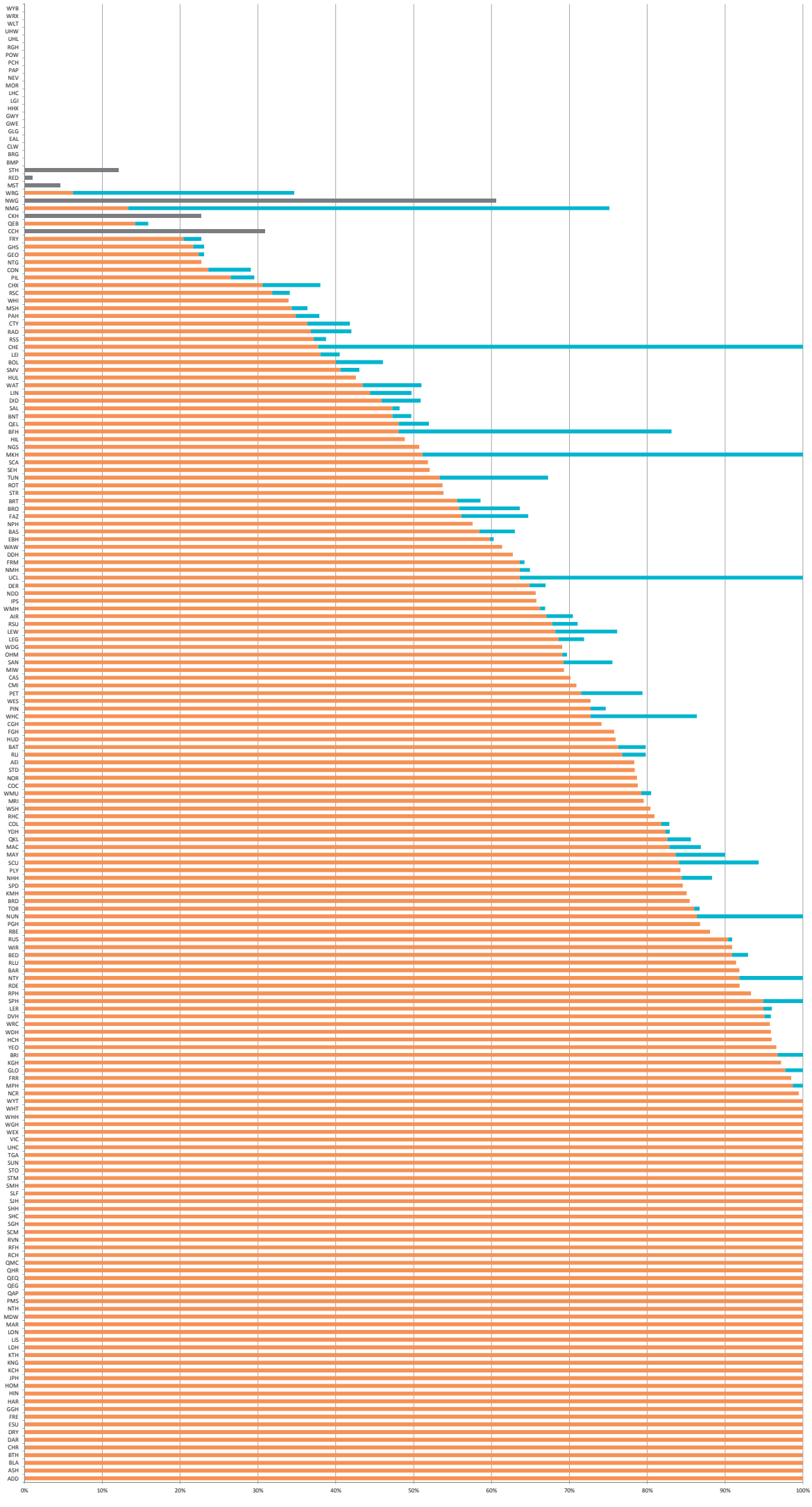



**Figure 18**
**Percentage case ascertainment at English hospitals, relative to HES algorithm estimates of annual volume of emergency laparotomies performed. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Final case ascertainment

Case ascertainment if incomplete cases had been locked

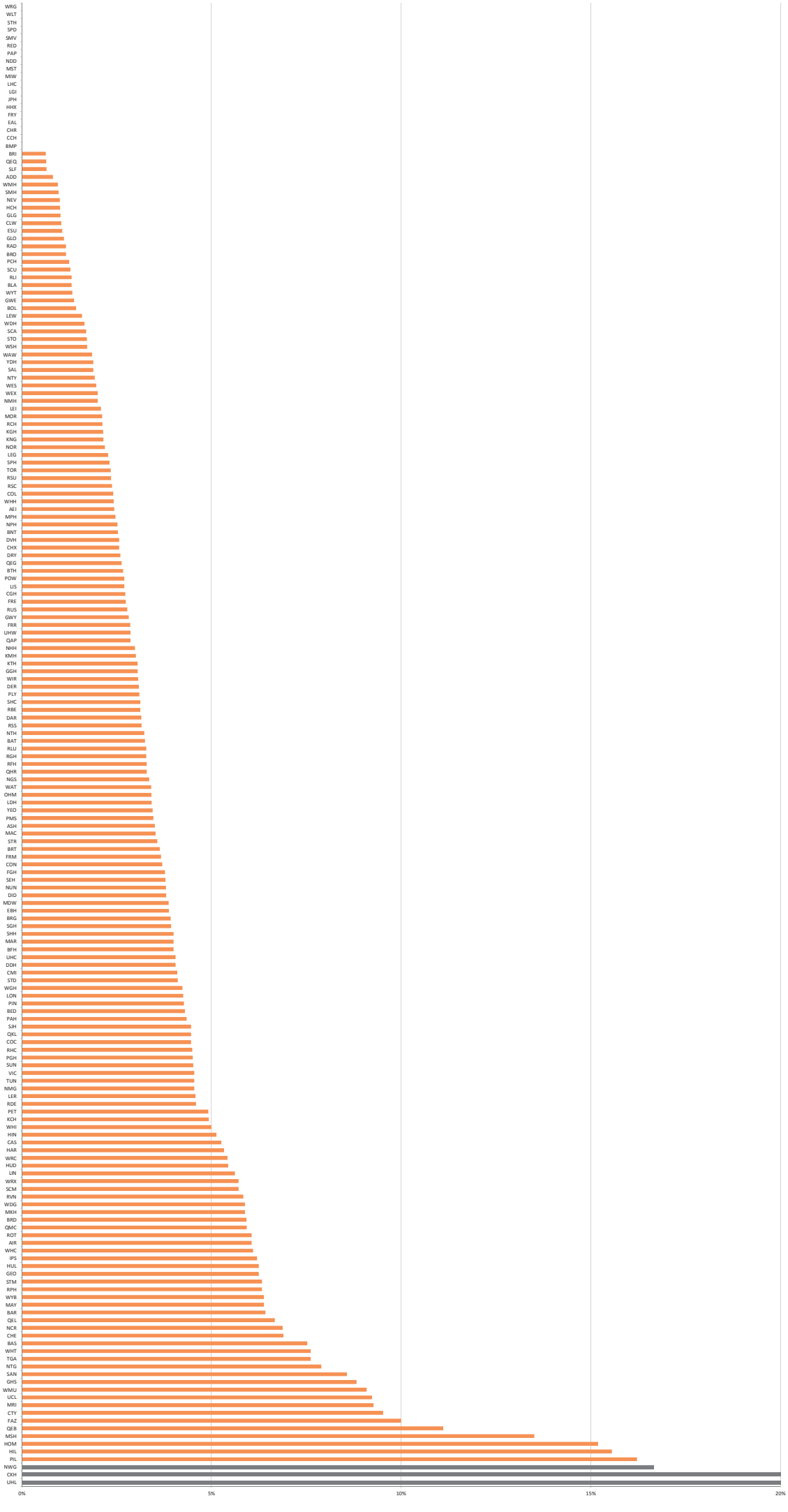



**Figure 19**
**Proportion of submitted cases that were excluded due to ineligibility of surgical procedure(s) performed, by hospital. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Excluded cases

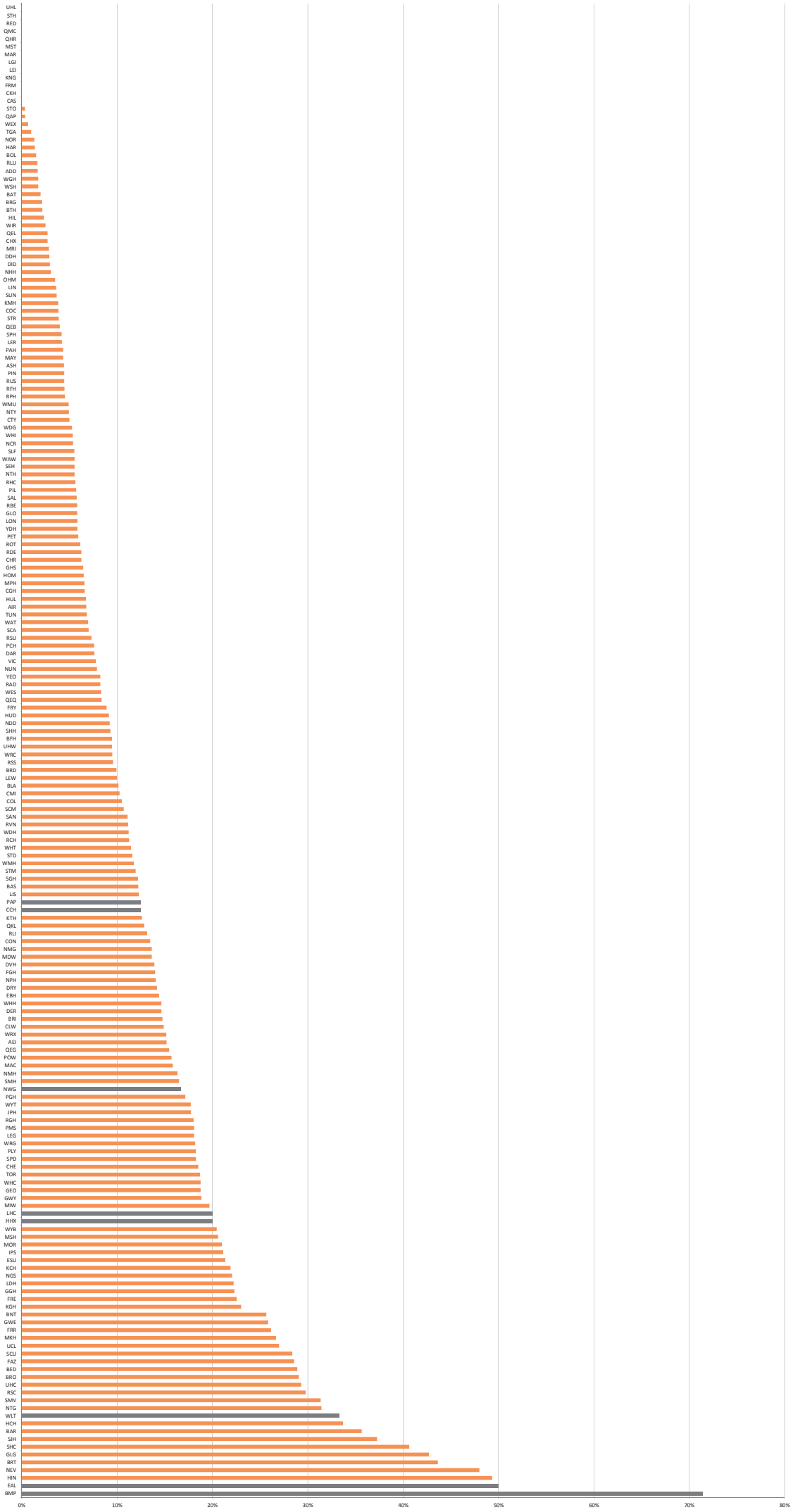



**Figure 20**
**Proportion of included cases where both time of decision to operate and time of booking for theatre were not entered, by hospital. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

Both fields missing

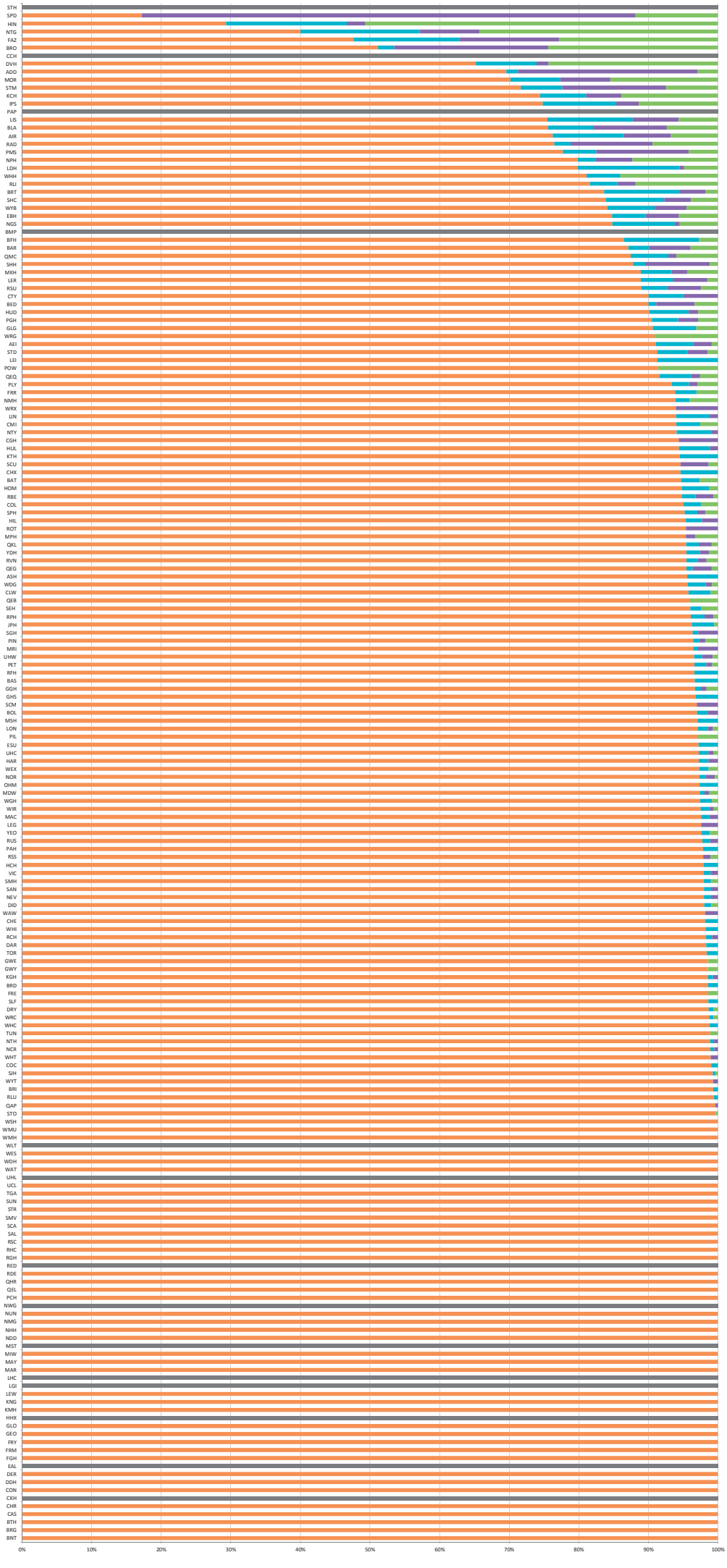



**Figure 21**
**Proportion of submitted cases with missing preoperative and postoperative POSSUM fields by hospital. Grey bars indicate hospitals submitting less than ten cases in the first year of data collection**

No missing fields

Postoperative field(s) missing

Preoperative field(s) missing

Pre and postoperative field(s) missing

# 18 GLOSSARY OF COMMONLY USED TERMS AND ACRONYMS

**AAA**
Age Anaesthesia Association

**AAGBI**
Association of Anaesthetists of Great Britain and Ireland

**Abdomen/Abdominal**
Anatomical area between chest and pelvis, which contains numerous organs including the bowel
Explanation to go here?

**Adhesiolysis**
Surgical procedure to remove intra-abdominal adhesions that often cause bowel obstruction

**Anastomotic Leak**
A leak from a join in the bowel

**APP**
Association for Perioperative Practice

**ASA**
American Society of Anesthesiologists' Physical Status score (ASA-PS)

**ASGBI**
Association of Surgeons of Great Britain and Ireland

**Average**
A number to describe a series of observations. Depending on the pattern of these observations, the median/or mean will better describe the series

**BGS**
British Geriatric Society

**Bowel**
Part of the continuous tube starting at the mouth and finishing at the anus. It includes the stomach, small intestine, large intestine and rectum

**CEU**
Clinical Effectiveness Unit of the Royal College of Surgeons of England

**Colitis**
Inflammation of the colon

**Colorectal Resection**
Surgical procedure to remove part of the bowel

**Colostomy**
A surgical procedure to divert one end of the large intestine (colon) through an opening in the abdominal wall (tummy). A colostomy bag is used to collect bowel contents

**CQUIN**
Commissioning for Quality and Innovation

**CRG**
Clinical Reference Group

**CT**
Computed tomography – a very advanced form of X-ray used in diagnosis and treatment

**EGS**
Emergency General Surgery. Often refers to the group of patients admitted to hospital with conditions that require the expertise of general surgeons. 10% require emergency bowel surgery

**Elective**
Refers to both to mode of hospital admission and to urgency of surgery in this Report. The timing of elective care can usually be planned to suit both patient and hospital (can be weeks to months). In contrast, urgent/emergency care usually has to take place within very short timescales (hours)

**ELN**
Emergency Laparotomy Network

**Emergency laparotomy**
Bowel surgery that, due to underlying conditions, must be carried out without undue delay

**FICM**
Faculty of Intensive Care Medicine

**Gastrografin**
A 'dye' used to diagnose disease that is visible on X-ray or CT imaging

**Hartmann's Procedure**
Surgical procedure to remove part of the large bowel resulting in the formation of a colostomy

**HES**
Hospital Episode Statistics

**HQIP**
Healthcare Quality Improvement Partnership

**HSRC**
Health Services Research Centre

**ICNARC**
Intensive Care National Audit and Research Centre

**ICS**
Intensive Care Society

**Ileostomy**
A surgical procedure to divert one end of the small intestine (small bowel) through an opening in the abdomen (tummy). An ileostomy bag is used to collect bowel contents

**Intestine**
Part of the bowel

**Intra-abdominal**
Inside the abdomen/tummy

**Intraoperative**
During surgery

**IQR**
Interquartile range – the middle 50% of observations either side of the median

**Ischaemia**
Loss of, or insufficient blood supply to an affected area or organ

**Laparoscopic**
Keyhole surgery

**Mean**
Mathematical average

**Median**
Midpoint of all observations when ranked in order from smallest to largest (see average)

**NCAAG**
National Clinical Audit Advisory Group

**NCEPOD**
National Confidential Enquiry into Patient Outcome and Deaths

**NELA**
National Emergency Laparotomy Audit

**NIAA**
National Institute of Academic Anaesthesia

**Non-operative**
Treatment options that do not require surgery

**Obstruction**
Blockage of the bowel. It can be caused by a variety of conditions and can cause the bowel to burst (perforate). It has the potential to make people very unwell and can be life threatening

**ONS**
Office for National Statistics

**PEDW**
Patient Episode Database of Wales

**Perforation**
One or more holes in the wall of the bowel. It can be caused by a variety of conditions. It has the potential to make people very unwell very quickly and can be life threatening

**Perioperative**
Around the time of surgery (incorporating preoperative, intraoperative and postoperative)

**Peritonitis**
Infection or inflammation within the abdomen. It has the potential to make people very unwell very quickly and can be life threatening

**Postoperative**
After surgery

**P-POSSUM**
A tool which has been validated for estimating an individual patient's risk of death within 30 days of emergency general surgery[38]

**Preoperative**
Before surgery

**Radiological imaging**
Diagnostic techniques including X-ray and CT

**RCN**
Royal College of Nursing

**RCoA**
Royal College of Anaesthetists

**RCR**
Royal College of Radiologists

**RCS**
Royal College of Surgeons of England

**Sepsis**
Widespread, severe inflammation in the body resulting from infection

**SIRS**
Systemic Inflammatory Response Syndrome

**Small Bowel Resection**
Surgical procedure to remove part of the small bowel (small intestine)

**Stoma**
Surgical procedure to create an opening in the abdominal wall for the bowel to terminate. See also colostomy and ileostomy

**Subtotal Colectomy**
Surgical procedure to remove part of the large bowel

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# APPENDIX 1
# STANDARDS OF CARE AND RECOMMENDATIONS

| | |
|---|---|
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| NICE MTG3 | Medical Technologies Guidance: CardioQ-ODM. *NICE*, 2011<br>www.nice.org.uk/guidance/MTG3 |
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| RCS HR | The Higher Risk General Surgical Patient: towards improved care for a forgotten group. *RCSEng and DH*, 2011<br>www.rcseng.ac.uk/publications/docs/higher-risk-surgical-patient/ |
| RCS USC | Emergency Surgery Standards for unscheduled surgical care. *RCSEng*, 2011<br>www.rcseng.ac.uk/publications/docs/emergency-surgery-standards-for-unscheduled-care |

## KEY STANDARDS AGAINST WHICH THE FIRST YEAR OF DATA IS REPORTED IN THIS DOCUMENT

### Chapter 7

Patients admitted as an emergency should be seen by a consultant at the earliest opportunity. Ideally this should be within 12 hours and should not be longer than 24 hours.
*NCEPOD EA*

### Chapter 8

Hospitals which admit patients as emergencies must have access to both conventional radiology and CT scanning 24 hours per day, with immediate reporting.
*NCEPOD EA*

The delivery of quality clinical care is dependent on access to supporting facilities. Rapid access to CT imaging, U/S scanning and laboratory analyses are critical to the efficient diagnosis, resuscitation and prioritisation of these patients.
*ASGBI EGS*

### Chapter 9

An assessment of mortality risk should be made explicit to the patient and recorded clearly on the consent form and in the medical record.
*NCEPOD KTR*

Patients must be actively involved in shared decision making and supported by clear information from healthcare professionals to make fully informed choices about treatment and on-going care that reflect what is important to them. This should happen consistently, seven days a week.
*NHS 7 Day Services*

We recommend that objective risk assessment become a mandatory part of the preoperative checklist to be discussed between surgeon and anaesthetist for all patients. This must be more detailed than simply noting the ASA score.
*RCS HR*

### Chapter 10

Those with septic shock require immediate broad-spectrum antibiotics with fluid resuscitation and source control.
*RCS HR*

The number of patients who present to emergency departments and other wards/units that directly admit emergencies with severe sepsis, Red Flag Sepsis or Septic Shock who received intravenous antibiotics within one hour of presenting.
*CQUIN 2015/2016*

Trusts should ensure emergency theatre access matches need and ensure prioritisation of access is given to emergency surgical patients ahead of elective patients whenever necessary as significant delays are common and affect outcomes.
*RCS HR*

### Chapter 11

Trusts should ensure emergency theatre access matches need and ensure prioritisation of access is given to emergency surgical patients ahead of elective patients whenever necessary as significant delays are common and affect outcomes.
*RCS HR*

The time from decision to operate to actual time of operation is recorded in patient notes and audited locally.
*RCS USC*

Delays in surgery for the elderly are associated with poor outcome. They should be subject to regular and rigorous audit and this should take place alongside identifiable agreed standards.
*NCEPOD Age*

**Chapter 12**

Each higher risk case (predicted mortality ≥5%) should have the active input of consultant surgeon and consultant anaesthetist.
*RCS HR*

A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% and for cases with predicted mortality >5% except in specific circumstances where adequate experience and manpower is otherwise assured.
*RCS USC*

Each higher risk case (predicted mortality ≥5%) should have the active input of consultant surgeon and consultant anaesthetist. Surgical procedures with a predicted mortality of ≥10% should be conducted under the direct supervision of a consultant surgeon and a consultant anaesthetist unless the responsible consultants have actively satisfied themselves that junior staff have adequate experience and manpower and are adequately free of competing responsibilities.
*RCS HR*

**Chapter 13**

There should be clear strategies for the management of intraoperative low blood pressure in the elderly to avoid cardiac and renal complications. Non-invasive measurement of cardiac output facilitates this during major surgery in the elderly.
*NCEPOD Age*

**Chapter 14**

All high risk patients should be considered for critical care and as minimum, patients with an estimated risk of death of ≥10% should be admitted to a critical care location.
*RCS HR*

Intensive care requirements are considered for all patients needing emergency surgery. There is close liaison and communication between the surgical, anaesthetic and intensive care teams perioperatively with the common goal of ensuring optimal safe care in the best interests of the patient.
*RCS USC*

The outcome of high-risk general surgical patients could be improved by the adequate and effective use of critical care in addition to a better preoperative risk stratification protocol.
*ASGBI pt safety*

**Chapter 15**

Clear protocols for the postoperative management of elderly patients undergoing abdominal surgery should be developed which include, where appropriate, routine review by an MCOP (Medicine for Care of Older People) consultant and nutritional assessment.
*NCEPOD Age*

Comorbidity, disability and frailty need to be clearly recognised as independent markers of risk in the elderly. This requires skill and multidisciplinary input, including early involvement of Medicine for the Care of Older People.
*NCEPOD Age*

All emergency inpatients must have prompt assessment by a multi-professional team to identify complex or on-going needs, unless deemed unnecessary by the responsible consultant.
*NHS 7 Day Services*

# APPENDIX 2
# HOSPITAL-LEVEL ACHIEVEMENT OF KEY PROCESSES OF CARE

## London

| REGION | ABBREVIATED HOSPITAL IDENTIFIER | TRUST | HOSPITAL | FINAL CASE ASCERTAINMENT | CONSULTANT SURGEON REVIEW WITHIN 12HRS OF EMERGENCY ADMISSION | CT REPORTED BEFORE SURGERY | RISK DOCUMENTED PREOPERATIVELY | ARRIVAL IN THEATRE IN TIMESCALE APPROPRIATE TO OPERATIVE URGENCY | PREOPERATIVE REVIEW BY CONSULTANT SURGEON AND CONSULTANT ANAESTHETIST | BOTH CONSULTANT SURGEON AND CONSULTANT ANAESTHETIST PRESENT IN THEATRE | CONSULTANT SURGEON PRESENT IN THEATRE | CONSULTANT ANAESTHETIST PRESENT IN THEATRE | DIRECT POSTOPERATIVE ADMISSION TO CRITICAL CARE | POSTOPERATIVE ASSESSMENT BY MCOP SPECIALIST IN PATIENTS OVER THE AGE OF 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORTH CENTRAL | NMH | North Middlesex University Hospital NHS Trust | North Middlesex University Hospital | | | | | | | | | | | |
| | BNT | Royal Free London NHS Foundation Trust | Barnet Hospital | | | | | | | | | | | |
| | RFH | Royal Free London NHS Foundation Trust | Royal Free Hospital | | | | | | | | | | | |
| | UCL | University College London Hospitals NHS Foundation Trust | University College Hospital | | | | | | | | | | | |
| | WHT | Whittington Health | Whittington Hospital | | | | | | | | | | | |
| NORTH EAST | KNG | Barking Havering & Redbridge Univ Hosps NHS Trust | King George Hospital | | | | | | | | | | | |
| | QHR | Barking Havering & Redbridge Univ Hosps NHS Trust | Queen's Hospital - Romford | | | | | | | | | | | |
| | NWG | Barts Health NHS Trust | Newham University Hospital | | | | | | | | | | | |
| | LON | Barts Health NHS Trust | The Royal London Hospital | | | | | | | | | | | |
| | WHC | Barts Health NHS Trust | Whipps Cross University Hospital | | | | | | | | | | | |
| | HOM | Homerton University Hospital NHS Foundation Trust | Homerton Hospital | | | | | | | | | | | |
| NORTH WEST | STM | Imperial College Healthcare NHS Trust | St Mary's Hospital | | | | | | | | | | | |
| | EAL | London North West Healthcare NHS Trust | Ealing Hospital | | | | | | | | | | | |
| | NPH | London North West Healthcare NHS Trust | Northwick Park/St Marks Hospital | | | | | | | | | | | |
| | HHX | Royal Brompton & Harefield NHS Foundation Trust | Harefield Hospital | | | | | | | | | | | |
| | HIL | The Hillingdon Hospitals NHS Foundation Trust | Hillingdon Hospital | | | | | | | | | | | |
| | WMU | West Middlesex University Hospital NHS Trust | West Middlesex University Hospital | | | | | | | | | | | |
| SOUTH EAST | QEL | Lewisham and Greenwich NHS Trust | Queen Elizabeth Hospital (Lewisham and Greenwich NHS Trust) | | | | | | | | | | | |
| | STH | Guy's and St Thomas' NHS Foundation Trust | St Thomas' Hospital | | | | | | | | | | | |
| | KCH | King's College Hospital NHS Foundation Trust | King's College Hospital | | | | | | | | | | | |
| | BRO | King's College Hospital NHS Foundation Trust | The Princess Royal University Hospital | | | | | | | | | | | |
| | LEW | Lewisham and Greenwich NHS Trust | University Hospital Lewisham | | | | | | | | | | | |
| SOUTH WEST | WES | Chelsea and Westminster Hosp NHS Foundation Trust | Chelsea and Westminster Hospital | | | | | | | | | | | |
| | MAY | Croydon Health Services NHS Trust | Croydon University Hospital | | | | | | | | | | | |
| | SHC | Epsom and St Helier University Hospitals NHS Trust | St Helier Hospital | | | | | | | | | | | |
| | CHX | Imperial College Healthcare NHS Trust | Charing Cross | | | | | | | | | | | |
| | KTH | Kingston Hospital NHS Trust | Kingston Hospital | | | | | | | | | | | |
| | BMP | Royal Brompton & Harefield NHS Foundation Trust | Royal Brompton Hospital | | | | | | | | | | | |
| | GEO | St George's Healthcare NHS Trust | St George's Hospital | | | | | | | | | | | |

## Key

**Proportion of patients for which each process of care was met:**

80–100% 50–79% 0–49% Data unavailable

**Except for Case Ascertainment column:** 70–100% 50–69% 0–49% Data unavailable

## Central

| REGION | ABBREVIATED HOSPITAL IDENTIFER | TRUST | HOSPITAL | FINAL CASE ASCERTAINMENT | CONSULTANT SURGEON REVIEW WITHIN 12HRS OF EMERGENCY ADMISSION | CT REPORTED BEFORE SURGERY | RISK DOCUMENTED PREOPERATIVELY | ARRIVAL IN THEATRE IN TIMESCALE APPROPRIATE TO OPERATIVE URGENCY | PREOPERATIVE REVIEW BY CONSULANT SURGEON AND CONSULTANT ANAESTHETIST | BOTH CONSULANT SURGEON AND CONSULTANT ANAESTHETIST PRESENT IN THEATRE | CONSULTANT SURGEON PRESENT IN THEATRE | CONSULTANT ANAESTHETIST PRESENT IN THEATRE | DIRECT POSTOPERATIVE ADMISSION TO CRITICAL CARE | POSTOPERATIVE ASSESSMENT BY MCOP SPECIALIST IN PATIENTS OVER THE AGE OF 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAST MIDLANDS | CHE | Chesterfield Royal Hospital NHS Foundation Trust | Chesterfield Royal Hospital | | | | | | | | | | | |
| | DER | Derby Hospitals NHS Foundation Trust | Royal Derby Hospital | | | | | | | | | | | |
| | NUN | George Eliot Hospital NHS Trust | George Eliot Hospital | | | | | | | | | | | |
| | KGH | Kettering General Hospital NHS Foundation Trust | Kettering General Hospital | | | | | | | | | | | |
| | NTH | Northampton General Hospital NHS Trust | Northampton General Hospital | | | | | | | | | | | |
| | QMC | Nottingham University Hospitals NHS Trust | Queens Medical Centre - Nottingham | | | | | | | | | | | |
| | KMH | Sherwood Forest Hospitals NHS Foundation Trust | Kings Mill Hospital | | | | | | | | | | | |
| | LIN | United Lincolnshire Hospitals NHS Trust | Lincoln County Hospital | | | | | | | | | | | |
| | PIL | United Lincolnshire Hospitals NHS Trust | Pilgrim Hospital | | | | | | | | | | | |
| | LEI | University Hospitals of Leicester NHS Trust | Leicester General Hospital | | | | | | | | | | | |
| | LER | University Hospitals of Leicester NHS Trust | Leicester Royal Infirmary | | | | | | | | | | | |
| EAST OF ENGLAND | BAS | Basildon and Thurrock University Hospitals NHS Foundation Trust | Basildon University Hospital | | | | | | | | | | | |
| | BED | Bedford Hospital NHS Trust | Bedford Hospital | | | | | | | | | | | |
| | ADD | Cambridge University Hosps NHS Foundation Trust | Addenbrookes Hospital | | | | | | | | | | | |
| | COL | Colchester Hospital University NHS Foundation Trust | Colchester General Hospital | | | | | | | | | | | |
| | LIS | East and North Hertfordshire NHS Trust | Lister Hospital | | | | | | | | | | | |
| | HIN | Hinchingbrooke Health Care NHS Trust | Hinchingbrooke Hospital | | | | | | | | | | | |
| | IPS | Ipswich Hospital NHS Trust | Ipswich Hospital | | | | | | | | | | | |
| | JPH | James Paget University Hosps NHS Foundation Trust | James Paget University Hospital | | | | | | | | | | | |
| | LDH | Luton and Dunstable Hospital NHS Foundation Trust | Luton & Dunstable Hospital | | | | | | | | | | | |
| | BFH | Mid Essex Hospital Services NHS Trust | Broomfield Hospital | | | | | | | | | | | |
| | NOR | Norfolk and Norwich University Hospitals NHS Foundation Trust | Norfolk and Norwich University Hospital | | | | | | | | | | | |
| | PAP | Papworth Hospital NHS Foundation Trust | Papworth Hospital | | | | | | | | | | | |
| | PET | Peterborough & Stamford Hosps NHS Foundation Trust | Peterborough City Hospital | | | | | | | | | | | |
| | SEH | Southend University Hospital NHS Foundation Trust | Southend University Hospital | | | | | | | | | | | |
| | PAH | The Princess Alexandra Hospital NHS Trust | Princess Alexandra Hospital | | | | | | | | | | | |
| | QKL | The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust | The Queen Elizabeth Hospital - King's Lynn | | | | | | | | | | | |
| | WAT | West Hertfordshire Hospitals NHS Trust | Watford General Hospital | | | | | | | | | | | |
| | WSH | West Suffolk NHS Foundation Trust | West Suffolk Hospital | | | | | | | | | | | |
| WEST MIDLANDS | BRT | Burton Hospitals NHS Foundation Trust | Queen's Hospital - Burton | | | | | | | | | | | |
| | EBH | Heart of England NHS Foundation Trust | Birmingham Heartlands Hospital | | | | | | | | | | | |
| | GHS | Heart of England NHS Foundation Trust | Good Hope Hospital | | | | | | | | | | | |
| | CTY | Sandwell & West Birmingham Hospitals NHS Trust | City Hospital | | | | | | | | | | | |
| | SAN | Sandwell & West Birmingham Hospitals NHS Trust | Sandwell General Hospital | | | | | | | | | | | |
| | WAW | South Warwickshire NHS Foundation Trust | Warwick Hospital | | | | | | | | | | | |
| | RUS | The Dudley Group NHS Foundation Trust | Russells Hall Hospital | | | | | | | | | | | |
| | NCR | The Royal Wolverhampton Hospitals NHS Trust | New Cross Hospital | | | | | | | | | | | |
| | RSS | The Shrewsbury and Telford Hospital NHS Trust | Royal Shrewsbury Hospital | | | | | | | | | | | |
| | QEB | University Hosp Birmingham NHS Foundation Trust | Queen Elizabeth Hospital Birmingham | | | | | | | | | | | |
| | UHC | University Hospitals Coventry & Warwickshire NHS Trust | University Hospital, Coventry | | | | | | | | | | | |
| | MSH | University Hospitals of North Midlands NHS Trust | County Hospital** | | | | | | | | | | | |
| | STO | University Hospitals of North Midlands NHS Trust | Royal Stoke University Hospital*** | | | | | | | | | | | |
| | WMH | Walsall Healthcare NHS Trust | Walsall Manor Hospital | | | | | | | | | | | |
| | RED | Worcestershire Acute Hospitals NHS Trust | Alexandra Hospital* | | | | | | | | | | | |
| | WRC | Worcestershire Acute Hospitals NHS Trust | Worcestershire Royal Hospital | | | | | | | | | | | |
| | HCH | Wye Valley NHS Trust | Hereford County Hospital | | | | | | | | | | | |

** County Hospital was formally Stafford Hospital

***Royal Stoke University Hospital was formally City General Hospital, Stoke

## Key

**Proportion of patients for which each process of care was met:**

80–100% 50–79% 0–49% Data unavailable

**Except for Case Ascertainment column:** 70–100% 50–69% 0–49% Data unavailable

## North of England

| REGION | ABBREVIATED HOSPITAL IDENTIFIER | TRUST | HOSPITAL | FINAL CASE ASCERTAINMENT | CONSULTANT SURGEON REVIEW WITHIN 12HRS OF EMERGENCY ADMISSION | CT REPORTED BEFORE SURGERY | RISK DOCUMENTED PREOPERATIVELY | ARRIVAL IN THEATRE IN TIMESCALE APPROPRIATE TO OPERATIVE URGENCY | PREOPERATIVE REVIEW BY CONSULANT SURGEON AND CONSULTANT ANAESTHETIST | BOTH CONSULANT SURGEON AND CONSULTANT ANAESTHETIST PRESENT IN THEATRE | CONSULTANT SURGEON PRESENT IN THEATRE | CONSULTANT ANAESTHETIST PRESENT IN THEATRE | DIRECT POSTOPERATIVE ADMISSION TO CRITICAL CARE | POSTOPERATIVE ASSESSMENT BY MCOP SPECIALIST IN PATIENTS OVER THE AGE OF 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORTH EAST | SUN | City Hospitals Sunderland NHS Foundation Trust | Sunderland Royal Hospital | | | | | | | | | | | |
| | DAR | County Durham & Darlington NHS Foundation Trust | Darlington Memorial Hospital | | | | | | | | | | | |
| | DRY | County Durham & Darlington NHS Foundation Trust | University Hospital North Durham | | | | | | | | | | | |
| | QEG | Gateshead Health NHS Foundation Trust | Queen Elizabeth Hospital - Gateshead | | | | | | | | | | | |
| | NTG | North Tees & Hartlepool NHS Foundation Trust | University Hospital of North Tees | | | | | | | | | | | |
| | NTY | Northumbria Healthcare NHS Foundation Trust | North Tyneside General Hospital | | | | | | | | | | | |
| | ASH | Northumbria Healthcare NHS Foundation Trust | Wansbeck General Hospital | | | | | | | | | | | |
| | SCM | South Tees Hospitals NHS Foundation Trust | The James Cook University Hospital | | | | | | | | | | | |
| | STD | South Tyneside NHS Foundation Trust | South Tyneside District Hospital | | | | | | | | | | | |
| | FRE | The Newcastle upon Tyne Hospitals NHS Foundation Trust | Freeman Hospital | | | | | | | | | | | |
| | RVN | The Newcastle upon Tyne Hospitals NHS Foundation Trust | Royal Victoria Infirmary | | | | | | | | | | | |
| NORTH WEST | FAZ | Aintree University Hospitals NHS Foundation Trust | Aintree University Hospital | | | | | | | | | | | |
| | VIC | Blackpool Teaching Hospitals NHS Foundation Trust | Blackpool Victoria Hospital | | | | | | | | | | | |
| | BOL | Bolton NHS Foundation Trust | Royal Bolton Hospital | | | | | | | | | | | |
| | MRI | Central Manchester University Hospitals NHS Foundation Trust | Manchester Royal Infirmary | | | | | | | | | | | |
| | COC | Countess of Chester Hospital NHS Foundation Trust | Countess of Chester Hospital | | | | | | | | | | | |
| | MAC | East Cheshire NHS Trust | Macclesfield District General Hospital | | | | | | | | | | | |
| | BLA | East Lancashire Hospitals NHS Trust | Royal Blackburn Hospital | | | | | | | | | | | |
| | RPH | Lancashire Teaching Hospitals NHS Foundation Trust | Royal Preston Hospital | | | | | | | | | | | |
| | LHC | Liverpool Heart & Chest Hospital NHS Foundation Trust | Liverpool Heart and Chest Hospital | | | | | | | | | | | |
| | LEG | Mid Cheshire Hospitals NHS Foundation Trust | Leighton Hospital | | | | | | | | | | | |
| | CMI | North Cumbria University Hospitals NHS Trust | Cumberland Infirmary | | | | | | | | | | | |
| | RLU | Royal Liverpool and Broadgreen Univ Hospitals NHS Trust | Royal Liverpool University Hospital | | | | | | | | | | | |
| | SLF | Salford Royal NHS Foundation Trust | Salford Royal Hospital | | | | | | | | | | | |
| | SPD | Southport & Ormskirk Hospital NHS Trust | Southport District General Hospital | | | | | | | | | | | |
| | WHI | St Helens & Knowsley Teaching Hospitals NHS Trust | Whiston Hospital | | | | | | | | | | | |
| | SHH | Stockport NHS Foundation Trust | Stepping Hill Hospital | | | | | | | | | | | |
| | TGA | Tameside Hospital NHS Foundation Trust | Tameside General Hospital | | | | | | | | | | | |
| | CHR | The Christie NHS Foundation Trust | The Christie | | | | | | | | | | | |
| | NMG | The Pennine Acute Hospitals NHS Trust | North Manchester General Hospital | | | | | | | | | | | |
| | OHM | The Pennine Acute Hospitals NHS Trust | The Royal Oldham Hospital | | | | | | | | | | | |
| | WLT | The Walton Centre NHS Foundation Trust | The Walton Centre | | | | | | | | | | | |
| | WYT | University Hospital of South Manchester NHS Foundation Trust | Wythenshawe Hospital | | | | | | | | | | | |
| | FGH | University Hospitals of Morecambe Bay NHS Foundation Trust | Furness General Hospital | | | | | | | | | | | |
| | RLI | University Hospitals of Morecambe Bay NHS Foundation Trust | Royal Lancaster Infirmary | | | | | | | | | | | |
| | WDG | Warrington & Halton Hospitals NHS Foundation Trust | Warrington Hospital | | | | | | | | | | | |
| | WIR | Wirral University Teaching Hospital NHS Foundation Trust | Arrowe Park Hospital | | | | | | | | | | | |
| | AEI | Wrightington, Wigan & Leigh NHS Foundation Trust | Royal Albert Edward Infirmary | | | | | | | | | | | |
| YORKSHIRE AND THE HUMBER | AIR | Airedale NHS Foundation Trust | Airedale General Hospital | | | | | | | | | | | |
| | BAR | Barnsley Hospital NHS Foundation Trust | Barnsley Hospital | | | | | | | | | | | |
| | BRD | Bradford Teaching Hospitals NHS Foundation Trust | Bradford Royal Infirmary | | | | | | | | | | | |
| | HUD | Calderdale & Huddersfield NHS Foundation Trust | Huddersfield Royal Infirmary | | | | | | | | | | | |
| | DID | Doncaster and Bassetlaw Hosps NHS Foundation Trust | Doncaster Royal Infirmary | | | | | | | | | | | |
| | HAR | Harrogate and District NHS Foundation Trust | Harrogate District Hospital | | | | | | | | | | | |
| | CAS | Hull and East Yorkshire Hospitals NHS Trust | Castle Hill Hospital | | | | | | | | | | | |
| | HUL | Hull and East Yorkshire Hospitals NHS Trust | Hull Royal Infirmary | | | | | | | | | | | |
| | GGH | Northern Lincolnshire and Goole Hospitals NHS Foundation Trust | Diana Princess of Wales Hospital | | | | | | | | | | | |
| | SCU | Northern Lincolnshire and Goole Hospitals NHS Foundation Trust | Scunthorpe General Hospital | | | | | | | | | | | |
| | NGS | Sheffield Teaching Hospitals NHS Foundation Trust | Northern General Hospital | | | | | | | | | | | |
| | FRR | South Tees Hospitals NHS Foundation Trust | Friarage Hospital | | | | | | | | | | | |
| | LGI | The Leeds Teaching Hospitals NHS Trust | Leeds General Infirmary | | | | | | | | | | | |
| | SJH | The Leeds Teaching Hospitals NHS Trust | St James's University Hospital | | | | | | | | | | | |
| | DDH | The Mid Yorkshire Hospitals NHS Trust | Dewsbury and District Hospital | | | | | | | | | | | |
| | PIN | The Mid Yorkshire Hospitals NHS Trust | Pinderfields Hospital | | | | | | | | | | | |
| | ROT | The Rotherham NHS Foundation Trust | Rotherham Hospital | | | | | | | | | | | |
| | SCA | York Teaching Hospital NHS Foundation Trust | Scarborough Hospital | | | | | | | | | | | |
| | YDH | York Teaching Hospital NHS Foundation Trust | York Hospital | | | | | | | | | | | |

## Key

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80–100% 50–79% 0–49% Data unavailable

**Except for Case Ascertainment column:** 70–100% 50–69% 0–49% Data unavailable

## South of England

| REGION | ABBREVIATED HOSPITAL IDENTIFIER | TRUST | HOSPITAL | FINAL CASE ASCERTAINMENT | CONSULTANT SURGEON REVIEW WITHIN 12HRS OF EMERGENCY ADMISSION | CT REPORTED BEFORE SURGERY | RISK DOCUMENTED PREOPERATIVELY | ARRIVAL IN THEATRE IN TIMESCALE APPROPRIATE TO OPERATIVE URGENCY | PREOPERATIVE REVIEW BY CONSULANT SURGEON AND CONSULTANT ANAESTHETIST | BOTH CONSULANT SURGEON AND CONSULTANT ANAESTHETIST PRESENT IN THEATRE | CONSULTANT SURGEON PRESENT IN THEATRE | CONSULTANT ANAESTHETIST PRESENT IN THEATRE | DIRECT POSTOPERATIVE ADMISSION TO CRITICAL CARE | POSTOPERATIVE ASSESSMENT BY MCOP SPECIALIST IN PATIENTS OVER THE AGE OF 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOUTH CENTRAL | SMV | Buckinghamshire Healthcare NHS Trust | Stoke Mandeville Hospital | 0–49% | 0–49% | 70–100% | 50–79% | 50–79% | 50–79% | 50–79% | 70–100% | 70–100% | 50–79% | 0–49% |
| | WEX | Frimley Health NHS Foundation Trust | Wexham Park Hospital | 70–100% | 0–49% | 50–79% | 0–49% | 70–100% | 0–49% | 50–79% | 70–100% | 50–79% | 0–49% | 0–49% |
| | NHH | Hampshire Hospitals NHS Foundation Trust | Basingstoke & North Hampshire Hospital | 70–100% | 50–79% | 70–100% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | RHC | Hampshire Hospitals NHS Foundation Trust | Royal Hampshire County Hospital | 70–100% | 50–79% | 50–79% | 0–49% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | MIW | Isle of Wight NHS Trust | St Mary's Hospital - IOW | 50–79% | 0–49% | 70–100% | 0–49% | 70–100% | 0–49% | 0–49% | 70–100% | 0–49% | 0–49% | 0–49% |
| | MKH | Milton Keynes Hospital NHS Foundation Trust | Milton Keynes Hospital | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% | 0–49% | 70–100% | 50–79% | 0–49% | 0–49% |
| | CCH | Oxford University Hospitals NHS Trust | Churchill Hospital | 0–49% | 50–79% | 50–79% | 0–49% | 50–79% | 0–49% | 0–49% | 70–100% | 0–49% | 50–79% | 0–49% |
| | RAD | Oxford University Hospitals NHS Trust | John Radcliffe Hospital | 0–49% | 0–49% | 0–49% | 50–79% | 70–100% | 0–49% | 50–79% | 70–100% | 50–79% | 0–49% | 0–49% |
| | QAP | Portsmouth Hospitals NHS Trust | Queen Alexandra Hospital | 70–100% | 50–79% | 50–79% | 0–49% | 70–100% | 50–79% | 70–100% | 70–100% | 50–79% | 0–49% | 0–49% |
| | RBE | Royal Berkshire NHS Foundation Trust | Royal Berkshire Hospital | 70–100% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 70–100% | 0–49% |
| | SGH | University Hospital Southampton NHS Foundation Trust | Southampton General Hospital | 70–100% | 50–79% | 50–79% | 0–49% | 70–100% | 0–49% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| SOUTH EAST COAST | SPH | Ashford & St Peter's Hospital NHS Foundation Trust | St Peter's Hospital | 70–100% | 50–79% | 50–79% | 0–49% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | RSC | Brighton and Sussex University Hospitals NHS Trust | Royal Sussex County Hospital | 0–49% | 0–49% | 50–79% | 0–49% | 50–79% | 50–79% | 0–49% | 50–79% | 50–79% | 50–79% | 0–49% |
| | DVH | Dartford & Gravesham NHS Trust | Darent Valley Hospital | 70–100% | 50–79% | 70–100% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | CKH | East Kent Hospitals University NHS Foundation Trust | Kent and Canterbury Hospital | 0–49% | 0–49% | 0–49% | 70–100% | Data unavailable | 70–100% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | QEQ | East Kent Hospitals University NHS Foundation Trust | Queen Elizabeth The Queen Mother Hospital | 70–100% | 50–79% | 70–100% | 50–79% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | WHH | East Kent Hospitals University NHS Foundation Trust | William Harvey Hospital | 70–100% | 0–49% | 70–100% | 0–49% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | CON | East Sussex Healthcare NHS Trust | Conquest Hospital | 0–49% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 0–49% | 0–49% |
| | FRM | Frimley Health NHS Foundation Trust | Frimley Park Hospital | 50–79% | 0–49% | 70–100% | 0–49% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | MST | Maidstone and Tunbridge Wells NHS Trust | Maidstone Hospital | 0–49% | Data unavailable | 70–100% | 70–100% | 70–100% | 0–49% | 70–100% | 70–100% | 70–100% | 70–100% | Data unavailable |
| | TUN | Maidstone and Tunbridge Wells NHS Trust | Tunbridge Wells Hospital | 50–79% | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% | 50–79% | 50–79% | 50–79% | 0–49% |
| | MDW | Medway NHS Foundation Trust | Medway Maritime Hospital | 70–100% | 50–79% | 50–79% | 0–49% | 70–100% | 0–49% | 0–49% | 50–79% | 0–49% | 50–79% | 0–49% |
| | RSU | Royal Surrey County Hospital NHS Foundation Trust | Royal Surrey County Hospital | 50–79% | 50–79% | 50–79% | 0–49% | 70–100% | 0–49% | 0–49% | 50–79% | 50–79% | 70–100% | 0–49% |
| | ESU | Surrey & Sussex Healthcare NHS Trust | East Surrey Hospital | 70–100% | 0–49% | 50–79% | 50–79% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | STR | Western Sussex Hospitals NHS Trust | St Richards Hospital | 50–79% | 0–49% | 50–79% | 0–49% | 70–100% | 70–100% | 70–100% | 70–100% | 70–100% | 70–100% | 0–49% |
| | WRG | Western Sussex Hospitals NHS Trust | Worthing Hospital | 0–49% | 70–100% | 70–100% | 70–100% | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% | 50–79% | 70–100% |
| SOUTH WEST | WDH | Dorset County Hospital | Dorset County Hospital | 70–100% | 0–49% | 50–79% | 70–100% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | CGH | Gloucestershire Hospitals NHS Foundation Trust | Cheltenham Hospital | 70–100% | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | GLO | Gloucestershire Hospitals NHS Foundation Trust | Gloucestershire Royal Hospital | 70–100% | 0–49% | 50–79% | 0–49% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 0–49% | 0–49% |
| | PMS | Great Western Hospitals NHS Foundation Trust | The Great Western Hospital | 70–100% | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 70–100% | 70–100% | 50–79% | 0–49% |
| | FRY | North Bristol NHS Trust | Frenchay Hospital* | 0–49% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | SMH | North Bristol NHS Trust | Southmead Hospital | 70–100% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | NDD | Northern Devon Healthcare NHS Trust | North Devon District Hospital | 50–79% | 50–79% | 50–79% | 50–79% | 70–100% | 70–100% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | PLY | Plymouth Hospitals NHS Trust | Derriford Hospital | 70–100% | 0–49% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 0–49% | 0–49% |
| | PGH | Poole Hospital NHS Foundation Trust | Poole Hospital | 70–100% | 0–49% | 70–100% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | RCH | Royal Cornwall Hospitals NHS Trust | Royal Cornwall Hospital | 70–100% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 0–49% | 0–49% |
| | RDE | Royal Devon & Exeter NHS Foundation Trust | Royal Devon & Exeter Hospital | 70–100% | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 70–100% | 70–100% | 50–79% | 0–49% |
| | BAT | Royal United Hospital Bath NHS Trust | Royal United Hospital | 70–100% | 50–79% | 0–49% | 50–79% | 70–100% | 0–49% | 0–49% | 50–79% | 50–79% | 50–79% | 0–49% |
| | SAL | Salisbury NHS Foundation Trust | Salisbury District Hospital | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | TOR | South Devon Healthcare NHS Foundation Trust | Torbay District General Hospital | 70–100% | 0–49% | 50–79% | 0–49% | 50–79% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |
| | MPH | Taunton & Somerset NHS Foundation Trust | Musgrove Park Hospital | 70–100% | 50–79% | 70–100% | 0–49% | 70–100% | 70–100% | 70–100% | 70–100% | 70–100% | 50–79% | 0–49% |
| | BTH | The Royal Bournemouth and Christchurch Hosps NHS Foundation Trust | The Royal Bournemouth Hospital | 70–100% | 0–49% | 50–79% | 70–100% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 0–49% | 0–49% |
| | BRI | University Hospitals of Bristol NHS Foundation Trust | Bristol Royal Infirmary | 70–100% | 0–49% | 50–79% | 50–79% | 70–100% | 0–49% | 0–49% | 0–49% | 0–49% | 50–79% | 0–49% |
| | WGH | Weston Area Health NHS Trust | Weston General Hospital | 70–100% | 50–79% | 70–100% | 50–79% | 70–100% | 70–100% | 70–100% | 70–100% | 70–100% | 0–49% | 0–49% |
| | YEO | Yeovil District Hospital NHS Foundation Trust | Yeovil District Hospital | 70–100% | 0–49% | 70–100% | 50–79% | 70–100% | 50–79% | 50–79% | 70–100% | 50–79% | 50–79% | 0–49% |

## Key

**Proportion of patients for which each process of care was met:**

80–100% 50–79% 0–49% Data unavailable

**Except for Case Ascertainment column:** 70–100% 50–69% 0–49% Data unavailable

## Wales

| REGION | ABBREVIATED HOSPITAL IDENTIFIER | Trust | Hospital | FINAL CASE ASCERTAINMENT | CONSULTANT SURGEON REVIEW WITHIN 12HRS OF EMERGENCY ADMISSION | CT REPORTED BEFORE SURGERY | RISK DOCUMENTED PREOPERATIVELY | ARRIVAL IN THEATRE IN TIMESCALE APPROPRIATE TO OPERATIVE URGENCY | PREOPERATIVE REVIEW BY CONSULANT SURGEON AND CONSULTANT ANAESTHETIST | BOTH CONSULANT SURGEON AND CONSULTANT ANAESTHETIST PRESENT IN THEATRE | CONSULTANT SURGEON PRESENT IN THEATRE | CONSULTANT ANAESTHETIST PRESENT IN THEATRE | DIRECT POSTOPERATIVE ADMISSION TO CRITICAL CARE | POSTOPERATIVE ASSESSMENT BY MCOP SPECIALIST IN PATIENTS OVER THE AGE OF 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WALES | MOR | Abertawe Bro Morgannwg University Health Board | Morriston Hospital | | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% | 50–79% | 50–79% | 50–79% | 0–49% | 0–49% |
| | POW | Abertawe Bro Morgannwg University Health Board | Princess of Wales Hospital | | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 80–100% | 50–79% | 50–79% | 0–49% |
| | NEV | Aneurin Bevan Health Board | Nevill Hall Hospital | | 0–49% | 80–100% | 50–79% | 80–100% | 50–79% | 80–100% | 80–100% | 80–100% | 50–79% | 0–49% |
| | GWE | Aneurin Bevan Health Board | Royal Gwent Hospital | | 50–79% | 50–79% | 80–100% | 80–100% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% |
| | CLW | Betsi Cadwaladr University Health Board | Glan Clwyd District General Hospital | | 0–49% | 80–100% | 50–79% | 50–79% | 50–79% | 50–79% | 80–100% | 80–100% | 50–79% | 0–49% |
| | WRX | Betsi Cadwaladr University Health Board | Wrexham Maelor Hospital | | 50–79% | 50–79% | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% |
| | GWY | Betsi Cadwaladr University Health Board | Ysbyty Gwynedd Hospital | | 0–49% | 50–79% | 0–49% | 0–49% | 50–79% | 0–49% | 80–100% | 0–49% | 0–49% | 0–49% |
| | UHL | Cardiff and Vale University Health Board | University Hospital Llandough | | 0–49% | 0–49% | 80–100% | 80–100% | 0–49% | 0–49% | 80–100% | 0–49% | 80–100% | 0–49% |
| | UHW | Cardiff and Vale University Health Board | University Hospital of Wales | | 50–79% | 50–79% | 80–100% | 50–79% | 50–79% | 0–49% | 50–79% | 50–79% | 0–49% | 0–49% |
| | PCH | Cwm Taf Health Board | Prince Charles Hospital | | 50–79% | 80–100% | 50–79% | 80–100% | 50–79% | 50–79% | 80–100% | 50–79% | 0–49% | 0–49% |
| | RGH | Cwm Taf Health Board | Royal Glamorgan | | 0–49% | 50–79% | 50–79% | 80–100% | 0–49% | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% |
| | BRG | Hywel Dda Health Board | Bronglais General Hospital | | 0–49% | 50–79% | 80–100% | 80–100% | 80–100% | 80–100% | 80–100% | 80–100% | 80–100% | 80–100% |
| | GLG | Hywel Dda Health Board | Glangwili General Hospital | | 0–49% | 0–49% | 0–49% | 80–100% | 0–49% | 50–79% | 80–100% | 50–79% | 80–100% | 0–49% |
| | WYB | Hywel Dda Health Board | Withybush General Hospital | | 50–79% | 50–79% | 50–79% | 50–79% | 50–79% | 0–49% | 80–100% | 0–49% | 50–79% | 0–49% |

## Key

**Proportion of patients for which each process of care was met:**

80–100% 50–79% 0–49% Data unavailable

**Except for Case Ascertainment column:** 70–100% 50–69% 0–49% Data unavailable

# APPENDIX 3
# SUPPLEMENTARY ANALYSES

**Table 25**
**Proportion of patients who were reviewed by a consultant surgeon within 12 hours of emergency admission to hospital. Data presented for patients admitted as an emergency and for whom the time of consultant review had been entered into the NELA webtool (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients reviewed by consultant surgeon within 12 hours of admission (%) |
|---|---|---|
| ***Overall*** | ***14,239*** | ***48%*** |
| **Age (years)** | | |
| 18–39 | 1,567 | 46* |
| 40–49 | 1,331 | 51 |
| 50–59 | 1,883 | 51 |
| 60–69 | 2,889 | 48 |
| 70–79 | 3,550 | 47 |
| 80–89 | 2,610 | 46 |
| ≥90 | 409 | 44 |
| **ASA** | | |
| 1 | 1,565 | 55*** |
| 2 | 4,851 | 48 |
| 3 | 4,974 | 45 |
| 4 | 2,563 | 48 |
| 5 | 286 | 47 |
| **Documented risk** | | |
| Lower | 2,905 | 50*** |
| High | 1,746 | 50 |
| Highest | 3,558 | 49 |
| Not documented | 6,030 | 45 |
| ***Overall*** | ***14,239*** | ***48%*** |

**Table 26**
**Preoperative CT scanning and reporting by descriptive patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients who had a CT scan before surgery (%) | Proportion of patients who had a CT scan reported by a consultant radiologist before surgery (%) |
|---|---|---|---|
| | 20,183 | 80% | 68% |
| **Age (years)** | | | |
| 18–39 | 2,188 | 69 *** | 56 *** |
| 40–49 | 1,939 | 77 | 64 |
| 50–59 | 2,707 | 81 | 67 |
| 60–69 | 4,197 | 82 | 70 |
| 70–79 | 5,084 | 81 | 69 |
| 80–89 | 3,537 | 83 | 71 |
| ≥90 | 531 | 83 | 71 |
| **ASA** | | | |
| 1 | 2,097 | 77 *** | 65 *** |
| 2 | 6,793 | 81 | 68 |
| 3 | 7,108 | 81 | 69 |
| 4 | 3,747 | 80 | 66 |
| 5 | 438 | 71 | 58 |
| **Admission type** | | | |
| Emergency | 18,693 | 81 *** | 68 *** |
| Elective | 14,90 | 70 | 60 |
| **Documented risk** | | | |
| Lower | 3,826 | 79 *** | 69 *** |
| High | 2,386 | 84 | 72 |
| Highest | 5,059 | 81 | 68 |
| Not documented | 8,912 | 79 | 66 |
| ***Overall*** | ***20,183*** | ***16,169 (80%)*** | ***13,624 (68%)*** |

**Table 27**
**Intervals between key milestones in the care of patients admitted as an emergency who were scheduled for emergency laparotomy within six hours and underwent surgery within 24 hours of admission to hospital for suspected peritonitis, by urgency of surgery**

| | Number of patients | Number of hours from admission to first antibiotics Median (IQR) | Number of hours from admission to arrival in theatre Median (IQR) | Number of hours from decision to operate to arrival in theatre Median (IQR) |
|---|---|---|---|---|
| ***Overall*** | ***1,302*** | ***3.6 (1.8–7.0)*** | ***8.1 (5.0–13.3)*** | ***2.0 (1.3–3.5)*** |
| **Age (years)** | | | | |
| 18–39 | 169 | 3.7 (1.8–7.3) | 8.0 (5.0–12.3) | 1.9 (1.0–3.0) |
| 40–49 | 139 | 3.8 (1.7–7.7) | 8.6 (4.7–13.5) | 1.7 (1.0–3.3) |
| 50–59 | 201 | 3.5 (1.7–6.6) | 7.4 (5.0–11.8) | 1.9 (1.2–2.8) |
| 60–69 | 266 | 3.5 (1.6–6.3) | 7.0 (4.5–12.9) | 2.0 (1.3–3.5) |
| 70–79 | 304 | 3.5 (2.0–7.5) | 8.2 (5.6–13.9) | 2.0 (1.3–3.8) |
| 80–89 | 200 | 3.7 (1.7–7.0) | 9.0 (5.3–15.5) | 2.1 (1.3–3.9) |
| ≥90 | 23 | 4.3 (2.3–6.6) | 10.0 (5.0–12.9) | 2.0 (1.7–3.8) |
| **ASA** | | | | |
| 1 | 210 | 3.9 (1.7–7.7) | 7.7 (4.7–12.2) | 1.8 (1.0–3.0) |
| 2 | 364 | 4.4 (2.2–7.5) | 8.4 (5.4–13.6) | 2.0 (1.3–3.3) |
| 3 | 346 | 3.5 (1.6–7.4) | 8.5 (5.2–13.9) | 2.2 (1.3–3.8) |
| 4 | 349 | 3.0 (1.5–6.0) | 7.7 (4.9–13.0) | 1.9 (1.2–3.5) |
| 5 | 33 | 3.2 (1.2–9.4) | 7.8 (4.8–13.7) | 1.3 (0.6–3.2) |
| **Documented risk** | | | | |
| Lower | 215 | 5.0 (1.9–8.0) | 8.3 (5.5–12.9) *(p=0.3)* | 1.9 (1.2–3.0) |
| High | 159 | 4.4 (2.0–7.4) | 8.1 (5.0–13.6) | 1.9 (1.3–2.8) |
| Highest | 508 | 2.9 (1.3–5.3) | 7.5 (4.9–12.6) | 1.9 (1.2–3.5) |
| Not documented | 420 | 4.1 (2.1–7.7) | 8.7 (5.0–14.6) | 2.2 (1.3–4.0) |
| **Operative urgency** | | | | |
| <2 hours | 383 | 2.9 (1.1–5.8) | 6 (4.0–10.2) | 1.5 (0.9–2.4) |
| 2–6 hours | 919 | 3.9 (2.0–7.5) | 9 (5.6–14.6) | 2.3 (1.4–4.0) |
| ***Overall*** | ***1,302*** | ***3.6 (1.8–7.0)*** | ***8.1 (5.0–13.3)*** | ***2.0 (1.3–3.5)*** |

**Table 28**
**Proportion of patients who arrived in theatre in a timescale appropriate to their operative urgency after the decision was made to perform an emergency laparotomy (or from time of booking if time of decision unavailable). Expedited surgery (category 3) has been excluded from this analysis ('n=': number of patients, * p<0.05, **p<0.005, ***p<0.001)**

| | Surgery required within 2hours | | Surgery required within 2–6 hours | | Surgery required within 6–18 hours | | All patients assessed | |
|---|---|---|---|---|---|---|---|---|
| | n= | % | n= | % | n= | % | n= | % |
| ***Overall*** | ***1,831*** | ***77%*** | ***4,920*** | ***86%*** | ***3,640*** | ***84%*** | ***10,391*** | ***84%*** |
| **Age (years)** | | | | | | | | |
| 18–39 | 193 | 80* | 529 | 89* | 394 | 81 (p=0.1) | 1,116 | 85* |
| 40–49 | 163 | 81 | 473 | 88 | 320 | 87 | 956 | 86 |
| 50–59 | 228 | 75 | 693 | 86 | 462 | 87 | 1,383 | 84 |
| 60–69 | 428 | 79 | 961 | 86 | 745 | 85 | 2,134 | 84 |
| 70–79 | 487 | 79 | 1,226 | 86 | 948 | 84 | 2,661 | 84 |
| 80–89 | 309 | 69 | 898 | 84 | 667 | 85 | 1,874 | 82 |
| ≥90 | 23 | 78 | 140 | 80 | 104 | 79 | 267 | 79 |
| **ASA** | | | | | | | | |
| 1 | 134 | 81** | 572 | 89* | 414 | 90** | 1,120 | 88** |
| 2 | 338 | 77 | 1,496 | 84 | 1,459 | 84 | 3,293 | 83 |
| 3 | 467 | 72 | 1,713 | 85 | 1,382 | 82 | 3,562 | 82 |
| 4 | 717 | 78 | 1,066 | 87 | 370 | 85 | 2,153 | 84 |
| 5 | 175 | 86 | 73 | 93 | 15 | 100 | 263 | 89 |
| **Admission type** | | | | | | | | |
| Emergency | 1,594 | 76 (p=0.09) | 4,506 | 85** | 3,451 | 84*** | 9,551 | 83* |
| Elective | 237 | 81 | 414 | 91 | 189 | 94 | 840 | 89 |
| **Documented risk** | | | | | | | | |
| Lower | 160 | 74 (p=0.1) | 896 | 85*** | 877 | 85 (p=0.3) | 1,933 | 84* |
| High | 164 | 71 | 642 | 87 | 486 | 83 | 1,292 | 84 |
| Highest | 917 | 79 | 1,466 | 88 | 555 | 87 | 2,938 | 85 |
| Not documented | 590 | 77 | 1,916 | 84 | 1,722 | 83 | 4,228 | 83 |
| ***Overall*** | ***1,831*** | ***77%*** | ***4,920*** | ***86%*** | ***3,640*** | ***84%*** | ***10,391*** | ***84%*** |

**Table 29**
**Proportions of patients receiving preoperative input by consultant surgeons and consultant anaesthetists by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients (%) | | | |
|---|---|---|---|---|---|
| | | Decision to operate made in person by a consultant surgeon and patient reviewed preoperatively by a consultant anaesthetist | Decision to operate made in person by a consultant surgeon | Preoperative review by a consultant anaesthetist | Decision to operate not made in person by a consultant surgeon and patient not reviewed preoperatively by a consultant anaesthetist |
| **Age (years)** | | | | | |
| 18–39 | 2,188 | 55*** | 71*** | 72*** | 12*** |
| 40–49 | 1,939 | 55 | 70 | 74 | 10 |
| 50–59 | 2,707 | 57 | 73 | 75 | 10 |
| 60–69 | 4,197 | 59 | 72 | 78 | 8 |
| 70–79 | 5,084 | 60 | 72 | 79 | 8 |
| 80–89 | 3,537 | 61 | 74 | 80 | 8 |
| ≥90 | 531 | 65 | 75 | 83 | 7 |
| **ASA** | | | | | |
| 1 | 2,097 | 51*** | 70*** | 69*** | 13*** |
| 2 | 6,793 | 57 | 74 | 74 | 10 |
| 3 | 7,108 | 59 | 73 | 78 | 8 |
| 4 | 3,747 | 63 | 71 | 85 | 7 |
| 5 | 438 | 61 | 65 | 89 | 6 |
| **Admission type** | | | | | |
| Emergency | 18,693 | 58* | 72 (p=0.4) | 77** | 9* |
| Elective | 1,490 | 61 | 73 | 81 | 7 |
| ***Overall*** | ***20,183*** | ***58%*** | ***72%*** | ***77%*** | ***8%*** |

**Table 30**
**Proportions of patients whose intraoperative care was directly supervised by consultant surgeons and consultant anaesthetists by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients (%) | | | |
|---|---|---|---|---|---|
| | | Both consultants present in theatre | Consultant surgeon present | Consultant anaesthetist present | Neither consultant present in theatre |
| **Age (years)** | | | | | |
| 18–39 | 2,188 | 62** | 84 (p=0.2) | 70*** | 8* |
| 40–49 | 1,939 | 63 | 85 | 71 | 7 |
| 50–59 | 2,707 | 62 | 84 | 71 | 8 |
| 60–69 | 4,197 | 66 | 85 | 75 | 7 |
| 70–79 | 5,084 | 68 | 85 | 77 | 6 |
| 80–89 | 3,537 | 67 | 83 | 77 | 6 |
| ≥90 | 531 | 70 | 85 | 81 | 5 |
| **ASA** | | | | | |
| 1 | 2,097 | 54*** | 78*** | 64*** | 11*** |
| 2 | 6,793 | 62 | 83 | 71 | 8 |
| 3 | 7,108 | 66 | 85 | 75 | 6 |
| 4 | 3,747 | 74 | 89 | 81 | 4 |
| 5 | 438 | 80 | 90 | 88 | 3 |
| **Admission type** | | | | | |
| Emergency | 18,693 | 65*** | 84 (p=0.6) | 74*** | 7*** |
| Elective | 1,490 | 72 | 82 | 78 | 3 |
| ***Overall*** | ***20,183*** | ***65%*** | ***85%*** | ***74%*** | ***7%*** |

**Table 31**
**Proportions of patients whose intraoperative care was directly supervised by consultant surgeons and consultant anaesthetists by day that surgery was commenced (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients (%) | | | |
|---|---|---|---|---|---|
| | | Both consultants present in theatre | Consultant surgeon present | Consultant anaesthetist present | Neither consultant present in theatre |
| Monday | 2,510 | 67*** | 86*** | 75*** | 6*** |
| Tuesday | 3,027 | 70 | 87 | 78 | 6 |
| Wednesday | 3,154 | 68 | 83 | 78 | 7 |
| Thursday | 3,396 | 69 | 85 | 79 | 5 |
| Friday | 3,078 | 68 | 85 | 77 | 6 |
| Saturday | 2,565 | 56 | 83 | 64 | 9 |
| Sunday | 2,453 | 57 | 84 | 64 | 9 |
| ***Overall*** | ***20,183*** | ***65%*** | ***84%*** | ***74%*** | ***7%*** |

**Table 32**
**Proportions of patients receiving goal directed fluid therapy and method of provision by descriptive patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients (%) | | |
|---|---|---|---|---|
| | | Cardiac output monitor | Other method | Overall |
| ***Overall*** | ***20183*** | ***37%*** | ***15%*** | ***52%*** |
| **Age (years)** | | | | |
| 18–39 | 2,188 | 27*** | 13*** | 40 |
| 40–49 | 1,939 | 33 | 15 | 48 |
| 50–59 | 2,707 | 35 | 13 | 48 |
| 60–69 | 4,197 | 37 | 15 | 52 |
| 70–79 | 5,084 | 40 | 15 | 55 |
| 80–89 | 3,537 | 40 | 16 | 56 |
| ≥90 | 531 | 37 | 19 | 56 |
| **ASA** | | | | |
| 1 | 2,097 | 28 *** | 11*** | 39 |
| 2 | 6,793 | 32 | 13 | 45 |
| 3 | 7,108 | 38 | 16 | 54 |
| 4 | 3,747 | 45 | 18 | 63 |
| 5 | 438 | 43 | 16 | 59 |
| **Admission type** | | | | |
| Emergency | 18,693 | 36 (p=0.9) | 15 (p=0.9) | 51 |
| Elective | 1,490 | 37 | 15 | 52 |
| **Documented risk** | | | | |
| Lower | 3,826 | 33*** | 12*** | 45 |
| High | 2,386 | 40 | 17 | 57 |
| Highest | 5,059 | 45 | 17 | 62 |
| Not documented | 8,912 | 32 | 14 | 46 |
| ***Overall*** | ***20,183*** | ***37%*** | ***15%*** | ***52%*** |

**Table 33**
**Proportions of patients receiving goal directed fluid therapy and method of provision by documented urgency of surgery (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | | Proportion of patients (%) | | |
|---|---|---|---|---|
| | Number of patients | Cardiac output monitoring | Other method | Overall |
| <2 hours | 1,976 | 41*** | 19*** | 60 |
| 2–6 hours | 5,498 | 39 | 15 | 54 |
| 6–18 hours | 4,213 | 34 | 14 | 48 |
| 18–24 hours | 2,247 | 31 | 13 | 44 |
| ***Overall*** | ***13,934*** | ***36%*** | ***15%*** | ***51%*** |

**Table 34**
**Proportion of patients directly admitted to a high dependency or intensive care bed after surgery by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients directly admitted to a high dependency or intensive care bed after surgery (%) |
|---|---|---|
| **Age (years)** | | |
| 18–39 | 2,188 | 38*** |
| 40–49 | 1,939 | 47 |
| 50–59 | 2,707 | 51 |
| 60–69 | 4,197 | 61 |
| 70–79 | 5,084 | 68 |
| 80–89 | 3,537 | 72 |
| ≥90 | 531 | 70 |
| **ASA** | | |
| 1 | 2,097 | 29*** |
| 2 | 6,793 | 43 |
| 3 | 7,108 | 67 |
| 4 | 3,747 | 90 |
| 5 | 438 | 97 |
| **Admission type** | | |
| Emergency | 18,693 | 59*** |
| Elective | 1,490 | 72 |
| ***Overall*** | ***20,183*** | ***60%*** |

**Table 35**
**Proportion of patients directly admitted to a high dependency or intensive care bed after surgery by operative urgency (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients directly admitted to a high dependency or intensive care bed after surgery (%) |
|---|---|---|
| <2 hours | 1,976 | 84*** |
| 2–6 hours | 5,498 | 66 |
| 6–18 hours | 4,213 | 50 |
| 18–24 hours | 2,247 | 44 |
| ***Overall*** | ***13,934*** | ***60%*** |

**Table 36**
**Proportion of patients directly admitted to a high dependency or intensive care bed after surgery by the day that surgery was commenced**

| | Number of patients | Proportion of patients directly admitted to a high dependency or intensive care bed after surgery (%) |
|---|---|---|
| Monday | 2,510 | 61 (p=0.1) |
| Tuesday | 3,027 | 61 |
| Wednesday | 3,154 | 59 |
| Thursday | 3,396 | 59 |
| Friday | 3,078 | 58 |
| Saturday | 2,565 | 60 |
| Sunday | 2,453 | 59 |
| ***Overall*** | ***20,183*** | ***60%*** |

**Table 37**
**Proportion of patients over the age of 70 who were assessed after surgery by a Medicine for Care of the Older Person (MCOP) specialist following emergency laparotomy by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion of patients assessed after surgery by a MCOP specialist (%) |
|---|---|---|
| **ASA** | | |
| 1 | 178 | 5 *** |
| 2 | 2,380 | 6 |
| 3 | 3,998 | 11 |
| 4 | 2,325 | 13 |
| 5 | 215 | 6 |
| **Admission type** | | |
| Emergency | 8,454 | 10* |
| Elective | 642 | 8 |
| **Documented risk** | | |
| Lower | 1,022 | 8*** |
| High | 1,254 | 11 |
| Highest | 3,154 | 13 |
| Not documented | 3,666 | 7 |
| ***Overall*** | ***9,096*** | ***10%*** |

**Table 38**
**Inpatient 30-day mortality by patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Inpatient 30–day mortality (%) |
|---|---|---|
| **Age (years)** | | |
| 18–39 | 2,188 | 3%*** |
| 40–49 | 1,939 | 3% |
| 50–59 | 2,707 | 6% |
| 60–69 | 4,197 | 9% |
| 70–79 | 5,084 | 15% |
| 80–89 | 3,537 | 20% |
| ≥90 | 531 | 24% |
| **ASA** | | |
| 1 | 2,097 | 1% *** |
| 2 | 6,793 | 3% |
| 3 | 7,108 | 9% |
| 4 | 3,747 | 30% |
| 5 | 438 | 58% |
| **Admission type** | | |
| Emergency | 18,693 | 11% (p=0.08) |
| Elective | 1,490 | 10% |
| **Documented risk** | | |
| Lower | 3,826 | 2% *** |
| High | 2,386 | 6% |
| Highest | 5,059 | 28% |
| Not documented | 8,912 | 7% |
| **Return to theatre after initial operation** | | |
| No return to theatre | 18,192 | 11%*** |
| One or more returns | 1,991 | 17% |
| | ***20,183*** | ***11%*** |

**Table 39**
**Inpatient 30-day mortality by operative urgency (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Inpatient 30-day mortality (%) |
|---|---|---|
| **Urgency of surgery** | | |
| <2 hours | 1,976 | 26%*** |
| 2–6 hours | 5,498 | 12% |
| 6–18 hours | 4,213 | 7% |
| 18–24 hours | 2,247 | 6% |
| | ***13,934*** | ***11%*** |

**Table 40**
**Inpatient 30-day mortality by indication for surgery**

| Indication for surgery | Number of patients | Inpatient 30-day mortality (%) |
|---|---|---|
| Abdominal abscess | 1,332 | 8 |
| Abdominal compartment syndrome | 55 | 42 |
| Abdominal wound dehiscence | 116 | 9 |
| Anastomotic leak | 618 | 7 |
| Colitis | 748 | 7 |
| Haemorrhage | 819 | 14 |
| Intestinal fistula | 326 | 8 |
| Intestinal obstruction | 9,811 | 9 |
| Ischaemia | 1,720 | 29 |
| Other | 1,758 | 9 |
| Perforation | 4,744 | 15 |
| Peritonitis | 4,116 | 16 |
| Planned relook | 51 | 4 |
| Sepsis: other | 1,474 | 20 |

**Table 41**
**Inpatient 30-day mortality by operative findings**

| Operative findings | Number of patients | Inpatient 30-day mortality (%) |
|---|---|---|
| Abdominal compartment syndrome | 45 | 38 |
| Abscess | 2,332 | 9 |
| Adhesions | 5,592 | 9 |
| Anastomotic leak | 591 | 9 |
| Colitis | 654 | 8 |
| Crohn's disease | 658 | 3 |
| Diverticulitis | 1,158 | 8 |
| Haemorrhage: intestinal | 207 | 11 |
| Haemorrhage: peptic ulcer | 228 | 21 |
| Haemorrhage: postoperative | 300 | 8 |
| Incarcerated hernia | 1,224 | 12 |
| Intestinal ischaemia | 2,543 | 25 |
| Malignancy: disseminated | 1,443 | 15 |
| Malignancy: localised | 2,480 | 9 |
| Normal intra-abdominal findings | 215 | 10 |
| Other | 3,375 | 11 |
| Perforation: peptic ulcer | 1,212 | 10 |
| Perforation: small bowel/colonic | 3,893 | 17 |
| Volvulus | 715 | 11 |

**Table 42**
**Postoperative length of stay in patients surviving to discharge from hospital by operative urgency**
**(* p≤0.05, **p≤0.005, ***p≤0.001)**

| Operative urgency | Number of patients | Postoperative length of stay Median number of days (IQR) |
|---|---|---|
| <2 hours | 1,420 | 15.0*** (8.2–30.1) |
| 2–6 hours | 4,756 | 11.8 (7.0–22.3) |
| 6–18 hours | 3,882 | 10.3 (6.4–17.5) |
| 18–24 hours | 2,078 | 10.1 (6.3–17.4) |
| ***Overall*** | ***12,136*** | ***11.3 (6.5–20.3)*** |

**Table 43**
**Proportion of patients who returned to theatre following their initial emergency laparotomy by descriptive patient characteristics (* p≤0.05, **p≤0.005, ***p≤0.001)**

| | Number of patients | Proportion patients who returned to theatre following initial emergency laparotomy (%) |
|---|---|---|
| **Age (years)** | | |
| 18–39 | 2,188 | 9*** |
| 40–49 | 1,939 | 10 |
| 50–59 | 2,707 | 10 |
| 60–69 | 4,197 | 12 |
| 70–79 | 5,084 | 11 |
| 80–89 | 3,537 | 7 |
| ≥90 | 531 | 4 |
| **ASA** | | |
| 1 | 2,097 | 5*** |
| 2 | 6,793 | 7 |
| 3 | 7,108 | 10 |
| 4 | 3,747 | 16 |
| 5 | 438 | 18 |
| ***Overall*** | ***20,183*** | ***10%*** |

# APPENDIX 4
# SUMMARY OF METHODS

### Identification of sites undertaking emergency laparotomy

An initial survey of NHS acute Trusts and Local Health Boards identified 191 NHS hospitals across England and Wales as eligible to participate in NELA.[8] Analysis of Hospital Episode Statistics subsequently identified a further four hospitals at which emergency laparotomies are performed. All identified hospitals were contacted to invite participation in collection of patient-level NELA data.

### Inclusion and exclusion criteria

NELA was established to enrol the patients treated in NHS hospitals within England or Wales who were aged 18 years and over and who undergo an expedited, urgent or emergency (NCEPOD definitions) abdominal procedure on the gastrointestinal tract. The operations that NELA covers include:

- Procedures involving the stomach, small or large bowel, or rectum for conditions such as perforation, ischaemia, abdominal abscess, bleeding or obstruction.
- Washout/evacuation of intra-peritoneal abscess (unless due to appendicitis or cholecystitis).
- Bowel resection/repair due to incarcerated umbilical, inguinal and femoral hernias (but not hernia repair without bowel resection/repair).
- Return to theatre for repair of substantial dehiscence of major abdominal wound (i.e. 'burst abdomen') or after patients underwent non-elective gastro-intestinal surgery.

There are a number of abdominal procedures that are outside the scope of the Audit. Examples of these include:

- Uncomplicated appendicectomy or cholecystectomy.
- Non-elective hernia repair without bowel resection.
- Vascular surgery, including abdominal aortic aneurysm repair.
- Caesarean section, obstetric laparotomies or gynaecological laparotomy.
- Laparotomy/laparoscopy for pathology caused by blunt or penetrating trauma.

Full inclusion and exclusion criteria are available on the NELA website: www.nela.org.uk/Criteria.

### Dataset design

The data items in the patient dataset were chosen on the basis of existing clinical recommendations, national Standards of care, expert opinion, and the need to be able to adjust for differences in the characteristics of patients and operations between hospitals. The latter is required to enable risk-adjusted comparisons of patient outcomes between hospitals so that the performance of hospitals can be fairly compared.

The dataset contains data items covering various characteristics of the patient and the care they received:

- Patient age, gender, region of residence.
- Preoperative assessment and imaging.
- Preoperative patient risk factors.
- The type of procedures performed and the seniority of the surgeon and anaesthetist that performed it.
- Postoperative patient risk factors.
- Postoperative care including use of critical care and High Dependency Units.

The design and implementation of the NELA Patient Audit questionnaire was overseen by the NELA Project Board with advice from the Clinical Reference Group. The web-tool underwent several phases of testing prior to going live.

## The year 1 NELA patient audit data extract

Patients were included in the analysis for this report if they entered an operating theatre for an emergency laparotomy between 1 December 2013 and 30 November 2014.

In order to give hospitals sufficient time to lock cases that were eligible for inclusion in the Year 1 data extract, the data submission deadline was extended to 14 January 2015 and a full extract taken at 8.00 am on 15 January 2015. On this date there were 22,391 locked cases.

A number of these cases were removed prior to analysis because they did not meet the NELA patient inclusion criteria.

**Table 44**
**Cases excluded from analysis of the NELA Patient Audit dataset**

| Reason for exclusion | Cases excluded |
|---|---|
| Admitted to Scottish hospitals[∞] | 427 |
| Under 18 at time of hospital admission | 2 |
| Arrival in theatre after data collection period | 1,015 |
| Arrival in theatre before data collection period | 9 |
| Primary surgical procedure ineligible for inclusion | 755 |

After exclusions, the Audit dataset contained 20,183 locked cases, submitted by 192 NHS hospitals across England and Wales.

## Data processing

All analyses were performed in Microsoft Excel (2010) or STATA version 12 (StataCorp, Texas USA), and interpreted centrally by the NELA Project Team with support from the Clinical Effectiveness Unit of the Royal College of Surgeons of England. Oversight was provided by the NELA Project Board and Clinical Reference Group.

[∞]Five Scottish NHS hospitals submitted patient data during year 1 of patient data collection for the EPOCH trial: www.epochtrial.org/epoch.php.

Missing time and date variables were excluded from analyses unless another variable was available (e.g. time of decision to operate and time of booking for theatre).

In line with accepted methodology, missing P-POSSUM variables were assigned the lowest risk category (usually 1)[38] in order that patient-level estimates might be provided in real time via the webtool to guide treatment decisions.

Most analyses in this report are descriptive, presented as simple tables and bar charts. Statistical analysis was performed using:

- *Kruskal-Wallis one-way analysis of variance*: to assess for differences in non-parametric distributions of data between multiple groups.
- *Pearson's $\chi^2$ test*: to assess for associations between categorical variables, including multi-option categorical variables.

### Changes to the NELA dataset during the first year of patient data collection

In response to feedback from participants, operative urgency category options were changed on 5 April 2014. The two P-POSSUM urgency categories (surgery required within two hours and surgery required within 24 hours) were substituted with the following in which the second category was subcategorised in order to enhance clinical detail for subsequent analyses:

1 – Immediate (<2 hours)
2A – Urgent (2–6 hours)
2B – Urgent (6–18 hours)
3 – Expedited (>18 hours)

While this change increased the available level of detail, it was necessary to remove patients entered before this date from analyses of delivery of processes of care by operative urgency categories. This explains the smaller denominators presented for these analyses throughout this Report.

It should be noted that this change has not impacted upon calculation of P-POSSUM predicted 30-day mortality.

### Changes to the NELA dataset preceding the second year of patient data collection

Several enhancements of the webtool were implemented in response to participant feedback. Details can be found on the NELA website: www.nela.org.uk/Year-2-Dataset-Changes#pt.

# APPENDIX 5
# RECOMMENDATIONS OF THE NELA ORGANISATIONAL AUDIT

### What facilities are required?

Hospitals should review the adequacy of their own facilities and infrastructure, to ensure that individual Standards of care are met and that the care of emergency laparotomy patients is appropriately prioritised. Participation in the ongoing patient data collection will allow this to be assessed.

1 Hospitals should ensure 24-hour access to fully-staffed operating theatres, so that surgery can take place without undue delay.

2 Surgical staffing levels should be sufficient to safely cover acute and inpatient clinical workloads. A four-tier surgical rota is recommended.

3 Consultant anaesthetists must be available to provide direct care at all times. During daytime hours, this is facilitated by ensuring that emergency theatres are staffed by consultant anaesthetists with job-planned sessions.

4 Critical care and outreach services need to be staffed at adequate levels to ensure 24-hour specialist input.

5 Emergency and elective surgical workload should be organised within a hospital, so that the care of EGS patients may be appropriately prioritised without competition for facilities from the elective workload. Hospitals should explore which models of care are most appropriate for local circumstances.

6 A sustained multidisciplinary effort is required to provide 24-hour interventional radiology, this is essential for units providing an EGS service.

7 Every hospital providing emergency laparotomy care should ensure 24-hour availability of essential support services, including experienced radiology and pathology reporting.

8 Routine daily input from elderly medicine should be available to elderly patients undergoing emergency laparotomy.

9 Pathways for the care of unscheduled surgical patients and for the early identification and management of sepsis should be universally incorporated into the routine care of all EGS patients. Pathways facilitate the reliable delivery of optimal care to all emergency laparotomy patients.

### Action by multidisciplinary teams

10 Multidisciplinary reviews of processes and patient outcomes (Morbidity and Mortality meetings) should be held for all emergency laparotomy patients. This is a basic requirement of professional practice.

11 Structured handover of care is required at all times by all clinicians treating emergency laparotomy patients. This is a basic requirement of professional practice.

## Who needs to be involved in improving quality of care?

### 1 Local clinical teams

Some of these issues may be addressed within the hospital by teams with direct responsibility for providing clinical care. In many cases, this will require a co-ordinated multidisciplinary approach in order to determine why a particular element of care is not available or not provided. This will also need to include the relevant medical managers, supported by local quality improvement/service improvement teams. Specialties that need to be involved include:

- Surgery.
- Anaesthesia.
- Critical Care.
- Radiology.
- Endoscopy.
- Pathology.
- Elderly Medicine.

### 2 Commissioners and trust boards

Some areas will require discussion at a higher level, as additional services may need to be commissioned in order to meet Standards. Some solutions may require the pooling of local resources and development of networks with other hospitals. This is particularly relevant where the workload for an individual hospital is insufficient to sustain a service in its own right, or where minimum numbers of clinicians are required in order to provide sustainable rotas.

# APPENDIX 6
# OVERVIEW OF HOSPITAL EPISODE STATISTICS (HES)

The Hospital Episode Statistics (HES) database contains information about patients admitted to National Health Service (NHS) hospitals in England since 1989, and collects data on more than 12 million hospital admissions each year. A unique patient identifier is used to link admissions by the same patient, enabling patterns of hospital care to be described prior to, during and after an index admission for emergency abdominal surgery (also referred to as emergency laparotomy).

Each HES record contains information about the time spent by a patient under the management of a consultant, and is referred to as an 'Episode'. This will represent a patient's entire hospital admission if they only spent time under one consultant/speciality, but patients who move between consultants/specialties during their hospital admission will have a record for each move. The entire period of time between admission and discharge is referred to as a 'Spell'. Each record contains fields that describe the combination of episodes within a spell, such as patient diagnosis (conditions), investigations/operations performed, the sequence of these events and length of hospital stay.

The operative procedures (operations, radiological investigations etc) that a patient undergoes are described using the Office of Population Censuses and Surveys (OPCS) classification of procedures (Version 4). Currently up to 24 OPCS codes can be recorded in a record, with the first field (opertn_01) containing the most resource-intensive procedure. Subsequent fields contain secondary procedures, which may not be listed in date order. Procedure codes may be accompanied by codes describing the location and/or side of a procedure or other information about the operation.

A patient's medical conditions are captured using International Classification of Diseases (ICD-10) diagnosis codes, and currently up to twenty can be recorded. The first diagnosis field (diag_01) in a record holds the primary diagnosis for that episode. Other fields can be used to capture co-morbidities (other conditions the patient has) or complications (problems that have arisen during treatment), but in many cases, there is no simple way to distinguish between the two, e.g. a stroke could relate to a co-morbidity or complication.

### Case ascertainment

The patients covered by NELA have surgery for many different problems and can undergo a wide variety of surgical procedures. Their surgery may be performed as the primary operation within a hospital admission, or be a re-operation after another procedure (elective or emergency). Unlike other National Clinical Audits, where the expected number of cases can be defined using a small number of ICD-10 or OPCS codes, the number of problems or operations included in NELA means that a much larger combination of codes is required to identify eligible cases within HES.

In order to establish the expected number of emergency laparotomy cases at each hospital, we designed an algorithm (a system of rules) to find relevant patients in HES. The number of cases found nationally/at individual hospitals in HES was considered to be the expected number of cases, and used as the denominator to provide an indication of the proportion of expected cases submitted to NELA – the case ascertainment.

### Creating the algorithm to identify procedures in hes that matched the NELA criteria

Our aim was to devise an algorithm consistent with the NELA inclusion criteria:

- patients aged 18 years or over who had a major emergency abdominal procedure on the GI tract (excluding trauma and transplant patients).
- patients who had multiple procedures within the abdominal cavity during the same emergency theatre visit are included if one was an eligible major procedure on the GI tract (e.g. bowel resection).
- patients who returned to theatre for an emergency laparotomy are included, even if the original operation was not eligible (e.g. an elective procedure).

We obtained an extract of HES data that included all admissions whose procedure fields contained an OPCS code related to abdominal surgery for patients discharged from English NHS hospitals over the six-year period between 1 April 2006 and 31 March 2012.

### Overview of the algorithm

The algorithm follows a number of sequential steps.

1. Records were excluded if the operation fields did not contain any OPCS codes that corresponded to a potentially valid emergency laparotomy procedure.
2. The date and OPCS code(s) of the earliest surgical procedure(s) within an admission were found. This step ignored OPCS codes that identified diagnostic radiological procedures (e.g. CT scan), incidental procedures (e.g. catheter, central line and mechanical ventilation) and OPCS codes entered as qualifiers of the operation (anatomical site, side of operation, method of operation).
3. The algorithm classified the earliest procedures as eligible or ineligible according to a series of rules that combined criteria on whether the OPCS codes corresponded to an emergency laparotomy, the urgency of hospital admission and the primary diagnosis. As the time of operation is not captured in HES, it was assumed that all procedures that occurred on the same date were performed during the same theatre visit.
4. The algorithm then identified the next two valid emergency laparotomy OPCS codes occurring after the earliest operation date within the spell.
5. If the earliest surgical procedures within the spell contained an eligible procedure, it was classified as a primary emergency laparotomy. If the earliest surgical procedures were not eligible but the subsequent procedures were, the spell was classified as a re-operation emergency laparotomy. The spell was excluded if the sequence of procedures did not contain a valid procedure.

### OPCS and ICD-10 code groupings

Valid OPCS codes were grouped into categories of emergency laparotomy based on the 'Main Procedure' field in the NELA dataset. Categories and rankings are described in the following tables.

Some patients undergo two or more procedures on the same date. In some situations, records have OPCS codes that both appear on the NELA procedure list, e.g. bowel resection and adhesiolysis; in others, an emergency laparotomy may be paired with a major procedure that is not within the scope of NELA, e.g. abdominal aortic aneurysm (AAA) repair and irrigation of peritoneal cavity. To determine whether records with combinations of operations should be included, we ranked the valid emergency laparotomy procedures by placing their OPCS codes into one of three tiers (A, B, C), according to the perceived severity of their insult to the patient. The ranked tiers are as follows:

- A: procedures involving excision of all/part of an organ (stomach/bowel) or repair of a perforation.
- B: procedures involving some form of bowel incision.
- C: any other procedure in the emergency laparotomy OPCS code list, e.g. drainage, washout.

In most cases, all procedures within a category have the same rank, but this is not always the case. A fourth tier (D) was defined for procedure codes which were not included in the list of valid emergency laparotomy procedures, but could result in an emergency laparotomy, e.g. AAA repair.

The algorithm then allocated records with multiple emergency laparotomy procedures occurring on the same date as follows:

- Records that contained OPCS codes for tier A and tiers B and/or C were allocated to the tier A group, e.g. a record with OPCS codes for bowel resection, stoma formation and washout was grouped into the category for bowel resection (tier A).
- Records that contained OPCS codes for tiers B and C were allocated to the tier B group, e.g. a record with OPCS codes for stoma formation and washout was grouped into the stoma formation category (tier B).

The 'Indication for surgery' field in the NELA dataset was used as the starting point to form groups of ICD-10 codes that frequently appeared in the diag_01 field of episodes containing valid emergency laparotomy OPCS codes (below).

The tier rankings were used to refine the eligibility criteria by distinguishing between three types of diagnostic category:

1. The first group corresponded to diagnoses that described operative episodes that were always eligible
2. The second group of diagnoses defined records that would only be eligible when the earliest procedure was in the A/B group
3. The third group of diagnoses defined records which would only be eligible as a re-operation (valid emergency laparotomy procedure occurring after an ineligible procedure).

Records with procedures for which the primary diagnosis was appendicitis or a gallbladder condition were ineligible except if the record contained an emergency laparotomy procedure in tier A, e.g. bowel resection.

Finally, records were labelled as eligible if it met the following criteria:

- Hernia repair OPCS code in combination with A and/or B tier procedure.
- Hernia diagnosis code in combination with A and/or B tier procedure.
- 'Clearance of pelvis' (OPCS code X14) in combination with A and/or B tier procedure.
- Obstruction diagnosis in combination with an A/B tier procedure or adhesiolysis.
- 'Other abdominal' tier D procedure code in combination with A and/or B tier procedure.

Records were labelled as ineligible if it met the following criteria:

- Ineligible diagnosis: ICD-10 codes for AAA/aortic dissection, liver conditions, ascites, pancreatic disease, ineligible cancers and ineligible peptic ulcer/hernia.
- 'Clearance of pelvis' (OPCS code X14) in combination with a C tier procedures.
- Hernia repair code with a C tier procedure.
- 'Other abdominal' tier D procedure with a C tier procedure.

**Limitations to the algorithm:**

Due to the nature of HES data, we had to make the following assumptions:

- That elective/emergency admissions are coded correctly.
- That multiple procedures listed on the same date occurred during the same visit to theatre.
- That the initial procedure during an emergency admission was performed as an emergency procedure.
- That subsequent procedures during any admission are emergency procedures and not planned follow-up procedures.
- Where multiple procedures with an equivalent ranking are listed on the same date, the one with the lowest operation number is the most important procedure.
- That the first ICD-10 code (diag_01) in the episode of care during which the first operation occurred is an accurate description of the reason for the patient undergoing an emergency laparotomy.

These assumptions may mean that our expected number of cases is not always correct. We plan to link the NELA patient data to inpatient HES data for the same time period. This will enable us to find out how accurate our method of finding emergency laparotomy cases in HES is, to make improvements where required, and to improve the accuracy of case ascertainment reporting.

## Procedure categories and groupings for the first operation

| Procedure category from NELA dataset | OPCS code | OPCS Description | Comment | Operation Group |
|---|---|---|---|---|
| 1. Peptic ulcer – suture or repair of perforation | G35 | Operations on ulcer of stomach | | A |
| | G52 | Operations on ulcer of duodenum | except G523 | A |
| 2. Peptic ulcer oversew of bleed | G523 | Oversew of blood vessel of duodenal ulcer | | A |
| 3. Gastric surgery – other | G01 | Excision of oesophagus and stomach | | A |
| | G27 | Total excision of stomach | | A |
| | G28 | Partial excision of stomach | | A |
| | G29 | Open extirpation of lesion of stomach | | A |
| | G36 | Other repair of stomach | | A |
| | G38 | Other open operations on stomach | | A |
| 4. Small bowel resection | G49 | Excision of duodenum | | A |
| | G58 | Excision of jejunum | | A |
| | G69 | Excision of ileum | | A |
| 5. Colectomy: left (including anterior resection) | H09 | Excision of left hemicolon | | A |
| | H10 | Excision of sigmoid colon | | A |
| | H33 | Excision of rectum | except H335 | A |
| 6. Colectomy: right | H06 | Extended excision of right hemicolon | | A |
| | H07 | Other excision of right hemicolon | | A |
| | H08 | Excision of transverse colon | | A |
| 7. Colectomy: subtotal | H11 | Other excision of colon | | A |
| | H29 | Subtotal excision of colon | | A |
| 8. Colorectal resection (other) | H04 | Total excision of colon and rectum | | A |
| | H05 | Total excision of colon | | A |
| | H66 | Therapeutic operations on ileoanal pouch | | A |
| 9. Hartmann's procedure | H335 | Rectosigmoidectomy and closure of rectal stump and exteriori | | A |
| 20. Abdominal wall closure | T28 | Other repair of anterior abdominal wall | | C |
| 22. Adhesiolysis | T412 | Division of band of peritoneum | | C |
| | T413 | Freeing of adhesions of peritoneum | | C |
| | T415 | Freeing of extensive adhesions of peritoneum | | C |
| 23. Drainage of abscess/collection | T34 | Open drainage of peritoneum | | C |
| 24. Exploratory/ relook laparotomy only | T30 | Opening of abdomen | | C |

| Procedure category from NELA dataset | OPCS code | OPCS Description | Comment | Operation Group |
|---|---|---|---|---|
| 26. Intestinal bypass | G31 | Connection of stomach to duodenum | | B |
| | G32 | Connection of stomach to transposed jejunum | | B |
| | G33 | Other connection of stomach to jejunum | except G334 | B |
| | G51 | Bypass of duodenum | | B |
| | G61 | Bypass of jejunum | | B |
| | G71 | Bypass of ileum | | B |
| | G72 | Other connection of ileum | | B |
| | H13 | Bypass of colon | | B |
| 28. Repair of intestinal perforation | G532 | Closure of perforation of duodenum NEC | | A |
| | G633 | Closure of perforation of jejunum | | A |
| | G784 | Closure of perforation of ileum | | A |
| 30. Stoma formation | G601 | Creation of jejunostomy | | B |
| | G74 | Creation of artificial opening into ileum | | B |
| | H141 | Tube caecostomy | | B |
| | H151 | Loop colostomy | | B |
| | H152 | End colostomy | | B |
| 31. Stoma revision | G334 | Open reduction of intussusception of gastroenterostomy | | B |
| | G602 | Refashioning of jejunostomy | | B |
| | G603 | Closure of jejunostomy | | B |
| | G608 | Other specified artificial opening into jejunum | | B |
| | G609 | Unspecified artificial opening into jejunum | | B |
| | G733 | Resection of ileostomy | | B |
| | G75 | Attention to artificial opening into ileum | | B |
| | H142 | Refashioning of caecostomy | | B |
| | H143 | Closure of caecostomy | | B |
| | H148 | Other specified exteriorisation of caecum | | B |
| | H149 | Unspecified exteriorisation of caecum | | B |
| | H153 | Refashioning of colostomy | | B |
| | H154 | Closure of colostomy | | B |
| | H155 | Dilation of colostomy | | B |
| | H156 | Reduction of prolapse of colostomy | | B |
| | H158 | Other specified other exteriorisation of colon | | B |
| | H159 | Unspecified other exteriorisation of colon | | B |
| 32. Washout only | T463 | Irrigation of peritoneal cavity | | C |

| Procedure category from NELA dataset | OPCS code | OPCS Description | Comment | Operation Group |
|---|---|---|---|---|
| 99. Other | G531 | Open biopsy of lesion of duodenum | | B |
| | G533 | Open removal of foreign body from duodenum | | B |
| | G535 | Incision of duodenum NEC | | B |
| | G536 | Correction of malrotation of duodenum | | B |
| | G538 | Other specified open operations on duodenum | | B |
| | G539 | Unspecified open operations on duodenum | | B |
| | G631 | Open biopsy of lesion of jejunum | | B |
| | G632 | Incision of jejunum | | B |
| | G638 | Other specified open operations on jejunum | | B |
| | G639 | Unspecified open operations on jejunum | | B |
| | G701 | Excision of meckel's diverticulum | | B |
| | G702 | Excision of lesion of ileum NEC | | B |
| | G703 | Open destruction of lesion of ileum | | B |
| | G708 | Other specified open extirpation of lesion of ileum | | B |
| | G709 | Unspecified open extirpation of lesion of ileum | | B |
| | G731 | Revision of anastomosis of ileum | | B |
| | G732 | Closure of anastomosis of ileum | | B |
| | G734 | Resection of ileo-colic anastomosis | | B |
| | G738 | Other specified attention to connection of ileum | | B |
| | G739 | Unspecified attention to connection of ileum | | B |
| | G76 | Intra-abdominal manipulation of ileum | | B |
| | G781 | Open biopsy of lesion of ileum | | B |
| | G782 | Strictureplasty of ileum | | B |
| | G783 | Removal of foreign body from ileum | | B |
| | G785 | Exclusion of segment of ileum | | B |
| | G788 | Other specified other open operations on ileum | | B |
| | G789 | Unspecified open operations on ileum | | B |
| | H12 | Extirpation of lesion of colon | | B |
| | H16 | Incision of colon | | B |
| | H17 | Intra-abdominal manipulation of colon | | B |
| | H19 | Other open operations on colon | | B |
| | T36 | Operations on omentum | | C |
| | T411 | Open biopsy of lesion of peritoneum NEC | | C |
| | T414 | Open removal of foreign body from peritoneum | | C |
| | T418 | Other specified open operations on peritoneum | | C |
| | T419 | Unspecified open operations on peritoneum | | C |

## Diagnostic categories

### a Any admission with these diagnoses in the operative episode are eligible

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Infection | A04 | Other bacterial intestinal infections |
| | A183 | Tuberculosis of intestines, peritoneum and mesenteric glands |
| | A41 | Other septicaemia |
| Gastric Cancer | C16 | Malignant neoplasm of stomach |
| Bowel Cancer | C17 | Malignant neoplasm of small intestine |
| | C18 | Malignant neoplasm of colon |
| | C19 | Malignant neoplasm of rectosigmoid junction |
| | C20 | Malignant neoplasm of rectum |
| | C260 | Malignant neoplasm of intestinal tract, part unspecified |
| | C268 | Malignant neoplasm, overlapping lesion of digestive system |
| | C269 | Malignant neoplasm of ill-defined sites within digestive system |
| Other Cancer | C48 | Malignant neoplasm of retroperitoneum and peritoneum |
| | C56 | Malignant neoplasm of ovary |
| | C76 | Malignant neoplasm of other and ill-defined sites |
| | C77 | Secondary and unspecified malignant neoplasm of lymph nodes |
| | C78 | Secondary malignant neoplasm of respiratory and digestive organs |
| | C80 | Malignant neoplasm without specification of site |
| | C81 | Hodgkin's disease |
| | C82 | Follicular [nodular] non-Hodgkin's lymphoma |
| | C83 | Diffuse non-Hodgkin's lymphoma |
| | C85 | Other and unspecified types of non-Hodgkin's lymphoma |
| | D37 | Neoplasm of uncertain or unknown behaviour of oral cavity and digestive organs |
| | D48 | Neoplasm of uncertain or unknown behaviour of other and unspecified sites |
| Peptic ulcer | K25 | Gastric ulcer |
| | K26 | Duodenal ulcer |
| | K27 | Peptic ulcer, site unspecified |
| | K28 | Gastrojejunal ulcer |

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Hernia | K400 | Bilateral inguinal hernia with obstruction without gangrene |
| | K401 | Bilateral inguinal hernia, with gangrene |
| | K403 | Unilateral or unspecified inguinal hernia with obstruct without gangrene |
| | K404 | Unilateral or unspecified inguinal hernia, with gangrene |
| | K410 | Bilateral femoral hernia, with obstruction, without gangrene |
| | K411 | Bilateral femoral hernia, with gangrene |
| | K413 | Unilateral or unspecified femoral hernia with obstruct without gangrene |
| | K414 | Unilateral or unspecified femoral hernia, with gangrene |
| | K420 | Umbilical hernia with obstruction, without gangrene |
| | K421 | Umbilical hernia with gangrene |
| | K430 | Ventral hernia with obstruction, without gangrene |
| | K431 | Ventral hernia with gangrene |
| | K450 | Other specified abdominal hernia with obstruct without gangrene |
| | K451 | Other specified abdominal hernia with gangrene |
| | K460 | Unspecified abdominal hernia with obstruction without gangrene |
| | K461 | Unspecified abdominal hernia with gangrene |
| Crohn's disease | K50 | Crohn's disease [regional enteritis] |
| Ulcerative colitis | K51 | Ulcerative colitis |
| Bowel ischaemia | K55 | Vascular disorders of intestine |
| Volvulus | K562 | Volvulus |
| CEU Diagnosis Group | ICD-10 code | Description |
| Adhesions | K565 | Intestinal adhesions [bands] with obstruction |
| | K660 | Peritoneal adhesions |
| | N736 | Female pelvic peritoneal adhesions |
| | N994 | Postprocedural pelvic peritoneal adhesions |
| Other obstruction | K560 | Paralytic ileus |
| | K561 | Intussusception |
| | K563 | Gallstone ileus |
| | K564 | Other impaction of intestine |
| | K566 | Other and unspecified intestinal obstruction |
| | K567 | Ileus, unspecified |
| | K59 | Other functional intestinal disorders |
| | T18 | Foreign body in alimentary tract |

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Peritonitis | K63 | Other diseases of intestine |
| | K65 | Peritonitis |
| | K661 | Haemoperitoneum |
| | K668 | Other specified disorders of peritoneum |
| | K669 | Disorder of peritoneum, unspecified |
| Haemorrhage | K92 | Other diseases of digestive system |
| | R58 | Haemorrhage, not elsewhere classified |
| Complications | K91 | Postprocedural disorders of digestive system NEC |
| | T81 | Complications of procedures, not elsewhere classified |
| | T85 | Complications of other internal prosthetic devices implants and grafts |
| Diverticulitis | K57 | Diverticular disease of intestine |
| Miscellaneous | D12 | Benign neoplasm of colon, rectum, anus and anal canal |
| | D17 | Benign lipomatous neoplasm |
| | D20 | Benign neoplasm soft tissues of retroperitoneum and peritoneum |
| | K31 | Other diseases of stomach and duodenum |
| | K52 | Other noninfective gastroenteritis and colitis |
| | K62 | Other diseases of anus and rectum |
| | N321 | Vesicointestinal fistula |
| | N822 | Fistula of vagina to small intestine |
| | N823 | Fistula of vagina to large intestine |
| | N824 | Other female intestinal-genital tract fistulae |
| | Q43 | Other congenital malformations of intestine |
| | R10 | Abdominal and pelvic pain |
| | R19 | Other symptoms and signs involving digestive system and abdomen |
| | Z43 | Attention to artificial openings |

## b Admissions with these diagnoses in the operative episode are eligible when the first procedure is in the A/B group

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Ineligible Cancers | C21 | Malignant neoplasm of anus and anal canal |
| | C22 | Malignant neoplasm of liver and intrahepatic bile ducts |
| | C23 | Malignant neoplasm of gallbladder |
| | C24 | Malignant neoplasm of other and unspecified parts biliary tract |
| | C25 | Malignant neoplasm of pancreas |
| | C261 | Malignant neoplasm of spleen |
| | C51 | Malignant neoplasm of vulva |
| | C52 | Malignant neoplasm of vagina |
| | C53 | Malignant neoplasm of cervix uteri |
| | C54 | Malignant neoplasm of corpus uteri |
| | C55 | Malignant neoplasm of uterus, part unspecified |
| | C57 | Malignant neoplasm of other and unspecified female genital organs |
| | C60 | Malignant neoplasm of penis |
| | C61 | Malignant neoplasm of prostate |
| | C62 | Malignant neoplasm of testis |
| | C64 | Malignant neoplasm of kidney, except renal pelvis |
| | C65 | Malignant neoplasm of renal pelvis |
| | C66 | Malignant neoplasm of ureter |
| | C67 | Malignant neoplasm of bladder |
| | C68 | Malignant neoplasm of other and unspecified urinary organs |
| | D30 | Benign neoplasm of urinary organs |
| | D41 | Neoplasm of uncertain or unknown behaviour of urinary organs |
| | D73 | Diseases of spleen |
| Ascites | R18 | Ascites |
| Gynaecological/ Obstetric | Nx | All remaining 'N' codes |
| | O | All codes |

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Ineligible Hernias | K402 | Bilateral inguinal hernia, without obstruction or gangrene |
| | K409 | Unilateral or unspecified inguinal hernia without obstruction or gangrene |
| | K412 | Bilateral femoral hernia, without obstruction or gangrene |
| | K419 | Unilateral or unspecified femoral hernia without obstruction or gangrene |
| | K429 | Umbilical hernia without obstruction or gangrene |
| | K439 | Ventral hernia without obstruction or gangrene |
| | K458 | Other specified abdominal hernia without obstruction or gangrene |
| | K469 | Unspecified abdominal hernia without obstruction or gangrene |
| Not classified | All remaining codes not mentioned above | |

## c Admissions with these diagnoses in the operative episode are eligible only as a re-operation to an ineligible procedure

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Oesophageal disease | C15 | Malignant neoplasm of oesophagus |
| | D00 | Carcinoma in situ of oral cavity, oesophagus and stomach |
| | D13 | Benign neoplasm of other and ill-defined parts of digestive system |
| | I85 | Oesophageal varices |
| | I982 | Oesophageal varices in diseases classified elsewhere |
| | K20 | Oesophagitis |
| | K21 | Gastro-oesophageal reflux disease |
| | K22 | Other diseases of oesophagus |
| | K23 | Disorders of oesophagus in diseases classified elsewhere |
| | Q39 | Congenital malformations of oesophagus |
| | T28 | Burn and corrosion of other internal organs |
| AAA/Aortic dissection | I71 | Aortic aneurysm and dissection |
| | I72 | Other aneurysm |
| | I790 | Aneurysm of aorta in diseases classified elsewhere |
| Pancreatic disease | K85 | Acute pancreatitis |
| | K86 | Other diseases of pancreas |
| Liver conditions | K70 | Alcoholic liver disease |
| | K71 | Toxic liver disease |
| | K72 | Hepatic failure, not elsewhere classified |
| | K73 | Chronic hepatitis, not elsewhere classified |
| | K74 | Fibrosis and cirrhosis of liver |
| | K75 | Other inflammatory liver diseases |
| | K76 | Other diseases of liver |
| | K77 | Liver disorders in diseases classified elsewhere |
| | R16 | Hepatomegaly and splenomegaly, not elsewhere classified |
| | R17 | Unspecified jaundice |

| CEU Diagnosis Group | ICD-10 code | Description |
|---|---|---|
| Renal disease | N0 | All codes |
| | N1 | All codes |
| | N2 | All codes |
| | N3 | All codes |
| | N990 | Postprocedural renal failure |
| | N991 | Postprocedural urethral stricture |
| | N995 | Malfunction of external stoma of urinary tract |
| | N998 | Other postprocedural disorders of genitourinary system |
| | N999 | Postprocedural disorder of genitourinary system, unspecified |
| Male | N4 | All codes |
| | N5 | All codes |
| Trauma | S | All codes |

# APPENDIX 7
# GOVERNANCE AND ORGANISATIONAL ARRANGEMENTS FOR NELA

## Project board

The Project Board oversees the strategic direction and is responsible for monitoring all aspects of delivery of the project by the Project Team and sub-contractors, and is accountable to the stakeholder organisations.

**Chair**

Dr William Harrop-Griffiths, Consultant Anaesthetist and Honorary Senior Lecturer, Imperial College Healthcare NHS Trust

**Members**

Ms Lauren Osborne, patient representative
Miss Gillian Tierney, Association of Surgeons of Great Britain and Ireland (ASGBI)
Dr Liam Brennan, Royal College of Anaesthetists representative (RCoA)
Dr David Cromwell, Royal College of Surgeons of England – Clinical Effectiveness Unit Trustee
Ms Lucy Lloyd-Scott, Intensive Care National Audit and Research Centre (ICNARC)
Dr Yvonne Silove, Health Quality Improvement Partnership (HQIP)
Mr Daniel Devitt, Health Quality Improvement Partnership (HQIP)

## Project team

The NELA Project Team is responsible for the ongoing delivery of the project.

**Chair**

Professor Mike Grocott, Director NIAA Health Services Research Centre, Consultant in Anaesthesia and Critical Care Medicine, University Hospital Southampton

**NELA National Clinical Lead**

Dr Dave Murray, Consultant Anaesthetist, James Cook University Hospital, Middlesbrough

**Members**

Mr Iain Anderson, NELA Surgical Advisor (Association of Surgeons of Great Britain and Ireland)
Mr Martin Cripps (Netsolving)
Dr David Cromwell, NELA Methodologist (Royal College of Surgeons of England)
Mrs Emma Davies, Surgical Research Fellow
Ms Sharon Drake, RCoA Director of Education and Research
Dr Angela Kuryba, Statistician (Royal College of Surgeons of England)
Mr Jose Lourtie, NELA Project Administrator
Dr Ramani Moonesinghe, UCLH/UCL CBRC

Dr Matt Oliver, Research Fellow (Health Services Research Centre)
Mr Dimitri Papadimitriou, NELA Research Team Administrator
Dr Carol Peden, NELA Quality Improvement Lead (Royal United Hospital Bath)
Dr Kate Walker, Statistician (Royal College of Surgeons of England)

## Clinical Reference Group (CRG)

All relevant clinical professional and specialty stakeholders have direct input into the design and conduct of this audit. The Clinical Reference Group consists of representatives from partner organisations as well as other stakeholders, including patients. The CRG acts in an advisory capacity to the Project Team, providing specialty-specific advice, and lay advice as appropriate. CRG meetings are chaired by Professor Mike Grocott and are attended by members of the Project Team.

### List of organisations and members

**Age Anaesthesia Association (AAA)**
Dr Irwin Foo, Honorary President, Age Anaesthesia Association

**The Association of Anaesthetists of Great Britain and Ireland (AAGBI)**
Dr Richard Griffiths, Honorary Secretary AAGBI

**The Association for Perioperative Practice (AfPP)**
Ms Jenny Abraham, Perioperative Specialist Laparoscopic Nurse Practitioner

**The Association of Surgeons of Great Britain and Ireland (ASGBI)**
Mr Iain Anderson, Executive Board Member, ASGBI
Mr Nicholas Markham, Executive Board Member, ASGBI

**British Geriatric Society (BGS)**
Dr Jugdeep Dhesi, Chair of BGS Perioperative Care of Older People Undergoing Surgery (POPS)

**Emergency Laparotomy Network (ELN)**
Dr Simon Varley, Chair, Emergency Laparotomy Network
Dr David Saunders, Secretary, Emergency Laparotomy Network

**The Faculty of Intensive Care Medicine (FICM)**
Dr Diane Monkhouse, Consultant in Anaesthesia and Critical Care

**The Intensive Care Society (ICS)**
Dr Andy Rhodes, Council Member, The Intensive Care Society

**Quality Observatories**
Dr Gary Cook, Consultant Epidemiologist

**The Royal College of Anaesthetists (RCoA)**
Dr Liam Brennan, Vice-President, RCoA
Dr Hywel Jones, Consultant Anaesthetist

**The Royal College of Nursing (RCN)**
Mr J P Nolan, Nurse Adviser in Acute, Emergency and Critical Care

**The Royal College of Radiologists (RCR)**
Dr Richard Wright, Radiology Audit Committee member

**The Royal College of Surgeons of England (RCS)**
Mr John Abercrombie, Council Member, Royal College of Surgeons of England
Mr Nicholas Lees, Consultant General and Colorectal Surgeon
Mr Mike Parker, Council Member, Royal College of Surgeons of England

**UK Clinical Director Network**
Dr Mike Nevin, National Lead UK Clinical Director Network

**Commissioning representative**
Dr Mark Spencer, Medical Director for NHS North West London

**Patient representative – Elderly**
Mrs Joyce Colston

**Patient representative – Anaesthesia**
Ms Lauren Osborne

The National Emergency Laparotomy Audit
The Royal College of Anaesthetists
National Institute of Academic Anaesthesia
Health Services Research Centre

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