NELA
National Emergency Laparotomy Audit

ORGANISATIONAL REPORT OF THE NATIONAL EMERGENCY LAPAROTOMY AUDIT

The Royal College of Anaesthetists

NIAA National Institute of Academic Anaesthesia
HSRC Health Services Research Centre

RCS ADVANCING SURGICAL STANDARDS

HQIP Healthcare Quality Improvement Partnership

May 2014

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ISBN: 978-1-900936-07-1

Citation for this report:
NELA project team. First organisational report of the National Emergency Laparotomy Audit. RCoA London, 2014.

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Design and layout by the Royal College of Anaesthetists.

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Acknowledgements

The NELA project team and board would like to thank the clinical and non-clinical staff at all NHS trusts and Welsh health boards who collected and submitted data, for their hard work, leadership and continued enthusiasm.

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

We are pleased to be able to present this first report of the National Emergency Laparotomy Audit (NELA). This is a major step towards improving the quality of care delivered to patients undergoing emergency laparotomy. Concerns about the quality of care received by patients in this situation have been highlighted on many occasions over the past two decades. Multidisciplinary recommendations on standards of care have been written in the wake of a number of NCEPOD reports, showing adverse outcomes. Emergency laparotomy patients represent one of the highest risk groups undergoing surgery, and with over 30,000 procedures performed annually, the potential health impact of an even modest improvement will be substantial. Through the auspices of the NELA project, data will be available to facilitate a concerted effort to reduce morbidity and mortality.

The current report presents the results of an organisational audit comparing compliance against current standards on the infrastructure required for the best delivery of care. Emergency laparotomy is carried out at 191 hospitals in England and Wales, and 190 hospitals have provided data about their organisation of services. We are extremely grateful to the clinical and audit leads for their assistance in collating the data.

The primary focus of the audit is currently in progress, the collection of patient data about processes and pathways of care and outcomes following emergency laparotomy. It is essential that high quality data is collected in real-time using a web-based data collection platform. Hospitals' specific data is being made available on-demand, to inform local quality improvement programmes and help deliver the desired improvements in care quality.

Improving the quality of care delivered to patients undergoing emergency laparotomy requires a multidisciplinary approach. We envisage clinical and non-clinical colleagues working closely with each other across specialties to harness accurate data collection to bring about the much needed and desired improvements in the quality of care for this high-risk group of patients.

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EXECUTIVE SUMMARY

The National Emergency Laparotomy Audit (NELA) was established to examine the inpatient care and outcomes of patients undergoing emergency laparotomy in England and Wales and to then provide comparative data to hospitals, thereby promoting local quality improvement. The Audit was commissioned by the Healthcare Quality Improvement Partnership (HQIP), funded by NHS England and the Welsh Government and began in December 2012. The commissioning of NELA is a landmark in the ongoing 20 year journey to improve the quality of care that these patients receive. It represents a natural development of the work of the multidisciplinary Emergency Laparotomy Network (ELN) in highlighting the variation in quality of care and outcomes across NHS hospitals.

A proportion of emergency general surgical (EGS) patients have life-threatening intra-abdominal conditions requiring prompt investigation and management. Unlike elective presentations, there is often limited time in which to optimise these patients before surgery. Emergency laparotomy is a term used to describe the group of abdominal surgical procedures that are commonly performed at short notice to treat these conditions; there are, however, occasions when non-surgical intervention may be more appropriate.

Approximately 30,000 patients undergo an emergency laparotomy each year in England and Wales. Post-operative complications and death are unfortunately common; several studies in recent years have shown that 15% of all patients die within a month of having an emergency laparotomy, and that this varies by hospital and patient group.

Concerns about the quality of care received by patients requiring an emergency laparotomy have been raised repeatedly over the last 20 years. This has culminated in the publication of a variety of multidisciplinary recommendations and standards that are intended to safeguard the quality of care of all patients undergoing emergency laparotomy. These standards should be adhered to by every hospital where emergency laparotomy is performed (the full list of standards is shown in Appendix 1). These include:

- The timely review by a senior surgeon following admission.
- A formal assessment of risk of death.

- A pathway of defined peri-operative care.
- The prompt administration of antibiotics.
- The ready availability of diagnostic investigations.
- Prompt access to an operating theatre.
- Surgery performed under the direct care of a consultant surgeon and consultant anaesthetist.
- The admission of high-risk patients to a critical care unit following surgery.

Patient outcomes are generally improved with prompt investigation and treatment, which can only be achieved through the appropriate prioritisation of resources. The clinical pathway is complex, requiring input from clinicians across multiple specialties. This brings challenges in itself, both in terms of delivery of care on a day to day basis, and also bringing about long-term service improvement. Change will require co-ordinated improvement across multiple areas.

Emergency laparotomies are performed at 191 English and Welsh hospitals. All 191 hospitals have registered with NELA and identified clinical leads. In October 2013, 190 hospitals provided information regarding their structures and processes of care that relate to the treatment of patients undergoing emergency laparotomy. The high level of engagement with this audit is testament to the readiness of clinicians and managers across specialties to engage with this challenging issue.

These self-reported data indicated that the provision of facilities required to perform emergency laparotomy varies substantially between hospitals. Many hospitals meet several of the key recommended standards of care. However, in some cases, the organisation of services falls short of the recommended standards. As this Audit represents the first systematic assessment of these issues, this shortfall is perhaps understandable, and provides the opportunity to bring about much needed improvement.

The immediate availability of operating-theatre, imaging and laboratory facilities and of appropriately trained staff is fundamental to the prompt and effective care of emergency general surgical patients. However, 24-hour availability of these essential resources varies widely.

- Four out of five hospitals admitting unscheduled adult general surgical patients provide one or more fully staffed operating theatres in which emergency laparotomy may be performed at all times.
- 24-hour contemporaneous CT reporting is available at 9 out of 10 hospitals.
- 24-hour on-site interventional radiology (a non-surgical treatment) is not provided at two-thirds of hospitals.

- 24-hour on-site endoscopy (a non-surgical treatment) is available at two-thirds of hospitals.
- 24-hour availability of consultant advice for biochemistry, haematology and transfusion services is available at 9 out of 10 hospitals.

There are diverse models of clinical staffing and organisation of essential supporting clinical services. The recommended four-tier surgical EGS rota is in use at all times at less than half of hospitals; the number and type of consultant surgeons on the rota varies widely. The provision of consultant anaesthetists dedicated to emergency theatres varies by time of day and between institutions. During weekday daytime hours three-quarters of hospitals have dedicated consultant anaesthetist sessions to support operating theatres for EGS cases.

In addition to the prompt availability of these fundamental facilities and staff, patient outcomes are influenced by the treatments received and the timeliness with which they are delivered. Clear pathways have been developed for the care of the unscheduled surgical patient to facilitate timely senior review, formal assessment of risk, consultant-delivered peri-operative care and transfer to critical care. Such pathways have been implemented in only one-third of institutions, although pathways for severe infections (sepsis) are available at 84% of hospitals.

Half of the hospitals had recently audited the adequacy of emergency theatre provision. It is reassuring that all 191 hospitals have registered to provide the patient level data that is currently being collected.

Additional information about individual hospitals' provision is available in Appendix 2.

Hospitals are currently collecting data on individual patients and a report describing the patterns of care will be published in summer 2015. This report will provide comparative information on processes of care and outcomes at a hospital level. The data submitted to the Audit by a hospital is currently available to its clinicians and managers to download on-demand. This information can be used to inform local quality improvement programmes that can and should be implemented now. The responsibility for implementing these quality improvement programmes lies with local Clinical Commissioning Groups (CCGs) and Trust Boards, as well as clinical managers and front line clinicians across multiple specialties. We hope that the current high level of engagement for this difficult multidisciplinary topic will continue in order to bring about the required improvements in the quality of care received by patients requiring emergency laparotomy.

RECOMMENDATIONS

The provision of essential facilities and staff required for the high quality care of patients requiring emergency laparotomy does not meet current standards at many hospitals. This requires urgent action in order to ensure safe care is being delivered. We make 11 key recommendations to address this, and comment on who needs to be involved in improving quality of care.

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 which 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.

The importance of patient data collection

This organisational audit report does not provide patient level outcome data, and hence the interpretation of some data is limited. Patient level data is currently being collected and is available on-demand for hospitals to download in order to inform local quality improvement programmes. All hospitals should ensure full, ongoing participation in the collection of patient data for the National Emergency Laparotomy Audit. Regional Quality Observatories can play a role in the analysis and monitoring of care at hospital and regional level. Patient level data will also allow identification of hospitals with the best outcomes, in order that best practice may be shared throughout the NHS.

Care of the patient undergoing emergency laparotomy requires a multidisciplinary approach. All of these disciplines need to be involved in improving the quality of care delivered. We are reassured by the high level of engagement to date, which suggests that the existing concerns about emergency laparotomy care are appreciated by many others. We hope to see clinical and non-clinical colleagues working with each other across specialties to collect data and bring about improvements in the quality of care for this high-risk group of patients.

1 INTRODUCTION

The National Emergency Laparotomy Audit (NELA) was commissioned in 2011 by the Health Care Quality Improvement Partnership (HQIP), and funded by NHS England and the Welsh Government, to collect comparative information from all hospitals in England and Wales at which emergency laparotomy is performed. It is anticipated that these data will answer many questions concerning the relative contributions of patient and organisational factors to the high incidence of adverse outcomes and that the findings will subsequently inform improvements in the quality of care received by patients.

Adverse patient outcomes after emergency laparotomy (complications of surgery or death) may be associated with intrinsic patient risk factors and a variety of organisational factors. These may be classified as either the structural factors of a hospital or components of the process of care delivery.[2]

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 such as operating theatres, imaging and laboratories, treatment options may be limited and essential care delayed. This may increase the likelihood of post-operative morbidity and mortality. Essential provision for the safe delivery of an emergency laparotomy service has been specified in a variety of publications (Appendix 1).

Process factors are the treatments that are delivered and how they are delivered. This may include which clinical information is used to make treatment decisions, which operation is performed and how quickly it is started, how quickly antibiotics are given and whether they are given at all, and the seniority of the clinician who makes these decisions.

A variety of models of care may be used to deliver an emergency laparotomy service, and some of the variation found in this organisational audit may reflect this. However, the same standards of care still apply regardless of the model of care delivered, in order that high quality care can be reliably delivered in that hospital to all patients undergoing an emergency laparotomy.

In some cases, the adequacy of facilities provided can only be determined by whether clinical need is met at each hospital. This can only be assessed by collecting process and outcome data on individual patients.

This report presents the findings of the first NELA organisational audit, which was conducted in October 2013. The collected data relate to the provision of facilities and staff that are required for the delivery of emergency laparotomy at each of these hospitals and compares the organisation of care against national recommendations and standards of care. Where relevant, context is provided in this report to allow the exploration of inter-hospital variation in provision. Appendix 2, details each hospital's facilities, grouped by geographical region. Where shortfall is identified, recommendations are made and hospitals and commissioners should urgently review and address these. Additional guidance for commissioning for EGS is available.[3]

All hospitals have registered to provide patient-level data, the collection of which commenced in January 2014. This will provide comparative hospital-level data about processes of care and patient outcome. It will allow hospitals to determine whether they are providing care that meets recommended standards, and ultimately drive improvements in the quality of care received by patients requiring an emergency laparotomy.

2 BACKGROUND

Emergency laparotomy is a collective term that describes a heterogeneous group of unplanned intra-abdominal surgical procedures that are performed for a variety of indications, including the complications of elective surgery. Approximately 30,000 emergency laparotomies are performed annually in England and Wales. Post-operative morbidity and mortality are unfortunately common. Emergency laparotomy is responsible for a significant proportion of the total number of deaths that occur after both elective and unplanned general surgery.

Short-term mortality is consistent in the UK and US; 15% of all patients who undergo emergency laparotomy die within 30 days of surgery. The risk of death is substantially greater in some sub-groups, including the elderly and those with certain comorbidities[1,4–5] and mortality rates have also been demonstrated to vary by hospital.[1,4] It is likely that some of this variation is due to differences in the delivery of care.

Professional bodies have voiced concerns that the scale of the problem is widely under-appreciated, both by the public and by medical professionals and that EGS services are insufficiently resourced. Consequently, several national recommendations and standards of care have been published to help guide the appropriate provision of care (Appendix 1).

NELA was one of the top two (of 11) national clinical audits prioritised for immediate funding in response to the HQIP call for new national audit topic proposals in 2011. The contract to run NELA was awarded to the Royal College of Anaesthetists (RCoA) in June 2012. It is being run with significant input from the Clinical Effectiveness Unit of the Royal College of Surgeons of England. Additional technical advice is provided by the Intensive Care National Audit and Research Centre (ICNARC).

The aim of NELA is to improve the quality of care received by all patients undergoing emergency laparotomy. This will be achieved through the analysis and publication of high-quality comparative data from all providers of emergency laparotomy in England and Wales. As a nationally funded mandatory audit, every hospital that undertakes emergency laparotomy should participate. Quality of care will be assessed against standards drawn from a variety of publications (Appendix 1).

NELA commenced in December 2012 and is currently funded for three years, with the potential for a further two-year extension. It is delivered by a central project team based at the RCoA. Oversight is provided by a project board. The project team is advised by a multidisciplinary clinical reference group, consisting of key stakeholders including patient advisors. Governance and organisational arrangements for NELA are described in Appendix 3. In Year 1 an organisational audit was performed. Collection of patient level data commenced in January 2014 and will continue over two years. Process measures and risk-adjusted outcome data will be reported on an annual basis at hospital level. All patients over the age of 18 years who have a general surgical emergency laparotomy in an NHS hospital in England or Wales will be enrolled on a prospective basis. The audit will also support delivery of local quality improvement programmes by providing data on-demand to hospitals.

Additional information can be found at www.nela.org.uk.

3 METHODS

Identification of sites undertaking emergency laparotomy

In January 2013, the Audit approached 163 English NHS trusts and Welsh local health boards to ascertain which of their sites performed emergency laparotomy and were therefore eligible to participate in NELA. Responses were received from all NHS trusts and health boards, indicating that 191 hospitals were eligible to participate. Individual hospitals were then required to nominate lead clinicians and audit staff for local contact and co-ordination.

Non-NHS hospitals and hospitals in Scotland, Northern Ireland, the Republic of Ireland and the Channel Islands were also welcome to contribute to NELA, but HQIP funding arrangements extended only to coverage of England and Wales.

Development of the organisational audit questionnaire

The design of the audit questionnaire was informed by existing recommendations and national standards of care in which required and desirable facilities for the safe delivery of emergency laparotomy are specified (Appendix 1) and by existing health services research. A paper version of the audit questionnaire is provided in Appendix 4.

Oversight of the design and implementation of the organisational audit questionnaire was provided by the NELA project board and clinical reference group.

Data submission and analysis

Clinical and audit leads provided online responses to the organisational audit with assistance from appropriate staff, in order to obtain accurate information. Where data were evidently inconsistent, sites were contacted to afford them the opportunity to clarify or amend submitted data. However, hospitals were responsible for the accuracy of the results submitted to the Audit.

Throughout this report, results are presented alongside the relevant standard, and include the question as worded in the audit questionnaire.

Analysis and interpretation of data was performed centrally by the NELA project team and oversight was provided by the NELA project board and clinical reference group.

4 PARTICIPATION

Organisational data were received from 190 of 191 hospitals. One English hospital provided no data due to a planned reconfiguration of services with another site.

English sites: 176
Welsh sites: 14

This represents an extremely high level of engagement with the audit.

5 HOSPITAL CHARACTERISTICS

The characteristics of hospitals undertaking emergency laparotomy in England and Wales vary widely. Institutions range from small district general hospitals to large tertiary centres and include hospitals with no on-site acute general surgical intake. The facilities available within each of these hospitals may therefore be expected to vary accordingly. However, while a hospital's size and resources may account for differences in the structure of the delivery of care, minimum standards exist to ensure that safe care is delivered regardless of the hospital size and model of care used to provide an emergency laparotomy service (Appendix 1).

A variety of methods may be used to characterise an organisation's capacity and volume of work. Total number of hospital beds is an objective, readily-available marker of size that is used in this report for the exploration of differences in the provision of facilities and processes of care that are either fundamental to the safe delivery of emergency laparotomy or may be markers of the quality of care. Accordingly, hospital size is represented by the total number of hospital inpatient beds and characterised as quartiles.

Additional estimates of the number of emergency laparotomies performed at individual hospitals are provided. These were obtained from an analysis of recent Hospital Episodes Statistics (HES) data, the administrative hospital dataset that contains records for all admissions to English NHS hospitals. Emergency laparotomy cases were identified using a combination of International Classification of Diseases (ICD-10) diagnosis and Operating Procedure Code Supplement (OPCS) codes, to provide a 'basket' of codes that describe emergency laparotomy. Additional detail is given in Appendix 5. Data from the equivalent dataset for Welsh hospitals [known as Patient Episode Database for Wales (PEDW)] were not available for this report.

The minority of hospitals that undertake emergency laparotomy but do not accept acute general surgical admissions are presented separately from other sites (Chapter 11). These hospitals should also comply with minimum standards of care for the peri-operative management of patients undergoing emergency laparotomy, but facilities would be expected to differ from those of other hospitals due to their specialist nature.

a Acute general surgical admissions

Qu: Does your hospital accept acute general surgical admissions?

Of the 190 English and Welsh hospitals that responded to the organisational audit, 176 sites (93%) indicated that acute general surgical patients are admitted to their hospital at all times.

Characteristics of the 14 hospitals (7%) that did not accept acute general surgical admissions are detailed in Chapter 11. These sites are not otherwise included in the analysis and discussion of organisational data in Chapters 5–10.

b Size

Qu: How many adult inpatient or overnight beds (including 23-hours stay) are currently available within the hospital?

Total number of hospital beds is a convenient and well established marker of hospital size and correlates well with other markers of hospital size collected in this audit.

There was marked variation in the size of the 176 hospitals in England and Wales where emergency laparotomy is performed. The number of adult inpatient beds ranged from 64 to 1,179 beds, (median: 459, interquartile range (IQR): 368–649).

For the purposes of comparison and characterisation, hospitals have been classified into quartiles of size, according to number of adult inpatient beds:

	Number of hospitals	Range of hospital beds
Quartile 1	44	64–364
Quartile 2	43	371–457
Quartile 3	45	459–648
Quartile 4	44	649–1,179

c Emergency laparotomy workload

Data from HES demonstrate that the annual number of emergency laparotomy procedures undertaken by each hospital varies according to hospital size. These data are derived from the period April 2010 to March 2011 for a basket of operative codes for emergency laparotomy. The median number of emergency laparotomy procedures performed by English hospitals per year was 150 (IQR: 108–194). (Please note that the quartiles of hospital size in this table only include English hospitals owing to the lack of Welsh data).

	Quartile 1 64–364 beds (*n* = 38)	Quartile 2 371–457 beds (*n* = 41)	Quartile 3 459–648 beds (*n* = 41)	Quartile 4 649–1,179 beds (*n* = 44)	All sites (*n* = 163)
Number of emergency laparotomy procedures performed					
Range	25–208	67–205	71–316	119–358	**25–358**
Median (IQR)	108 (100–144)	140 (119–166)	173 (132–212)	209 (171–246)	**150 (108–194)**

d General surgical beds

Qu: How many adult inpatient or overnight beds (including 23-hours stay) are currently available within the hospital? Do not include day-case beds

Qu: How many of these beds are found on adult general surgical inpatient wards?

Larger hospitals had a greater total number of beds available for adult general surgical admissions, but these beds made up a smaller proportion of the total institutional beds in large hospitals than in smaller hospitals.

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Beds available to patients undergoing gastrointestinal surgery					
Range	0–153	24–154	27–150	26–303	**0–303**
Median (IQR)	58 (43–73)	67 (53–86)	72 (63–96)	89 (71–115)	**72 (54–91)**
Beds available to patients undergoing gastrointestinal surgery as a percentage of total hospital beds					
Range	0–100	5–35	6–30	2–27	**0–100**
Median (IQR)	20 (15–28)	16 (13–20)	14 (12–18)	10 (8–14)	**15 (11–20)**

At those hospitals where general surgery makes up a smaller proportion of total clinical workload there may be increased competition for timely access to facilities such as operating theatres and imaging. Highly performing large hospitals will recognise this potential shortfall and provide dedicated services for EGS.

e Specialist characteristics

Qu: Is your hospital a tertiary referral centre for any gastrointestinal surgical specialties?

Sixty hospitals (34%) reported that they were tertiary referral centres for gastrointestinal surgery. These are moderate to large institutions when characterised by the number of adult inpatient beds (range 258–1,179 beds, median [IQR]: 636 [460–935]).

6 FACILITIES

Adverse patient outcomes after emergency laparotomy (complications of surgery or death) may be associated with intrinsic patient risk factors and a variety of organisational factors.

Organisational factors include both the presence and prompt availability of hospital facilities and the appropriately trained personnel who are required to staff them.[2] Inadequate provision may increase the likelihood of adverse patient outcomes if treatment options are limited or essential care delayed.

Because a variety of models may be used to deliver an emergency laparotomy service, the provision of some facilities may be expected to vary between hospitals, reflecting differences in resources and the volume of work undertaken. However, other facilities are essential if EGS patients are to be safely treated. Recommendations as to which facilities are required for the delivery of high-quality care are specified in a variety of national publications (Appendix 1) and are referred to throughout this report in discussion of the findings of this organisational audit.

Subsequent analysis of NELA patient process and outcome data will improve understanding of the consequences of alternative models of care and the availability of staffed essential facilities.

a Operating theatre provision

i Number of operating theatres

Qu: How many operating theatres are at this hospital? Please exclude interventional radiology suites and dedicated obstetric and minor ops theatres, but include day-case theatres

The reported number of operating theatres increases with hospital size at those hospitals where emergency laparotomy is performed in England and Wales.

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Operating theatres					
Range	4–15	5–17	8–24	8–38	**4–38**
Median (IQR)	8 (7–10)	11 (8–13)	13 (11–16)	21 (17–26)	**12 (9–17)**
Operating theatres per 100 hospital beds					
Range	1.5–14.1	1.1–4.1	1.3–4.5	0.9–3.4	**0.9–14.1**
Median (IQR)	2.8 (2.4–3.4)	2.5 (1.9–3.0)	2.5 (2.0–3.0)	2.4 (2.0–2.8)	**2.5 (2.1–3.0)**

To assess adequacy of theatre provision, the number of operating theatres per 100 hospital beds may be calculated. Estimates by geographical region are 4.5 theatres per 100 beds in North America, 3.9 in Latin America and 2.6 in Europe.[6]

While many hospitals have two to three operating theatres per 100 hospital beds, there is evidence of considerable inter-hospital variation in theatre provision. This variation may mean that clinicians encounter difficulties in ensuring timely access to theatres for patients undergoing emergency laparotomy. The association of staffed theatre provision and patient outcomes will be analysed in the ongoing patient audit.

ii Staffed theatres

Timely treatment of EGS patients depends, in part, upon the immediate availability of facilities and appropriately trained staff. Where the provision of resources does not meet clinical requirements, this may result in delays to treatment.

Standards
All hospitals admitting emergency general surgical patients should have a dedicated, fully staffed, theatre available at all times for this clinical workload (ASGBI EGS)
Even in the smallest centres the principle of dedicated commitment to emergency general surgery still applies (ASGBI EGS)
Adequate emergency theatre time is provided throughout the day to minimise delays and avoid emergency surgery being undertaken out-of-hours when the hospital may have reduced staffing to care for complex post-operative patients (RCS USC)

Qu: In a usual week, what is the total number of fully staffed operating theatres available for adult general surgical emergency cases? (Trauma theatres were excluded)

Of these theatres, how many are reserved exclusively for emergency general surgical cases?

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
One or more fully staffed operating theatres available for adult EGS cases at all times					
	24 (55%)	31 (72%)	42 (93%)	40 (91%)	**137 (78%)**
One or more fully staffed operating theatres reserved exclusively for adult EGS cases at all times					
	9 (21%)	14 (33%)	15 (33%)	12 (27%)	**50 (28%)**

The minimum requirement to ensure the timely treatment of patients requiring emergency laparotomy is an operating theatre with a full complement of appropriately trained staff, which is available at all times and with minimal delay to receive patients.

There is considerable variation in the provision of staffed operating theatres for emergency laparotomy. While the results suggest greater emergency theatre capacity at larger hospitals, it should be remembered that adequacy of provision is determined by factors including emergency surgical workload and competition for theatre time from other surgical specialties, which may also be greatest at large sites.

Twenty-four hour availability of a fully staffed operating theatre for exclusive use by adult EGS cases may result in decreased competition for emergency theatre space and facilitate timely surgical intervention. These operating theatres were available in around 1 in 4 hospitals, and their provision appears to be unrelated to hospital size.

In the absence of fully staffed emergency operating theatres, timely access for emergency laparotomy patients can only be provided by 'breaking in' to an elective theatre list. This may be facilitated by policies for the deferment of elective activity to prioritise emergency workload, and policies directing the timeliness of surgical intervention. It is of concern therefore that such policies were absent in many hospitals: a policy for the deferment of elective activity was available at 34%, while a policy directing the timing of surgery according to defined clinical urgency was available at 67% of hospitals (Chapter 8).

iii Assessing adequacy of theatre provision

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

Qu: Have you audited adequacy of provision of emergency theatres within the last two years?

Qu: Does your hospital have plans in place to increase emergency theatre provision within the current or next financial year?

Qu: Are there currently plans to reconfigure emergency surgical services with neighbouring trusts within the next two years?

In response to these questions:

- 94 hospitals (53%) indicated that the adequacy of emergency theatre provision had been audited within the previous two years
- 44 hospitals (25%), 35 of which had recently audited provision, reported the existence of plans to increase emergency theatre capacity within the subsequent financial year
- 46 hospitals (26%), 32 of which had recently audited provision, reported the existence of plans to reconfigure emergency surgical services with neighbouring NHS trusts within the subsequent two years
- 63 hospitals (36%) indicated that none of the above statements were applicable.

The importance of ensuring adequate provision of emergency theatres has been highlighted in publications by a variety of bodies including royal colleges, specialty associations, the Department of Health and NCEPOD and it has also received media attention. The findings of this organisational audit suggest that the importance of timely intervention and avoidance of delays in the care of EGS patients is appreciated at many hospitals, but the lack of audit of emergency theatre provision at more than one-third of sites is of concern.

Hospitals should therefore urgently review the adequacy of local provision, consider the implementation of policies and pathways of care for EGS patients, and ensure the appropriate prioritisation of unscheduled surgical admissions.

b Emergency surgical units

Emergency surgical units (ESUs) usually take referrals directly from GPs or A&E and comprise an assessment area and short-stay ward facilities. Some units may run a dedicated ambulatory care service, with the provision of daily emergency 'hot' clinics and dedicated radiology slots. By separating elective from emergency workload, ESUs allow the delivery of emergency care to be streamlined without competition for facilities by elective workload. A dedicated ESU and emergency surgery ambulatory care service facilitate the timely review of patients by a senior surgeon, may minimise unnecessary and prolonged inpatient episodes and subsequently reduce costs.

Standards
There must be a clear and identifiable separation of delivery of emergency and elective care (ASGBI EGS)
Wherever possible, emergency and elective surgical pathways are separated (RCS EESC)

Qu: Do you have a dedicated emergency surgical unit that is separate from elective workload, i.e. a ward area where patients receive ongoing care, NOT a surgical admissions unit from which patients are relocated for continuing inpatient care?

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Hospitals with an emergency surgical unit					
	12 (27%)	11 (26%)	16 (36%)	16 (36%)	**55 (31%)**

Whilst ESUs may potentially control admissions and costs, they were available in less than one-third of hospitals. Hospital size did not appear to be an obstacle to their implementation.

c Imaging provision

Prompt treatment and timely intervention are dependent upon the immediate availability of diagnostic information. Where the provision of imaging facilities, expertise and appropriately trained staff do not match clinical need, this may result in delays to treatment and potentially hazardous transfers off-site. This can adversely affect patient outcomes and the quality of care delivered.

Standards
The delivery of quality clinical care is dependent on access to supporting facilities. Rapid access to CT imaging, ultrasound (US) scanning and laboratory analyses are critical to the efficient diagnosis, resuscitation and prioritisation of these patients (ASGBI EGS)
Where imaging will affect immediate outcome, emergency surgical patients have access to CT, plain films and US within 30 minutes of request. When MRI is required and not available, patients are transferred to the appropriate centre. Advice on appropriate imaging is available immediately (RCS USC)
Definitive diagnostic CT as early as possible but should be within four hours of identification as high-risk (RCS HR)
Emergency surgical services delivered via a network have arrangements in place for image transfer and telemedicine and agreed protocols for ambulance bypass/transfer (RCS USC)
Hospitals should (also) ensure that there are clear arrangements in place for interventional radiology, especially out-of-hours (RCS HR)
Hospitals providing emergency surgical services have access to 24/7 interventional radiology. Interventional radiology services are staffed by fully trained interventional radiologists, interventional nurses and interventional radiographers Interventional radiology services are ideally on the same site as the emergency services. Where they are not, or where high-end intervention is necessary, there are clear and unambiguous patient pathways to deliver those services through a network solution Interventional radiology services have an identified consultant radiologist available 24/7 Interventional radiology services for emergency patients are available within one hour of request (RCS USC)
Scheduled seven-day access to diagnostic and treatment procedures such as diagnostic gastrointestinal (GI) endoscopy, bronchoscopy, echocardiography, diagnostic ultrasound, CT and MRI (RCS USC)

	All sites (*n* = 176)
24-hour availability of on-site diagnostic facilities	
X-ray	**176** (100%)
Computed tomography	**176** (100%)
Ultrasound	**113** (64%)

	All sites (*n* = 176)
24-hour CT reporting	
Contemporaneous CT reporting by a radiologist	**160** (91%)
Contemporaneous CT reporting by a radiologist with gastrointestinal specialisation	**3** (2%)

	All sites (*n* = 176)
24-hour availability of	
Site-specific interventional radiology	**58** (33%)
Diagnostic endoscopy	**113** (64%)
Interventional endoscopy	**116** (66%)
Dedicated endoscopy staff	**91** (52%)

i X-ray

Qu: Is there 24-hour on-site access to diagnostic X-ray?

Provision of 24-hour X-ray facilities was universal. An erect chest X-ray remains the primary investigation of choice for the detection of free intra-peritoneal gas and may obviate the requirement for CT. Plain abdominal radiography can still be useful in the detection of small bowel obstruction, fulminant colitis or perforation.[7]

ii Diagnostic computed tomography

Abdominal CT scanning is considered fundamental to acute surgical practice, and there are relatively few occasions on which a patient is too unstable to be transferred for imaging. CT is particularly informative in the management of abdominal sepsis, and can identify patients who can be appropriately managed with interventional radiology. It is mandatory that the images are reviewed in a timely manner by an appropriately experienced radiologist. Review by a radiologist with subspecialty GI expertise may be associated with enhanced accuracy of diagnosis and management. Ideally, the surgeon should be present at the scan review so that decisions can be made jointly.

Qu: With regard to access to on-site diagnostic CT, please indicate how this is provided:

- *Available and reported contemporaneously by radiologist with GI subspecialisation*
- *Available and reported contemporaneously by general radiologist*
- *Available, but unreported by radiology at time of scanning*
- *Not available*

Respondents indicated that 24-hour on-site diagnostic CT facilities were available at every hospital performing emergency laparotomy, but that 24-hour reporting by a radiologist at the time of scanning (local or distant) was not available at 16 sites.

The absence of contemporaneous CT reporting may prevent timely diagnosis and is concerning in its implications for treatment decisions and case prioritisation. Units performing emergency laparotomy should ensure they comply with this essential standard.

Despite the potential benefits of reporting by a GI-specialised radiologist, a very small minority of sites had 24-hour provision.

iii Ultrasound

Qu: Is there 24-hour on-site access to diagnostic ultrasound?

Abdominal ultrasound is fundamental to the management of acute abdominal pain, and is useful in the assessment of biliary, renal and gynaecological pathology, in the diagnosis of acute appendicitis and in monitoring identified collections. In the emergency situation, however, it has largely been superseded by CT, which provides greater sensitivity and specificity in the diagnosis of abdominal catastrophe.

Diagnostic ultrasound was available at all times at almost two-thirds of hospitals, which may reflect decreased reliance on this imaging modality.

iv Interventional radiology

Interventional radiology (IR) techniques are now the management of choice for many life-threatening general surgical emergencies, including the control of haemorrhage secondary to trauma or gastrointestinal bleeding, draining intra-abdominal collections, managing biliary sepsis and colonic stenting for obstruction. Therefore, it is recommended that every acute trust accepting unselected surgical admissions has 24-hour access to IR.[8]

While the demand for IR out-of-hours has increased significantly as technology has developed,[8] there is an acute shortage of trained interventional radiologists, with a number of hospitals reporting unfilled consultant posts.[9]

Qu: Is there a formal rota of radiologists who provide on-site interventional radiology

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
24-hour availability of an interventional radiologist					
	7 (16%)	8 (19%)	17 (38%)	26 (59%)	**58 (33%)**

Only one-third of hospitals performing emergency laparotomy had 24-hour access to on-site IR, illustrating that its availability remains disturbingly low three years after the identification of a workforce shortfall.

While provision of facilities was universally poor, the availability of IR was considerably less comprehensive at the smallest institutions. This suggests that smaller hospitals may have difficulty in attracting sufficient interventional radiologists to provide a comprehensive 'out-of-hours' service.

Failure to provide IR limits treatment options for patients with acute intra-abdominal pathology and may mean that a patient receives an emergency laparotomy unnecessarily. Units that do not have on-site provision should explore the use of local networks backed up by formalised pathways of referral.[8]

d Endoscopy

Acute upper and lower gastrointestinal bleeding is a common cause of emergency admission. A proportion of unstable patients with massive upper or lower gastrointestinal haemorrhage require immediate endoscopy after resuscitation.

In the case of non-variceal upper gastrointestinal haemorrhage, therapeutic endoscopy is gold standard.[10] A formal 'out-of-hours' rota of appropriately trained endoscopists is critical to the safe management of unstable upper gastrointestinal bleeding. Without this provision, unnecessary laparotomy may result.

The majority of lower GI bleeds settle spontaneously but an unstable patient must have the bleeding point identified urgently. The early use of colonoscopic localisation is recommended prior to CT angiography or mesenteric angiography with embolisation.[11]

Both endoscopy and interventional radiology expertise is required for colonic stenting in malignant obstruction. Such intervention can usually be carried out safely in daylight hours, though provision should be made for a weekend service if unnecessary defunctioning stomas are to be avoided.

*Qu: Is there a formal rota of clinicians for the provision of on-site **diagnostic** endoscopy:*

*Qu: Is there a formal rota of clinicians for the provision of on-site **interventional** endoscopy?*

Qu: Are clinicians performing endoscopy supported by dedicated endoscopy staff as opposed to other nursing staff (e.g. from theatre)?

Respondents reported that:

i there was 24-hour availability of both diagnostic and interventional endoscopists at 105 hospitals (60%)

ii these clinicians were supported at all times by dedicated endoscopy staff at 72 sites.

Availability of all elements of this service was least comprehensive at the smallest hospitals, suggesting that smaller units may not have the requisite number of trained endoscopists to run an out-of-hours upper GI bleeding rota. In these circumstances formal network provision should be secured.[12]

e Laboratory access and advice

The efficient diagnosis, resuscitation and prioritisation of patients requiring emergency surgery is reliant upon prompt access to laboratory and imaging facilities. Consultant advice is integral to the delivery of high-quality care of EGS patients and should be available at all times at hospitals performing emergency laparotomy.

Standards
The delivery of quality clinical care is dependent on access to supporting facilities. Rapid access to CT imaging, ultrasound scanning and laboratory analyses are critical to the efficient diagnosis, resuscitation and prioritisation of these patients (ASGBI EGS)
Wherever general and regional anaesthesia is administered, there is access to an appropriate range of laboratory and radiological services (RCS USC)
24-hour test availability including full blood count, sickle cell screen, coagulation screen, group and save, and availability of blood components (RCS USC)
Clinical telephone haematology advice available 24/7 (RCS USC)
Prompt availability of blood components and massive haemorrhage protocol available in all key areas (RCS USC)
24-hour availability of comprehensive infectious diseases and infection control advice (RCS USC)

Qu: Is there 24-hour on-site access to the following?

- *Biochemistry*
- *Haematology*
- *Microbiology*
- *Blood bank or transfusion*
- *Consultant advice (either resident or on-call)*

	All sites (*n* = 176)
Hospitals with 24-hour on-site access to	
Biochemistry, haematology and blood bank laboratories	**175 (99%)**
Consultant advice for biochemistry, haematology and blood bank	**156 (89%)**
Microbiology laboratories	**157 (89%)**
Consultant advice for microbiology	**173 (98%)**

All but one hospital performing emergency laparotomy indicated that access to biochemistry, haematology and transfusion laboratories was available on-site at all times. At the remaining hospital, these facilities were available out-of-hours at a neighbouring site.

Twenty-four hour access to consultant advice for biochemistry, haematology and blood transfusion was available at only 82% of the smallest quartile hospitals, whereas it was available at 91% of all other sites. This may represent a threshold at which there are insufficient consultant staff to be available at all times at the smallest hospitals.

Whilst 24-hour on-site access to microbiology laboratories was unavailable at one in ten hospitals, site-specific 24-hour consultant advice was available at almost every hospital. Immediate availability of specialist advice is essential to the optimal management of septic patients.

All hospitals should review how these services can be provided. This may include collaboration with neighbouring hospitals.

7 CLINICAL STAFFING

The care of patients undergoing emergency laparotomy requires direct senior input from both surgeons and anaesthetists. Standards of care exist to ensure that these clinicians, and their supporting junior tiers, are available in a timely fashion in order to provide care with minimal delay (Appendix 1). This section deals with the working patterns of these clinical staff.

a Surgical provision

Qu: For each tier, please indicate whether at least one individual is free from all elective and non-acute commitments (e.g. elective lists, out-patient clinics) for the whole period whilst they are covering emergency general surgical workload

Sites where clinician is free from all non-acute commitments when covering the emergency workload

Surgical grade	Number of sites (*n* = 176)
Consultant	**151** (**86%**)
Middle grade	**157** (**89%**)
Core trainee	**160** (**91%**)
Foundation trainee	**156** (**89%**)
Nurse practitioner	**29** (**16%**)

It is now recognised that surgeons must be free from their elective commitments if they are to provide an effective emergency service (ASGBI IPP). A 1:8 on-call rota is the most frequently reported here, and strikes a balance between maintaining emergency surgical skills and maintaining an elective practice.

i Consultant surgeons

Standards
A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% (RCS USC)
All hospitals admitting emergency general surgical patients should have 24-hour cover by a consultant with a general surgical Certificate of Completion of Training (CCT) or equivalent (ASGBI EGS)
It is important that there are effective arrangements for refereeing the priority of competing interests at all times of the day and night. ASGBI considers that this is best delivered by dedicated clinical leadership (ASGBI EGS)

Qu: How many consultant surgeons participate in the general surgical emergency rota?

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Number of consultant surgeons participating in EGS rota					
Range	3–12	5–13	5–13	8–20	**3–20**
Median (IQR)	7 (6–8)	8 (6–9)	8 (8–9)	10 (9–12)	**8 (7–10)**

The considerable variation in the reported numbers of consultant surgeons participating in EGS rotas was explained by hospital size. The results suggest that all but the smallest sites were sufficiently resourced to provide 1:8 on-call rotas.

Qu: What are the sub-specialties of the consultants on the emergency general surgical rota? Upper GI includes oesophageal, hepatobiliary and bariatric surgery

Standard
The assessment, prioritisation and management of emergency general surgical patients should be the responsibility of accredited general surgeons (ASGBI EGS)

A consultant in any of the 'traditional' general surgical specialties will have been trained and assessed in general surgery alongside their subspecialty. However, compliance with this standard does not necessarily reflect ongoing expertise. Emergency laparotomy requires complex decision making in gastrointestinal surgery. Those who have an elective practice in breast surgery without another discipline, for example, will need to actively consider how to maintain appropriate expertise.

While a number of vascular surgeons successfully combine their elective practice with EGS, the specialty is increasingly becoming centralised, and now has a separate career structure. Provision of EGS is therefore increasingly the preferred domain of gastrointestinal surgeons.

Surgical specialties represented on the EGS on-call rota

Consultant surgeon specialisation	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Colorectal	44 (100%)	43 (100%)	45 (100%)	44 (100%)	**176 (100%)**
Upper GI	33 (75%)	37 (86%)	40 (89%)	42 (95%)	**152 (86%)**
General	38 (86%)	37 (86%)	32 (71%)	30 (68%)	**137 (78%)**
Vascular	13 (30%)	12 (28%)	15 (33%)	7 (16%)	**47 (27%)**
Breast	30 (68%)	23 (53%)	17 (38%)	10 (23%)	**80 (45%)**
Endocrine	13 (30%)	20 (47%)	12 (27%)	11 (25%)	**56 (32%)**

Colorectal surgeons participate in EGS rotas at all hospitals that perform emergency laparotomy, and upper gastrointestinal surgeons do so at the majority of sites.

In smaller hospitals, there was greater reliance on breast surgeons. In the absence of outcome data, the consequences of this are unclear.

ii Emergency general surgical rotas

In the interests of patient safety, it is recommended that EGS rotas comprise a minimum of four tiers (ASGBI IPP). This allows sufficient capacity for the operating surgeon to be assisted in theatre and for new admissions and inpatients to be safely managed.

Standards
For a typical major hospital, the emergency general surgical team will comprise a consultant surgeon (CCT holder), middle grade (MRCS holder), core trainee and foundation doctor. As major procedures often require three surgeons, the effect on other activities during major surgery should be anticipated (RCS USC)
Specialty teams develop rotas of clearly identified, adequately experienced staff who can provide advice or attend and review patients expeditiously on the acute medical unit within a maximum of four hours of a request and ideally sooner (RCS USC)

Qu: How many surgical tiers cover the emergency general surgical workload for each time frame?

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Four or more surgical tiers to the EGS rota at all times					
	11 (25%)	14 (33%)	23 (51%)	37 (84%)	**85 (48%)**

Overall, less than half of hospitals performing emergency laparotomy have four or more tiers to surgical EGS rotas. Provision was less comprehensive at smaller hospitals.

Hospitals with fewer than four clinicians on the surgical on-call rota should review adequacy of local provision to ensure they comply with standards of care.

b Anaesthetic provision

Qu: In a usual week, how many dedicated and planned consultant anaesthetic sessions (i.e. outside of on-call and other duties) support those operating theatres available for adult general surgical emergency cases?

Standards
A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% (RCS USC)
All patients undergoing emergency surgery requiring anaesthesia should be seen by an anaesthetist for assessment and pre-operative optimisation; the exact timing of this visit will be dependent upon the urgency of surgery (RCoA GPAS)
The peri-operative anaesthetic care of ASA3 and above patients requiring immediate major surgery (and therefore with an expected higher mortality) is directly supervised by a consultant anaesthetist (RCS USC)

Only 136 sites (77%) indicated that they had planned and dedicated consultant anaesthetist sessions supporting operating theatres available for EGS cases during daytime hours (0800–1759) on weekdays (Monday to Friday).

Recent standards recommend that high-risk cases (>10% predicted mortality) should proceed only under the direct care of consultant surgeons and anaesthetists (RCS HR and RCS USC). The availability of consultant anaesthetists was therefore not sufficient to ensure that this standard is met during 'working hours' at all hospitals. The availability of consultant anaesthetists for EGS is facilitated by provision of job-planned consultant sessions within emergency theatres. Where unavailable, hospitals should examine how direct consultant care can be provided for high-risk EGS.

At 73 hospitals (41%) the consultant anaesthetist also had responsibility to other clinical areas while on-call (out of hours), which may result in competing clinical priorities depending on workload. Policies that clearly set out standards on timing of surgery according to clinical urgency are helpful in managing these competing priorities.

c Inter-professional handover of patient care

Continuity of care is central to safety and to patient satisfaction. However, with the predominance of shift patterns of work, the failure of professionals to communicate vital patient information poses an ever-present risk.

Structured handover is a professional obligation and should be routine practice for all clinicians directly involved in patient care.

> *'You must contribute to the safe transfer of patients between healthcare providers and between health and social care providers. This means you must share all relevant information with colleagues involved in your patients' care within and outside the team, including when you hand over care as you go off duty, when you delegate care or refer patients to other health or social care.'*
>
> **Good Medical Practice 2013, The General Medical Council.**[13]

Standards
Structured arrangements are in place for the handover of patients at each change of responsible consultant/medical team. Time for handover is built into job plans and occurs within working hours (RCS USC)
Patients admitted via the emergency general surgical service should remain under the care of this service until formally transferred to another team and accepted by them (ASGBI EGS)

Qu: Are emergency patients that still require assessment and treatment at the end of the consultant's period of on-call retained by the admitting consultant (surgeon)?
If no, do you have a policy requiring consultants to formally hand over to one another in person?

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Admitting consultant retains acute general surgical admissions					
	33 (75%)	29 (67%)	31 (69%)	28 (64%)	**121 (69%)**

An admitting surgical consultant is often on-call for a defined block of three or four days, during which time there is a defined team structure. During this time there is usually a clinical team, including junior staff, available to deal with the associated workload of diagnosing and treating acutely ill patients. Once the on-call period ends, this team may disperse, leaving a large burden of acutely unwell patients, some of whom require ongoing intervention. Some units therefore adopt a policy of transferring the care of patients who are particularly unstable or require further intervention to the incoming consultant on-call. Other units may distribute patients to the relevant sub-specialties. Local circumstances will dictate the optimum arrangements. While transfer of care has some clear advantages in terms of both patient safety and surgeon endurance, there is the potential for continuity of care to be compromised, especially in the event of multiple transfers of care.

Any transfer of care should be supported by appropriate inter-professional handover, but of those 55 hospitals (31%) where the care of acute general surgical patients is not retained by the admitting surgical consultant, nine sites do not have a policy requiring handover in person between consultants.

Qu: Do you have a policy requiring consultant (anaesthetists) to formally hand over to one another in person?

Qu: Is there a formal handover time built into the shifts for others (non-consultant anaesthetic tiers)?

Qu: Is there a formal handover time built into the shifts for others (non-consultant surgical tiers)?

	All sites (*n* = 176)
Formal handover of care	
Sites with a policy requiring handover in person between consultant anaesthetists	48 (27%)
Sites with formal handover for non-consultant anaesthetic tiers	151 (86%)
Sites with formal handover for non-consultant surgical tiers	167 (95%)

Respondents indicated that only a quarter of hospitals (27%) had policies setting out arrangements for formal handover between consultant anaesthetists. In contrast, the provision of policies for formal handover between other surgical and anaesthetic tiers was more comprehensive.

The provision of a handover policy does not guarantee that handover occurs, nor does it define the frequency or quality. However, the provision of a handover policy does suggest the promotion of continuity of care within a hospital and supports the allocation of appropriate time for handover in clinicians' job plans.

It is imperative that handover is adequately resourced and the implementation of formal policies should be promoted.

8 PERI-OPERATIVE CARE

a Pathways and protocols

The implementation of evidence-based care pathways facilitates the reliable delivery of high-quality care to all emergency laparotomy patients and can improve patient outcomes by reducing variability in the delivery of care.[14]

Qu: At your trust are there formal written pathways/protocols/policies applicable to the emergency general surgical patients incorporating the following (for the full wording of this question, see Question 3 of the Organisational Audit questionnaire in Appendix 4):

These may exist within pathways/protocols, or be incorporated into a single policy relevant to the unscheduled adult surgical patient.

i Distribution of pathways

Total pathways and protocols assessed: 13

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Number of hospital pathways/protocols					
Range	0–12	0–13	0–11	1–12	**0–13**
Median (IQR)	4 (2–8)	6 (4–9)	5 (3–8)	4 (3–8)	**5 (3–8)**

ii Hospital pathways and protocols

Care pathway or protocol	Number (%) of sites
National Institute for Health and Care Excellence (NICE) Clinical Guideline 50 (CG50) compliant monitoring plan (NICE CG50)	**130 (74%)**
A formal pathway for the management of **patients with sepsis**	**148 (84%)**
Explicit **arrangements with elderly medicine** for review of selected patients	**24 (14%)**

iii Surgery-specific pathways and protocols

Care pathway or protocol	Number (%) of sites
Timing of surgery according to clinical urgency	**118** (67%)
Formalised provision for the **deferment of elective activity** in order to appropriately prioritise unscheduled admissions	**60** (34%)
A formal calculation of risk that provides an estimation of peri-operative mortality	**44** (25%)
Seniority of anaesthetist present in theatre according to calculated risk of death	**58** (33%)
Seniority of surgeon present in theatre according to calculated risk of death	**59** (34%)
Location of post-operative care according to calculated risk of death	**65** (37%)

iv EGS-specific pathways and protocols

Care pathway or protocol	Number (%) of sites
A single pathway or policy for the care of the **unscheduled adult general surgical patient**	**54** (31%)
Provision for the **transfer of care** of emergency surgical patients between consultants – to ensure that they receive appropriate subspecialty care	**97** (55%)
A formal pathway for the involvement of **diagnostic and interventional radiology** in the care of EGS patients	**64** (36%)
A formal pathway for the **enhanced recovery of the EGS**	**53** (30%)

The implementation of protocols and pathways of care in unplanned surgery are recommended in multiple publications (Appendix 1). Principal standards are detailed overleaf to facilitate discussion of the findings of the Audit and the full text is available in supplementary materials on the NELA website (www.nela.org.uk).

Standards
Trusts should formalise their pathways for unscheduled adult general surgical care. The pathway should include the timing of diagnostic tests, timing of surgery and post-operative location for patients (RCS HR)
Each patient should have his or her expected risk of death estimated and documented prior to intervention and due adjustments made in urgency of care and seniority of staff involved (RCS HR)
High-risk patients are defined by a predicted hospital mortality ≥5%: they should have active consultant input in the diagnostic, surgical, anaesthetic and critical care elements of their pathway (RCS HR)
A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% (RCS USC)
Surgical patients often require complex management and delay worsens outcomes. The adoption of an escalation strategy which incorporates defined time-points and the early involvement of senior staff when necessary are strongly advised (RCS HR)
Best practice: hospital has agreed integrated pathway to facilitate the following within a defined timescale: urgent access to imaging (CT); timely definitive treatment (surgery/radiology/medical) (RCS USC)
The post-operative care of the high-risk surgical patient needs to be improved. Each trust must make provision for sufficient critical care beds or pathways of care to provide appropriate support in the post-operative period (NCEPOD KTR)

Respondents indicated that formal sepsis pathways were widely available (84%), which may reflect the efforts of the Surviving Sepsis Campaign (SSC).[15] Given the part that sepsis plays in the pathophysiology of emergency laparotomy, protocols and pathways for the early identification and management of sepsis should be routinely available at every hospital performing emergency laparotomy.

In contrast, many of the surgery and EGS-specific protocols and pathways were available at less than half of hospitals performing emergency laparotomy. Single pathways for the care of the unscheduled adult general surgical patient were available in less than one-third of hospitals.

Formal quantification of individual risk of death is required by multiple standards of care (Appendix 1) and is essential for patient choice, and to inform many peri-operative care decisions. However, formal risk calculations had been implemented at only a quarter of hospitals (25%). Pathways for determining both the location of post-operative care, and the seniority of surgical and anaesthetic clinicians present in theatre during surgery had been implemented in around one-third of hospitals performing emergency laparotomy (33–37%).

Therefore, even in the minority of hospitals where pathways exist for the streamlining of peri-operative care of EGS patients, these critical clinical decisions are not always based on formal calculations of peri-operative mortality.

Formal arrangements to defer elective cases to permit the appropriate prioritisation of unscheduled admissions were available at one-third of all hospitals (34%) and more than half (54%) had neither these arrangements nor the 24-hour availability of operating theatres reserved exclusively for EGS patients. These sites should urgently review whether the surgical treatment of patients requiring emergency laparotomy is appropriately prioritised.

Overall, the variable implementation of pathways may reflect both the large number of published standards of care and uncertainty over which pathways to use. While there are cost and resource implications associated with other initiatives to improve patient outcome and experience, care pathways require no specialist equipment, require minimal expertise and expense, and promote an array of potential benefits for both patients and healthcare providers. Hospitals performing emergency laparotomy should therefore make arrangements to implement a unified pathway for the routine care of the unscheduled adult general surgical patient, incorporating the components detailed in tables ii–iv above (see also Question 3 of the Organisational Audit Questionnaire in Appendix 4).

b Peri-operative provision of equipment for monitoring cardiac output

Cardiac output monitoring may be used to guide the management of peri-operative fluid administration. There are a variety of methods currently in use in clinical practice.

Standards
There is good evidence to demonstrate that inappropriate peri- and post-operative fluid therapy is harmful. Dynamic monitoring of stroke volume and cardiac output avoids this, and should be considered in all patients undergoing major surgery (ASGBI PS)
There should be clear strategies for the management of intra-operative 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)

Qu: Is non-invasive equipment for monitoring cardiac output available for use in the care of the patient undergoing emergency general surgery?

Respondents reported that equipment for monitoring cardiac output was available for use in the peri-operative care of EGS patients at 170 hospitals (97%).

Equipment for monitoring cardiac output was widely available for the routine management of EGS patients. The availability of cardiac output monitoring has been a requirement for Commissioning for Quality and Innovation (CQUIN) payments since April 2013. Where it is unavailable, hospitals should consider how it can be delivered.

c Multidisciplinary reviews of peri-operative morbidity and mortality

Reviews of morbidity and mortality are a core component of good clinical practice. Review meetings permit the investigation of a wide variety of factors that may contribute to adverse events and the process is enhanced by the perspectives and insight of multiple disciplines. Benefits include the sharing of knowledge, experiences and evidence, which fosters safe practices and can lead to the modification of processes of care to prevent avoidable adverse sequelae. Regular reviews of all morbidity and mortality following EGS should be carried out at all hospitals.

> *'You must take part in systems of quality assurance and quality improvement to promote patient safety. This includes taking part in regular reviews and audits of your own work and that of your team, responding constructively to the outcomes, taking steps to address any problems and carrying out further training where necessary.'*
>
> **Good Medical Practice 2013, The General Medical Council.**

Qu: Is there regular, i.e. at least bi-monthly, review of all deaths following emergency general surgery?
If yes, which (of the following) specialties provide input into this review?

Standards
Adverse events should be studied using morbidity and mortality (M&M) meetings (ASGBI PS)
Trusts should audit delays in proceeding to surgery in patients requiring emergency or urgent abdominal surgery and implement appropriate mechanisms to reduce these (NCEPOD Age)
All deaths/serious morbidity should be reviewed formally by a senior member of the anaesthetic department (RCS USC)

	Sites (*n* = 176)
Sites conducting at least bi-monthly reviews of all deaths following EGS	**144 (82%)**

Disciplines providing input into reviews of mortality	Sites (*n* = 176)
Surgery	**143 (81%)**
Anaesthesia	**60 (34%)**
Critical care medicine	**60 (34%)**
Radiology	**21 (12%)**
Elderly medicine	**16 (9%)**
Surgical, anaesthetic and critical care medicine input	**47 (27%)**

Whilst 144 hospitals (82%) conducted at least bi-monthly reviews of all deaths following EGS, the majority were reviewed by surgical teams in isolation.

Reviews of adverse events benefit greatly from the perspectives and insight of multiple disciplines and it is therefore concerning to note that reviews of emergency laparotomy patient deaths by each of the three specialties most likely to be involved in their care occur in only one-third of hospitals. Leaders in anaesthesia and critical care, in particular, should re-appraise their involvement in and ownership of EGS-associated outcomes and consider how review of adverse events might improve outcomes locally.

Regular multidisciplinary review of adverse events in patients undergoing emergency laparotomy represents a single intervention that requires no specialist equipment and minimal expense, but promotes a vast array of potential benefits. Hospitals should therefore make arrangements to ensure and promote its implementation.

9
CRITICAL CARE AND OUTREACH

EGS patients are a heterogeneous population in whom the likelihood of death and complications following surgery is high. Post-operative management of these patients on an intensive care unit (ICU) or high dependency unit (HDU) helps to address this risk. There should therefore be adequate provision of beds and appropriately trained staff to meet demand at hospitals undertaking emergency laparotomy. These are fully referenced in Appendix 1.

Whilst some patients are at higher risk of complications than others, even those who are managed post-operatively on a ward are at risk of suffering complications or adverse events. Hospitals should ensure the implementation and use of systems to rapidly recognise and appropriately manage post-operative deterioration regardless of where they receive post-operative care. Typically, this includes the use of physiological derangement scores (e.g. National Early Warning Score), escalation strategies and arrangements for the involvement of staff with critical care expertise.

Standards
All high-risk patients should be considered for critical care and as a minimum, patients with an estimated risk of death of ≥10% should be admitted to a critical care location (RCS HR)
Given the high incidence of post-operative complications demonstrated in the review of high-risk patients, and the impact this has on outcome there is an urgent need to address post-operative care (NCEPOD KTR)
The post-operative care of the high-risk surgical patient needs to be improved. Each Trust must make provision for sufficient critical care beds or pathways of care to provide appropriate support in the post-operative period (NCEPOD KTR)
To aid planning for provision of facilities for high-risk patients, each trust should analyse the volume of work considered to be high-risk and quantify the critical care requirements of this cohort (NCEPOD KTR)
Hospitals should plan their critical care resource to match need in order to avoid shortages and define critical care areas accordingly (RCS HR)
Critical care facilities are available at all times for emergency surgery. If this is not the case, agreed protocols for transfer are in place (RCS USC)

There is 24-hour cover of the ICU by a named consultant with appropriate experience and competences (RCS USC)
Each hospital should ensure that there is a system to rapidly recognise and deal appropriately with post-operative deterioration (NCEPOD KTR)
Prompt recognition and treatment of emergencies and complications is essential to improve outcomes and reduce costs (RCS HR)
Prompt intervention is fundamental to the successful treatment of the patient who deteriorates after surgery (RCS HR)

a Staffing

Qu: Is there a dedicated critical care unit with 24-hour cover by a named consultant with regular sessions in critical care?

Qu: Is there a critical care outreach service responsible for the review of patients 'at risk' and those with deranged physiological parameters? (other names might include rapid response team etc)

If yes, please indicate when it is available:

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
24-hour critical care unit cover by a named consultant with regular critical care sessions					
	32 (73%)	36 (84%)	41 (91%)	44 (100%)	**153 (87%)**
24-hour critical care outreach service					
	12 (27%)	12 (28%)	17 (38%)	23 (52%)	**64 (36%)**

Respondents reported that 23 hospitals failed to meet standards set out in 2011 (RSC USC) for the provision of intensive care consultants. There was a clear relationship between hospital size and provision. More stringent standards have subsequently been published, requiring consultants to have attained or to be eligible for Fellowship or Associate Fellowship of the Faculty of Intensive Care Medicine.[16] Hospitals that currently do not deliver consultant-led care by clinicians with appropriate experience and competences must explore how to deliver this service.

Critical care outreach was developed to undertake the immediate triage and management of unstable and deteriorating patients and those at risk of further decline. This service may be provided by clinicians or specialist nurses.

Post-operative complications and a hospital's failure to 'rescue' such individuals influence patient outcomes long into the post-operative period[17–18] and may increase the burden of care. It is therefore of concern that only one-third of hospitals performing emergency laparotomy had implemented 24-hour critical care outreach services, since it is likely that this directly influences patient outcomes.

b Facilities

Qu: Please specify the number of funded Level 2 and Level 3 beds routinely available for adult (>18 years) general surgical patients?

	Quartile 1 64–364 beds	Quartile 2 371–457 beds	Quartile 3 459–648 beds	Quartile 4 649–1,179 beds	All sites (*n* = 176)
Funded ICU and HDU beds that are available to GI surgical patients					
Range	4–40	5–43	7–48	11–93	**4–93**
Median (IQR)	8 (7–10)	11 (9–14)	13 (11–16)	21 (16–39)	**12 (9–18)**
Funded ICU and HDU beds that are available to GI surgical patients per 100 hospital beds					
Range	1.7–14.4	1.3–10.8	1.3–10.4	1.0–9.8	**1.0–14.4**
Median (IQR)	2.9 (2.4–3.6)	2.5 (2.0–3.4)	2.6 (2.0–3.1)	2.6 (1.9–4.2)	**2.7 (2.2–3.5)**

There was marked variation in the number of ICU and HDU beds available to gastrointestinal surgical patients at hospitals performing emergency laparotomy, reflecting hospital size. However, while bed capacity increased with hospital size, competition for beds by both internal and external admissions at large sites is likely to greatly exceed that at smaller sites.

To assess adequacy of provision, the number of critical care beds per 100 hospital beds may be calculated. There are an estimated nine beds in the USA and 2.5 to 4.4 critical care beds per 100 hospital beds across Europe.[19]

The results demonstrate that many hospitals have two to three critical care beds available to GI surgical patients per 100 hospital beds. The apparent variation in provision between some sites may influence the post-operative availability of critical care beds for emergency laparotomy patients, particularly at the largest sites where competition for resources may also be most pronounced. The effects of critical care bed provision may become apparent from the results of the patient audit.

Current recommendations are that all emergency laparotomy patients with an estimated risk of death greater than 5–10% should be admitted to a critical care bed post-operatively. Hospitals should therefore audit bed provision to determine whether there is sufficient capacity to provide this service and take appropriate steps to ensure its delivery.

10 MULTIDISCIPLINARY INPUT

a Elderly medicine

A significant proportion of patients undergoing emergency laparotomy are elderly. Increasing age and systemic disease are associated with substantially increased risk of peri-operative adverse events.[1] Owing to complex medical, nursing and social needs, elderly patients are likely to benefit from early specialist input by elderly medicine.[20] Advance directives, and better liaison with primary care out-of-hours would help define patients in whom surgical care is futile or unwanted.

Standards
Routine daily input from Medicine for the Care of Older People (MCOP) should be available to elderly patients undergoing surgery and is integral to inpatient care pathways in this population (NCEPOD Age)
Clear protocols for the post-operative management of elderly patients undergoing abdominal surgery should be developed, which include, where appropriate, routine review by a MCOP 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 elderly surgical admissions should have a formal nutritional assessment during their admission so that malnutrition can be identified and treated (NCEPOD Age)

i On-site provision

Qu: Do you have elderly medicine services on site?

What type of input does elderly medicine provide in the pre-operative period for patients admitted as emergency general surgical patients?

What type of input does elderly medicine provide in the post-operative period for emergency general surgical patients?

On-site elderly medicine was available at 172 hospitals performing emergency laparotomy (98%), but peri-operative input in the care of EGS patients varied widely between hospitals.

	Sites (*n* = 176)
Pre-operative input by elderly medicine	
None	**40** (23%)
Proactive	**7** (4%)
On request	**129** (73%)
Post-operative input by elderly medicine	
None	**15** (9%)
Proactive	**11** (6%)
On request	**150** (85%)

Respondents indicated that input by elderly medicine in the care of EGS patients was available on request at the majority of hospitals and that arrangements for proactive input were uncommon.

This high-risk population is likely to benefit from early input by elderly medicine. The reported lack of any on-site expertise at four hospitals and apparent absence of pre-operative input at almost one-quarter of sites (23%) is therefore of concern. The provision of arrangements for proactive input or input on request by on-site elderly medicine at hospitals performing emergency laparotomy does not reflect hospital size, demonstrating that size is not a barrier to the provision of specialist expertise.

Hospitals that do not have on-site elderly medicine should consider whether input can be provided from neighbouring sites. Hospitals with on-site elderly medicine should review arrangements for the delivery of care of acute general surgical patients in light of these findings.

ii Protocols for the assessment of elderly patients

Frailty, malnutrition, cognitive dysfunction and functional impairment have, among other factors, been associated with increased incidence of morbidity and mortality. Early identification of patients at increased risk of adverse events enables clinicians to tailor peri-operative care to the needs of the individual.

Qu: In the elderly patient undergoing EGS, are there formal pathways/protocols for the routine assessment of (the following):

	Sites (*n* = 176)
Sites with formal protocols for the routine assessment of elderly patients	
Frailty	**86** (49%)
Nutritional status	**153** (87%)
Cognitive function	**121** (69%)
Functional status	**100** (57%)

On-site elderly medicine is available at 98% of hospitals performing emergency laparotomy, but the implementation of core assessments of elderly patients is highly variable.

Assessment of these domains provides invaluable global health and comorbidity information, which if performed early, may guide patient choice, peri-operative care decisions and management throughout the inpatient episode. The implementation of protocols promotes the incorporation of best practice and guideline recommendations into the delivery of care by all clinicians and is encouraged.

b General medicine

A variety of acute and chronic health conditions may require specialist management in individuals of any age undergoing EGS, ranging from immediate expertise prior to surgery, to the routine management of long-term comorbidity. It is therefore imperative that general medicine input is accessible at hospitals performing emergency laparotomy.

Qu: Does your hospital accept acute medical admissions?

Acute medical admissions were accepted at 174 hospitals (99%) and general medicine input was available for general surgical admissions at all hospitals performing emergency laparotomy. However, proactive review was available at only one site.

Acute deteriorations of chronic health conditions and the development of new acute medical conditions increase the risk of adverse events throughout the peri-operative period. It is therefore advisable that experienced clinicians are involved early in the management of these patients, in order to prevent avoidable morbidity and mortality. Hospitals should consider how to implement formal arrangements for the identification of patients at risk and the facilitation of referrals between specialties when indicated.

11

SITES THAT DO NOT ACCEPT ACUTE GENERAL SURGICAL ADMISSIONS

Fourteen hospitals provided emergency laparotomy for inpatients when clinically indicated, but did not accept acute general surgical admissions. These hospitals were either regional or national cancer or cardiothoracic surgical centres, or hospitals within multi-site healthcare trusts. In these hospitals, patients could require an emergency laparotomy in order to treat complications of other types of surgery. Whilst their facilities might differ to those hospitals that do receive acute general surgical admissions, the same standards of care still apply.

Qu: How many adult inpatient or overnight beds (including 23-hours stay) are currently available within the hospital?

Qu: How many operating theatres are at this hospital? Please exclude interventional radiology suites and dedicated obstetric and minor ops theatres, but include day-case theatres

a Characteristics

	Sites not accepting acute general surgical admissions (*n* = 14)	Sites accepting acute general surgical admissions (*n* = 176)
Hospital beds		
Range	92–764	64–1,179
Median (IQR)	255 (180–409)	459 (368–649)
Operating theatres		
Range	5–20	4–38
Median (IQR)	7 (6–13)	12 (9–17)

These sites were typically smaller with fewer operating theatres than hospitals that accept acute general surgical admissions.

Respondents reported that elective gastrointestinal surgery was undertaken at nine hospitals (64%). Provision of those facilities required for the delivery of EGS and the availability of experienced staff at these sites is likely to be more comprehensive than at those performing no routine gastrointestinal surgery. However, while some structural elements at these hospitals may be expected to align more closely with those required for the delivery of EGS, in the absence of routine emergency services at these sites, the delivery of care may not be set up for emergency laparotomy. Regardless of whether or not gastrointestinal surgery is undertaken at specialist hospitals, there are minimum requirements for the safe delivery of EGS including access to relevant facilities and multidisciplinary expertise.

b Facilities

Fully staffed operating theatres were available for adult EGS cases at all times at only six hospitals (43%) and no sites reserved a theatre for the exclusive use of EGS cases (see table opposite).

Respondents indicated that the provision of diagnostic imaging facilities was good; all sites had 24-hour access to on-site X-ray and CT; and 24-hour contemporaneous CT reporting was available at 13 sites and at all sites at which elective GI surgery is performed. However, in common with those sites admitting acute general surgical patients, interventional radiology and endoscopy provision was less comprehensive at these 14 specialist sites.

24-hour on-site access to microbiology laboratories was available at half of these hospitals (57%), but site-specific 24-hour consultant advice was available at every hospital.

All sites had 24-hour access to biochemistry, haematology and blood bank laboratories, but outside working hours this was provided off-site at two hospitals at which elective GI surgery was performed.

With the exception of provision for the transfer of care of EGS patients to appropriate subspecialty consultants, availability of EGS-specific peri-operative pathways was invariably poor.

These sites should review the availability of facilities, staff and processes required to perform EGS safely and take appropriate action to ensure that standards of care are delivered. It is also important that these specialist hospitals participate fully in the ongoing patient data collection in order to determine if standards of care are being met on an individual patient basis.

Site	Elective adult GI surgery	24-hour availability of a fully staffed theatre for EGS cases	24-hour contemporaneous CT reporting	Bi-monthly reviews of mortality following EGS	Transfer of care of EGS patients to appropriate subspecialty consultant
Characteristics of the 14 sites that do not accept acute general surgical admissions					
Kent and Canterbury Hospital	No	No	Yes	No	No
Churchill Hospital	Yes	Yes	Yes	No	No
Papworth Hospital	No	Yes	Yes	Yes	No
Royal Brompton Hospital	No	No	Yes	Yes	Yes
Harefield Hospital	No	No	Yes	Yes	No
Liverpool Heart and Chest Hospital	Yes	No	Yes	Yes	Yes
Maidstone Hospital	Yes	No	Yes	No	Yes
Southmead Hospital	Yes	No	Yes	Yes	Yes
Castle Hill Hospital	Yes	No	Yes	Yes	Yes
The Walton Centre	No	Yes	No	Yes	No
The Christie	Yes	Yes	Yes	No	Yes
Freeman Hospital	Yes	Yes	Yes	Yes	Yes
Royal Marsden Hospital	Yes	Yes	Yes	Yes	No
University Hospital Llandough	Yes	No	Yes	No	No

12 GLOSSARY OF COMMONLY USED TERMS

AAA
Age Anaesthesia Association

AAGBI
Association of Anaesthetists of Great Britain and Ireland

APP
Association for Peri-operative Practice

ASGBI
Association of Surgeons of Great Britain and Ireland

BGS
British Geriatric Society

CEU
Clinical Effectiveness Unit

CQUIN
Commissioning for Quality and Innovation

CRG
Clinical Reference Group

EGS
Emergency General Surgery

ESU
Emergency Surgical Units

ELN
Emergency Laparotomy Network

FICM
Faculty of Intensive Care Medicine

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

IQR
Interquartile Range

IR
Interventional Radiology

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

NIGB
National Information Governance Board

OJEU
Official Journal of the European Union

ONS
Office for National Statistics

PEDW
Patient Episode Database of Wales

RCN
Royal College of Nursing

RCoA
Royal College of Anaesthetists

RCR
Royal College of Radiologists

RCS
Royal College of Surgeons of England

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APPENDIX 1
NATIONAL RECOMMENDATIONS AND STANDARDS OF CARE

All the standards referred to within this report have been collated in this Appendix for reference, along with their source document (with online links where available).

(ASGBI EGS) Association of Surgeons of Great Britain and Ireland
Emergency general surgery consensus statement (2007)
http://bit.ly/1hMjuk7

(ASGBI IPP) Association of Surgeons of Great Britain and Ireland
Issues in professional practice: Emergency general surgery (2012)
http://bit.ly/1lQ4SV6

(ASGBI PS) Association of Surgeons of Great Britain and Ireland
Patient safety: A consensus statement (2009)
http://bit.ly/1hMkaWM

(NCEPOD Age) National Confidential Enquiry into Patient Outcome and Death
An age old problem: A review of the care received by elderly patients undergoing surgery (2010)
http://bit.ly/1hMktB0

(NCEPOD KTR) National Confidential Enquiry into Patient Outcome and Death
Knowing the risk: A review of the peri-operative care of surgical patients (2011)
http://bit.ly/1hMkTY8

(NICE CG50) National Institute for Health and Care Excellence
Acutely ill patients in hospital: Recognition of and response to acute illness in adults in hospital (2007)
http://bit.ly/1hMl7hV

(NSF older people) Department of Health
The National Service Framework for older people (2001)
http://bit.ly/1hMlIjq

(RCoA GPAS) Royal College of Anaesthetists
Guidance on the provision of anaesthesia services for emergency surgery (2014)
www.rcoa.ac.uk/node/14669

(RCS EESC) Royal College of Surgeons of England
Separating emergency and elective surgical care: Recommendations for practice (2007)
http://bit.ly/1kCwCte

(RCS HR) The Royal College of Surgeons of England/Department of Health
The higher risk general surgical patient: Towards improved care for a forgotten group (2011)
http://bit.ly/1fH3b9H

(RCS USC) The Royal College of Surgeons of England
Emergency surgery: Standards for unscheduled care (2011)
http://bit.ly/NUhKLg

Surviving Sepsis Campaign
Dellinger RP, Levy MM, Rhodes A. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock 2012 (vol 41, pg 580, 2013). *Crit Care Med* 2014;**42(1)**:E88–E88.

PRINCIPAL STANDARDS AND RECOMMENDATIONS

6 Facilities

All hospitals admitting emergency general surgical patients should have a dedicated, fully staffed, theatre available at all times for this clinical workload (ASGBI EGS)

Even in the smallest centres the principle of dedicated commitment to emergency general surgery still applies (ASGBI EGS)

Adequate emergency theatre time is provided throughout the day to minimise delays and avoid emergency surgery being undertaken out-of-hours when the hospital may have reduced staffing to care for complex post-operative patients (RCS USC)

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)

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

There must be a clear and identifiable separation of delivery of emergency and elective care (ASGBI EGS)

Wherever possible, emergency and elective surgical pathways are separated (RCS EESC)

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

Where imaging will affect immediate outcome, emergency surgical patients have access to CT, plain films and US within 30 minutes of request. When MRI is required and not available, patients are transferred to the appropriate centre. Advice on appropriate imaging is available immediately (RCS USC)

Definitive diagnostic CT as early as possible but should be within four hours of identification as high-risk (RCS HR)

Emergency surgical services delivered via a network have arrangements in place for image transfer and telemedicine and agreed protocols for ambulance bypass/transfer (RCS USC)
Hospitals should (also) ensure that there are clear arrangements in place for interventional radiology, especially out-of-hours (RCS HR)
Hospitals providing emergency surgical services have access to 24/7 interventional radiology. Interventional radiology services are staffed by fully trained interventional radiologists, interventional nurses and interventional radiographers. Interventional radiology services are ideally on the same site as the emergency services. Where they are not, or where high-end intervention is necessary, there are clear and unambiguous patient pathways to deliver those services through a network solution. Interventional radiology services have an identified consultant radiologist available 24/7. Interventional radiology services for emergency patients are available within one hour of request (RCS USC)
Scheduled seven-day access to diagnostic and treatment procedures such as diagnostic gastrointestinal (GI) endoscopy, bronchoscopy, echocardiography, diagnostic ultrasound, CT and MRI (RCS USC)

The delivery of quality clinical care is dependent on access to supporting facilities. Rapid access to CT imaging, ultrasound scanning and laboratory analyses are critical to the efficient diagnosis, resuscitation and prioritisation of these patients (ASGBI EGS)
Wherever general and regional anaesthesia is administered, there is access to an appropriate range of laboratory and radiological services (RCS USC)
24-hour test availability including full blood count, sickle cell screen, coagulation screen, group and save, and availability of blood components (RCS USC)
Clinical telephone haematology advice available 24/7 (RCS USC)
Prompt availability of blood components and massive haemorrhage protocol available in all key areas (RCS USC)
24-hour availability of comprehensive infectious diseases and infection control advice (RCS USC)

7 Clinical staffing

A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% (RCS USC)

All hospitals admitting emergency general surgical patients should have 24-hour cover by a consultant with a general surgical Certificate of Completion of Training (CCT) or equivalent (ASGBI EGS)

It is important that there are effective arrangements for refereeing the priority of competing interests at all times of the day and night. ASGBI considers that this is best delivered by dedicated clinical leadership (ASGBI EGS)

The assessment, prioritisation and management of emergency general surgical patients should be the responsibility of accredited general surgeons (ASGBI EGS)

For a typical major hospital, the emergency general surgical team will comprise a consultant surgeon (CCT holder), middle grade (MRCS holder), core trainee and foundation doctor. As major procedures often require three surgeons, the effect on other activities during major surgery should be anticipated (RCS USC)

Specialty teams develop rotas of clearly identified, adequately experienced staff who can provide advice or attend and review patients expeditiously on the acute medical unit within a maximum of four hours of a request and ideally sooner (RCS USC)

A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% (RCS USC)

All patients undergoing emergency surgery requiring anaesthesia should be seen by an anaesthetist for assessment and pre-operative optimisation; the exact timing of this visit will be dependent upon the urgency of surgery (RCoA GPAS)

The peri-operative anaesthetic care of ASA3 and above patients requiring immediate major surgery (and therefore with an expected higher mortality) is directly supervised by a consultant anaesthetist (RCS USC)

Structured arrangements are in place for the handover of patients at each change of responsible consultant/medical team. Time for handover is built into job plans and occurs within working hours (RCS USC)

Patients admitted via the emergency general surgical service should remain under the care of this service until formally transferred to another team and accepted by them (ASGBI EGS)

8 Peri-operative care and pathways of care

Trusts should formalise their pathways for unscheduled adult general surgical care. The pathway should include the timing of diagnostic tests, timing of surgery and post-operative location for patients (RCS HR)
Each patient should have his or her expected risk of death estimated and documented prior to intervention and due adjustments made in urgency of care and seniority of staff involved (RCS HR)
High-risk patients are defined by a predicted hospital mortality ≥5%: they should have active consultant input in the diagnostic, surgical, anaesthetic and critical care elements of their pathway (RCS HR)
A consultant surgeon (CCT holder) and consultant anaesthetist are present for all cases with predicted mortality ≥10% (RCS USC)
Surgical patients often require complex management and delay worsens outcomes. The adoption of an escalation strategy which incorporates defined time-points and the early involvement of senior staff when necessary are strongly advised (RCS HR)
Best practice: hospital has agreed integrated pathway to facilitate the following within a defined timescale: urgent access to imaging (CT); timely definitive treatment (surgery/radiology/medical) (RCS USC)
The post-operative care of the high-risk surgical patient needs to be improved. Each trust must make provision for sufficient critical care beds or pathways of care to provide appropriate support in the post-operative period (NCEPOD KTR)

There is good evidence to demonstrate that inappropriate peri- and post-operative fluid therapy is harmful. Dynamic monitoring of stroke volume and cardiac output avoids this, and should be considered in all patients undergoing major surgery (ASGBI PS)
There should be clear strategies for the management of intra-operative 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)

Adverse events should be studied using morbidity and mortality (M&M) meetings (ASGBI PS)
Trusts should audit delays in proceeding to surgery in patients requiring emergency or urgent abdominal surgery and implement appropriate mechanisms to reduce these (NCEPOD Age)
All deaths/serious morbidity should be reviewed formally by a senior member of the anaesthetic department (RCS USC)

9 Critical care and outreach

All high-risk patients should be considered for critical care and as a minimum, patients with an estimated risk of death of ≥10% should be admitted to a critical care location (RCS HR)
Given the high incidence of post-operative complications demonstrated in the review of high-risk patients, and the impact this has on outcome there is an urgent need to address post-operative care (NCEPOD KTR)
The post-operative care of the high-risk surgical patient needs to be improved. Each Trust must make provision for sufficient critical care beds or pathways of care to provide appropriate support in the post-operative period (NCEPOD KTR)
To aid planning for provision of facilities for high-risk patients, each trust should analyse the volume of work considered to be high-risk and quantify the critical care requirements of this cohort (NCEPOD KTR)
Hospitals should plan their critical care resource to match need in order to avoid shortages and define critical care areas accordingly (RCS HR)
Critical care facilities are available at all times for emergency surgery. If this is not the case, agreed protocols for transfer are in place (RCS USC)
There is 24-hour cover of the ICU by a named consultant with appropriate experience and competences (RCS USC)
Each hospital should ensure that there is a system to rapidly recognise and deal appropriately with post-operative deterioration (NCEPOD KTR)
Prompt recognition and treatment of emergencies and complications is essential to improve outcomes and reduce costs (RCS HR)
Prompt intervention is fundamental to the successful treatment of the patient who deteriorates after surgery (RCS HR)

10 Multidisciplinary input

Routine daily input from Medicine for the Care of Older People (MCOP) should be available to elderly patients undergoing surgery and is integral to inpatient care pathways in this population (NCEPOD Age)
Clear protocols for the post-operative management of elderly patients undergoing abdominal surgery should be developed, which include, where appropriate, routine review by a MCOP 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 elderly surgical admissions should have a formal nutritional assessment during their admission so that malnutrition can be identified and treated (NCEPOD Age)

APPENDIX 2

HOSPITAL DATA PROVIDING DETAIL ON EACH INDIVIDUAL HOSPITAL'S FACILITIES, BROKEN DOWN ACCORDING TO GEOGRAPHICAL REGION

Hospital Quartile of size according to number of adult inpatient beds

	Number of hospitals	Range of hospital beds
Quartile 1	44	64–364
Quartile 2	43	371–457
Quartile 3	45	459–648
Quartile 4	44	649–1,179

Key

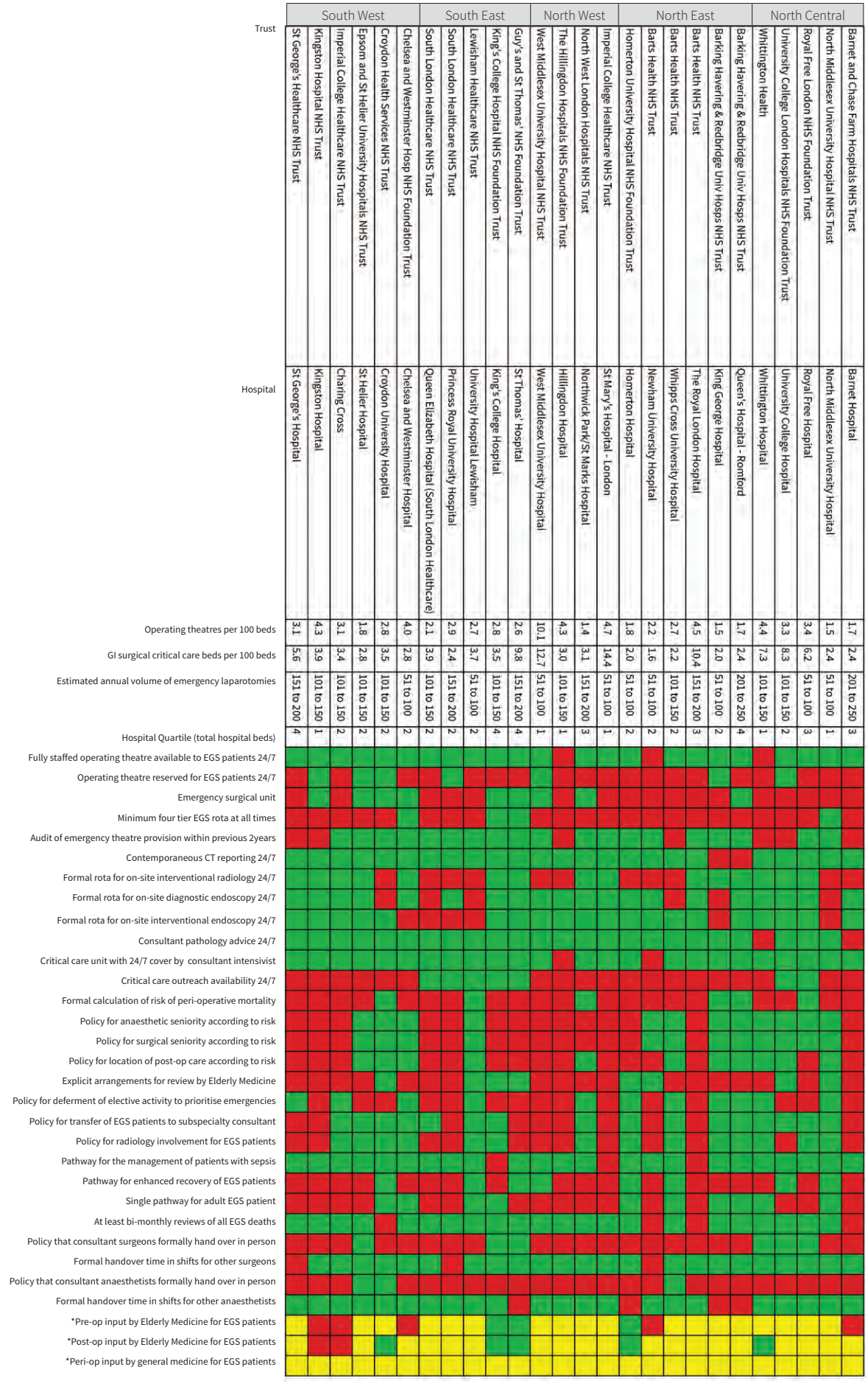
Available
Not available

For questions marked with an asterisk, the following key applies:

None
Proactive
On request

London

- North Central
- North East
- North West
- South East
- South West

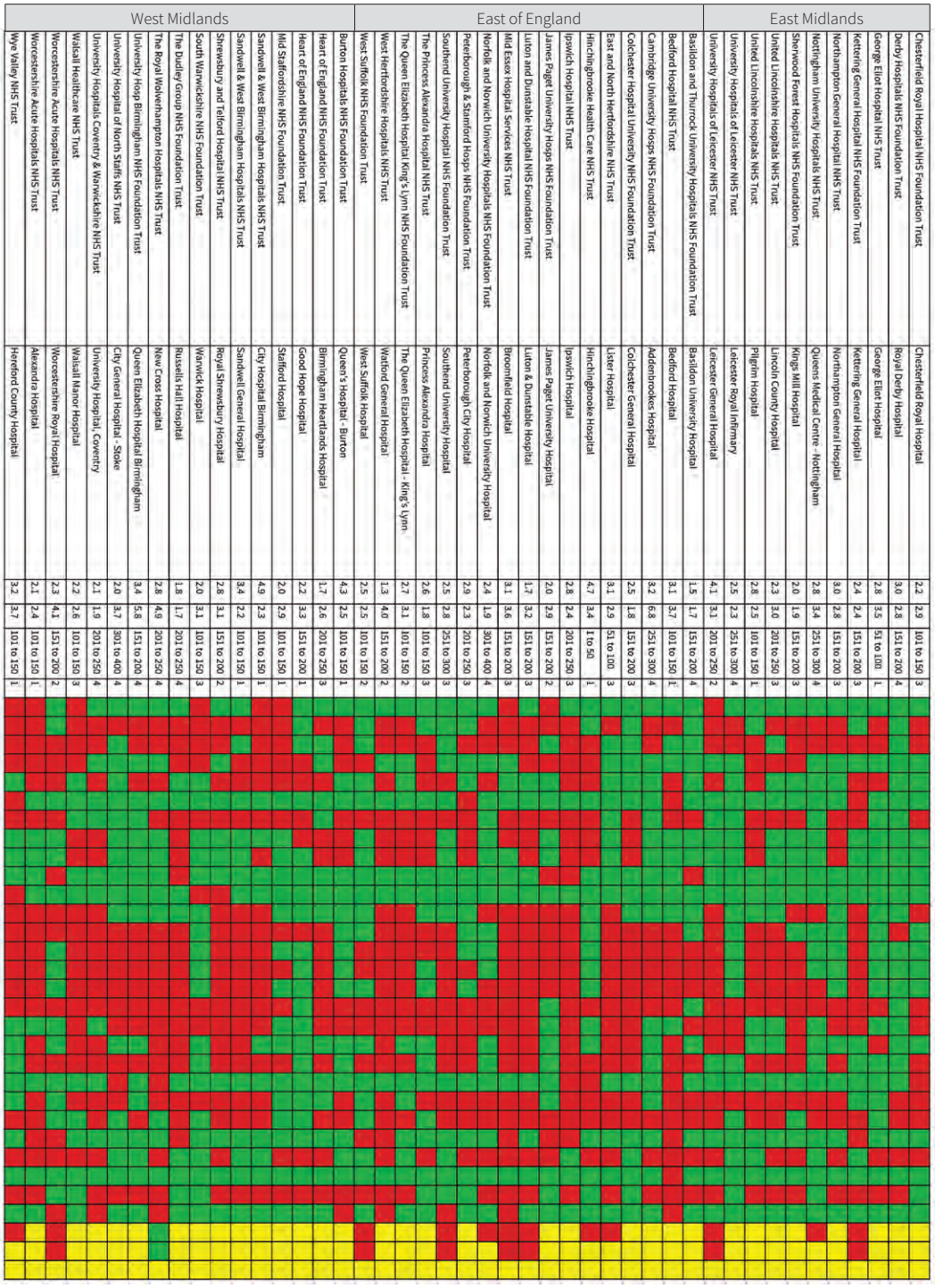


Central

East Midlands

East of England

West Midlands

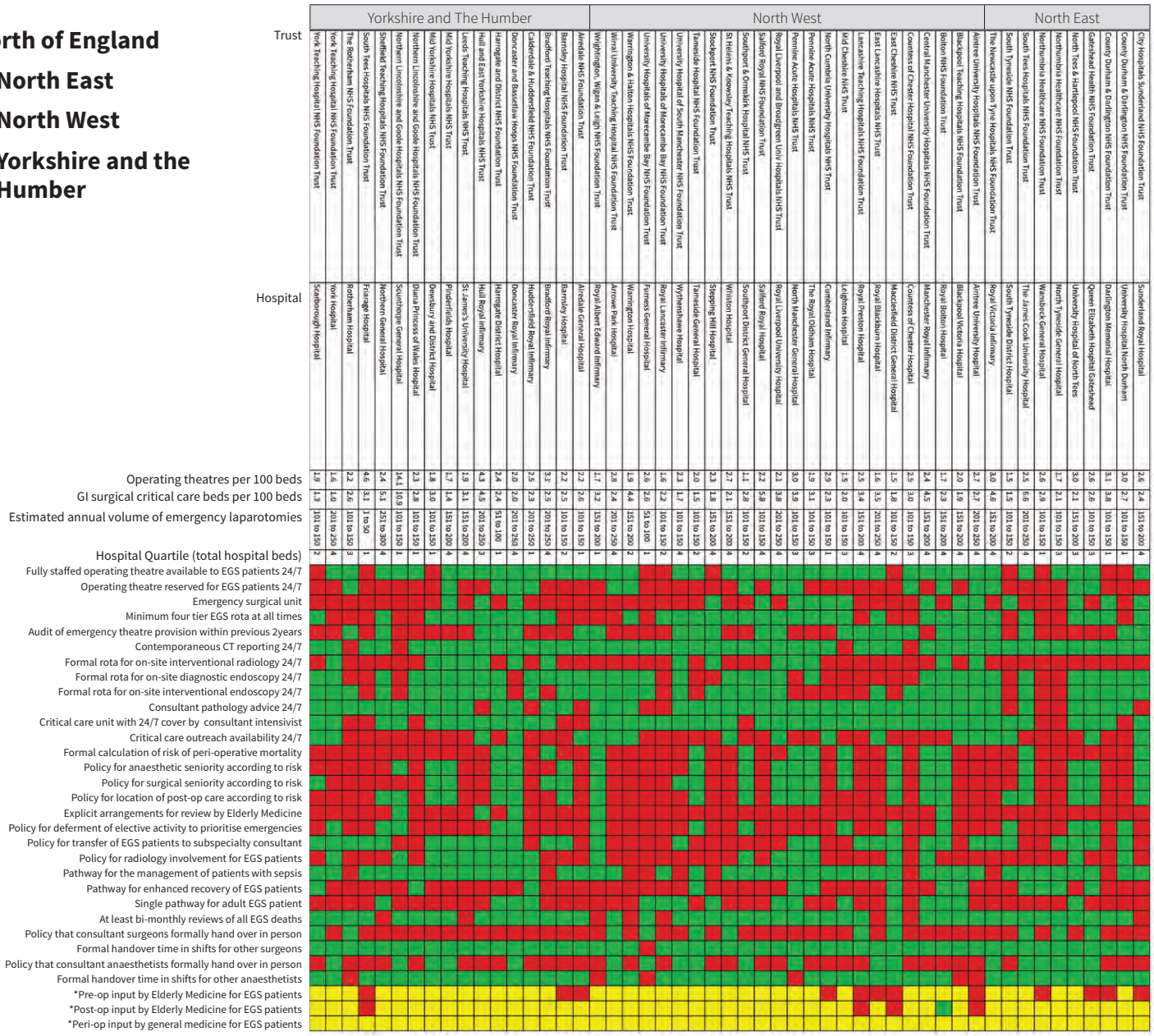


North of England

North East

North West

Yorkshire and the Humber

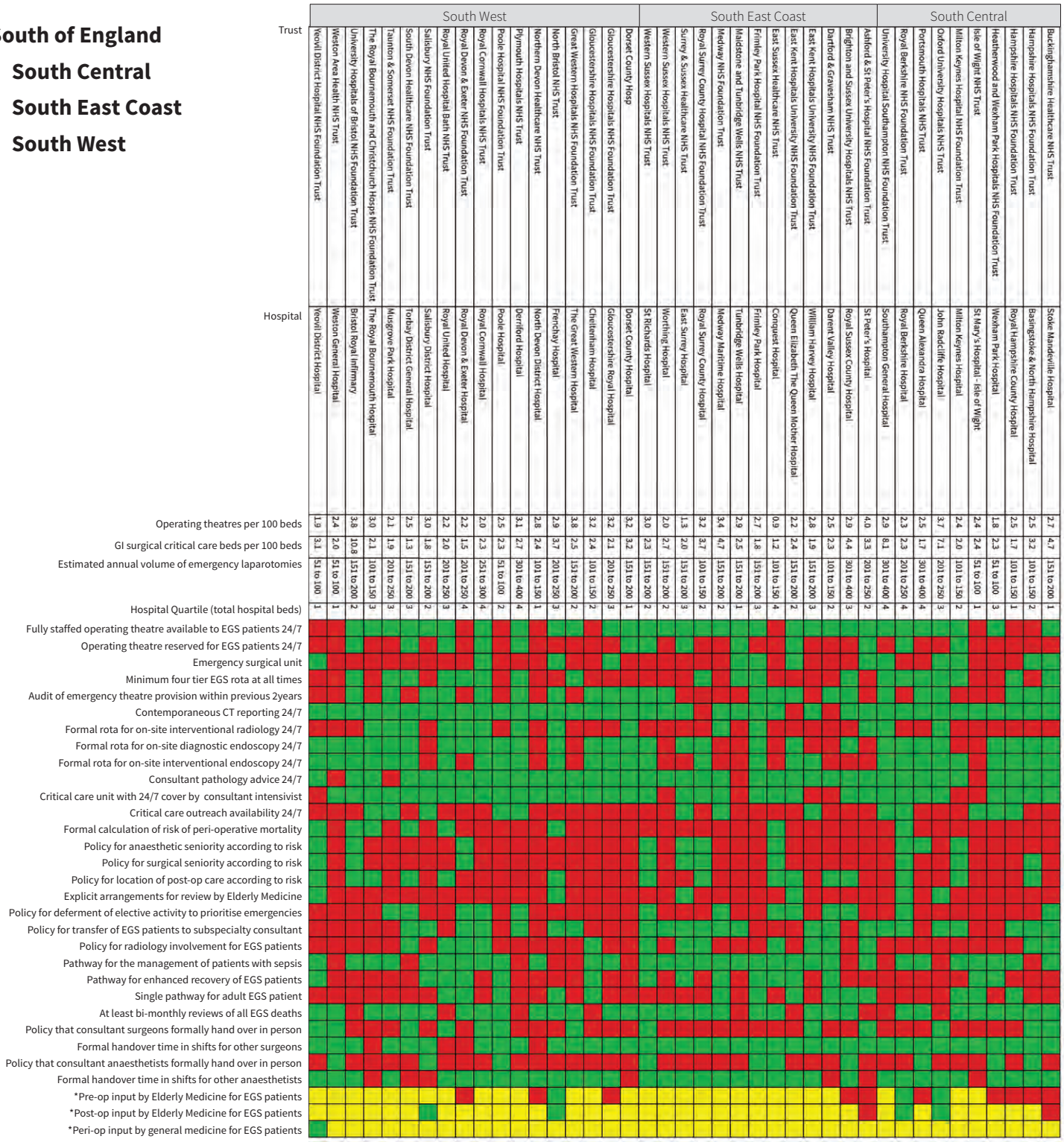


South of England

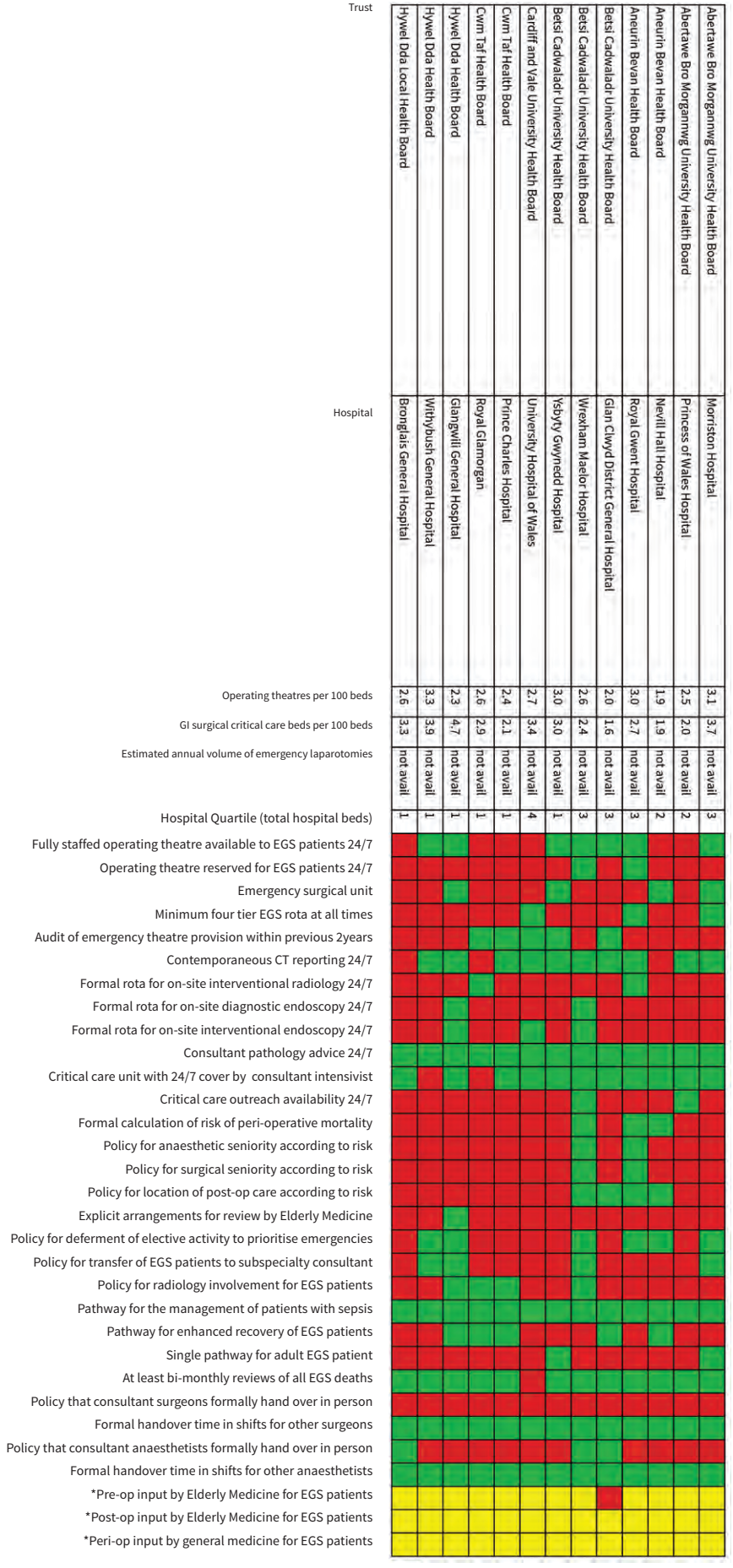
South Central

South East Coast

South West



Wales


Trust
Hospital
Operating theatres per 100 beds
GI surgical critical care beds per 100 beds
Estimated annual volume of emergency laparotomies
Hospital Quartile (total hospital beds)
Fully staffed operating theatre available to EGS patients 24/7
Operating theatre reserved for EGS patients 24/7
Emergency surgical unit
Minimum four tier EGS rota at all times
Audit of emergency theatre provision within previous 2years
Contemporaneous CT reporting 24/7
Formal rota for on-site interventional radiology 24/7
Formal rota for on-site diagnostic endoscopy 24/7
Formal rota for on-site interventional endoscopy 24/7
Consultant pathology advice 24/7
Critical care unit with 24/7 cover by consultant intensivist
Critical care outreach availability 24/7
Formal calculation of risk of peri-operative mortality
Policy for anaesthetic seniority according to risk
Policy for surgical seniority according to risk
Policy for location of post-op care according to risk
Explicit arrangements for review by Elderly Medicine
Policy for deferment of elective activity to prioritise emergencies
Policy for transfer of EGS patients to subspecialty consultant
Policy for radiology involvement for EGS patients
Pathway for the management of patients with sepsis
Pathway for enhanced recovery of EGS patients
Single pathway for adult EGS patient
At least bi-monthly reviews of all EGS deaths
Policy that consultant surgeons formally hand over in person
Formal handover time in shifts for other surgeons
Policy that consultant anaesthetists formally hand over in person
Formal handover time in shifts for other anaesthetists
*Pre-op input by Elderly Medicine for EGS patients
*Post-op input by Elderly Medicine for EGS patients
*Peri-op input by general medicine for EGS patients
Hywel Dda Local Health Board
Bronglais General Hospital
2.6
3.3
not avail
1
Hywel Dda Health Board
Withybush General Hospital
3.3
3.9
not avail
1
Hywel Dda Health Board
Glangwili General Hospital
2.3
4.7
not avail
1
Cwm Taf Health Board
Royal Glamorgan
2.6
2.9
not avail
1
Cwm Taf Health Board
Prince Charles Hospital
2.4
2.1
not avail
1
Cardiff and Vale University Health Board
University Hospital of Wales
2.7
3.4
not avail
4
Betsi Cadwaladr University Health Board
Ysbyty Gwynedd Hospital
3.0
3.0
not avail
1
Betsi Cadwaladr University Health Board
Wrexham Maelor Hospital
2.6
2.4
not avail
3
Betsi Cadwaladr University Health Board
Glan Clwyd District General Hospital
2.0
1.6
not avail
3
Aneurin Bevan Health Board
Royal Gwent Hospital
3.0
2.7
not avail
3
Aneurin Bevan Health Board
Nevill Hall Hospital
1.9
1.9
not avail
2
Aberta we Bro Morgannwg University Health Board
Princess of Wales Hospital
2.5
2.0
not avail
2
Abertawe Bro Morgannwg University Health Board
Morriston Hospital
3.1
3.7
not avail
3

APPENDIX 3
GOVERNANCE AND ORGANISATIONAL ARRANGEMENTS FOR THE NATIONAL EMERGENCY LAPAROTOMY AUDIT

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
Professor John MacFie, Association of Surgeons of Great Britain and Ireland (ASGBI)
Dr Hywel Jones, Royal College of Anaesthetists representative (RCoA)
Dr Deborah Nolan, Royal College of Anaesthetists representative (RCoA)
Professor Derek Alderson, Royal College of Surgeons of England – Clinical Effectiveness Unit Trustee
Professor Kathy Rowan, Intensive Care Audit and Research Centre (ICNARC)
Dr Yvonne Silove, 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)
Miss Emma Barrow, Surgical Research Fellow

Mr Martin Cripps, Senior Consultant, Net Solving Ltd
Dr David Cromwell, NELA Methodologist, Director of Clinical Effectiveness Unit
Ms Sharon Drake, RCoA Director of Education and Research
Dr Mike Galsworthy, Health Services Researcher
Ms Angela Kuryba, Statistician, CEU
Mr Jose Lourtie, NELA Project Administrator
Dr Ramani Moonesinghe, Director, UCL/UCLH Surgical Outcomes Research Centre
Dr Matthew Oliver, Research Fellow, National Institute of Academic Anaesthesia
Mr Dimitri Papadimitriou, NELA Research Team Administrator
Professor Carol Peden, Associate Medical Director for Clinical Quality, Royal United Hospital, Bath and NHS England (South)
Dr Kate Walker, Lecturer in Medical Statistics, CEU

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 of Age Anaesthesia Association

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

The Association for Peri-operative Practice (AfPP)
Ms Jenny Abraham, Peri-operative Specialist Laparoscopic Nurse Practitioner

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

British Geriatric Society (BGS)
Dr Jugdeep Dhesi, Chair of BGS Peri-operative Care of Older People Undergoing Surgery SIG (POPS)

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

Intensive Care Audit and Research Centre (ICNARC)
Ms Lucy Lloyd-Scott, ICNARC National Audit Programme Manager

Quality Observatories
Dr Gary Cook, Consultant Epidemiologist

The Royal College of Anaesthetists (RCoA)
Dr Deborah Nolan, Vice-President, RCoA
Dr Hywel Jones, Council Member, RCoA

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

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

The Royal College of Surgeons of England (RCS)
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, Lay Member, RCoA Patient Liaison Group

APPENDIX 4
ORGANISATIONAL AUDIT DATASET

1.	Hospital characteristics	
1.1a	How many adult inpatient or overnight beds (including 23-hours stay) are currently available within the hospital? Do not include day-case beds	
1.1b	How many of these beds are found on adult general surgical inpatient wards? This means beds found on either specialist GI wards (e.g. upper-GI, lower-GI), or wards that accept any type of general surgical admissions. Do not include 23-hour beds in this answer, or specialist non-GI wards (e.g. ENT, urology, neurosurgery)	
1.2	Does your hospital accept acute general surgical admissions?	Yes/No **If No go to Q1.3**
1.2a	**If Yes**, when does your hospital accept acute general surgical admissions?	
	• 24-hours per day, seven days per week	
	or	**Please select all that apply**
	• Monday–Friday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
1.3	Do you have a dedicated emergency surgical unit that is separate from elective workload? i.e. *a ward area where patients receive ongoing care, NOT a surgical admissions unit from which patients are* ***relocated*** *for continuing inpatient care.*	Yes/No
1.4	Is your hospital a tertiary referral centre for any gastro-intestinal surgical specialties?	Yes/No
1.5	Is cardiothoracic surgery undertaken at this hospital?	Yes/No
1.6	Does your hospital accept acute medical admissions?	Yes/No
1.7	Do you have elderly medicine services on site?	Yes/No

2	Hospital facilities	
2.1	How many operating theatres are at this hospital? *Please exclude interventional radiology suites and dedicated obstetric and minor ops theatres, but include day-case theatres*	
2.2a	In a usual **week**, what is the **total** number of fully staffed operating theatres available for **adult** general surgical emergency cases? • *'Fully staffed' refers to a full complement of **non-medical** personnel; anaesthetic and scrub nurses, operating department practitioners (ODPs), healthcare assistants (HCAs) etc.* • *Please exclude trauma theatres, interventional radiology suites and dedicated obstetric and minor ops theatres.*	
	• Monday–Friday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
2.2b	In a usual week, how many dedicated and planned consultant anaesthetic sessions (i.e. **outside of on-call and other duties**) support the theatres in question 2a? *Please note figures are **per week**, not per day. Please round answers to the nearest 0.5 sessions*	
	• Monday–Friday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
2.2c	Of the theatres in 2a, how many of these are reserved exclusively for emergency general surgical cases? *These theatres might be considered a ring-fenced 'general surgery theatre', similar to the provision of 'trauma theatres'. We accept that these theatres will be used for other specialties if there are no general surgical cases*	

	• Monday–Friday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
2.3	Can any member of the surgical team book emergency general surgical cases for emergency theatre(s)? *i.e. regardless of seniority*	Yes/No
2.4	Are emergency theatres staffed **at all times** by **non-medical** personnel (i.e. anaesthetic and scrub nurses, ODPs, HCAs) such that emergency cases can continue regardless of elective and emergency workload elsewhere (e.g. overrunning elective lists, recovery workload, obstetric emergencies, trauma and cardiac arrest calls)?	Yes/No
2.5	Please indicate whether the following individuals are required to be resident when covering the out-of-hours emergency general surgical workload:	
2.5a	• anaesthetic ODP/nurse	Resident/Non-resident
2.5b	• scrub nurse/ODP/HCAs	Resident/Non-resident
2.6	Is non-invasive cardiac output monitoring equipment available for use in the care of the patient undergoing emergency general surgery?	Yes/No **If No go to Q2.7**
2.6b	**If yes**, is it for exclusive use in emergency theatre(s)?	Yes/No
2.7	Have you audited adequacy of provision of emergency theatres within the last two years?	Yes/No
2.8	Does your hospital have plans in place to increase emergency theatre provision within the current or next financial year?	Yes/No
2.9	Are there currently plans to reconfigure emergency surgical services with neighbouring trusts within the next two years?	Yes/No/Not known
2.10	Is there 24-hour on-site access to the following?	
	• Biochemistry	Onsite laboratory Consultant advice (resident or on-call)

	• Haematology	Onsite laboratory Consultant advice (resident or on-call)
	• Microbiology	Onsite laboratory Consultant advice (resident or on-call)
	• Blood bank/transfusion	Onsite laboratory Consultant advice (resident or on-call)
3.	**Peri-operative Care**	
	At your trust are there formal written pathways/ protocols/policies applicable to the emergency general surgical patient, incorporating the following: *These may exist within pathways/protocols, or be incorporated into a single policy relevant to the unscheduled adult surgical patient.*	
3.1	• Monitoring plan compliant with NICE CG50 pathway ('Acutely ill patients in hospital')?	Yes/No
3.2	• Timing of surgery according to clinical urgency?	Yes/No
3.3	• A formal calculation of risk that provides an estimation of peri-operative mortality?	Yes/No
3.4	• Seniority of anaesthetist present in theatre according to calculated risk of death?	Yes/No
3.5	• Seniority of surgeon present in theatre according to calculated risk of death?	Yes/No
3.6	• Location of post-operative care according to calculated risk of death?	Yes/No
3.7	• Explicit arrangements with elderly medicine for review of selected patients?	Yes/No
3.8	• Formalised provision for the deferment of elective activity in order to give adequate priority to unscheduled admissions?	Yes/No
3.9	• Formalised provision for the transfer of care of emergency surgical patients between consultants, to ensure that they receive appropriate subspecialty care?	Yes/No
3.10	• A formal pathway for the involvement of diagnostic and interventional radiology in the care of emergency general surgical patients?	Yes/No

3.11	• A formal pathway for the management of patients with sepsis?	Yes/No
3.12	• A formal pathway for the enhanced recovery of the emergency surgical patient?	Yes/No
3.13	Do you have a single pathway/policy for the care of the unscheduled adult general surgical patient?	Yes/No
3.14a	Is there a regular (i.e. at least bi-monthly) review of all deaths following emergency general surgery?	Yes/No **If No go to Q4**
3.14b	**If Yes**, which of the following specialties provide input into this review:	
	• Surgery	Yes/No
	• Anaesthesia	Yes/No
	• Radiology	Yes/No
	• Critical care	Yes/No
	• Elderly medicine	Yes/No
4	**Critical care and outreach**	
4.1	Is there a dedicated critical care unit with 24-hour cover by a named consultant with regular sessions in critical care?	Yes/No
4.2	Please specify the number of funded Level 2 and Level 3 beds routinely available for adult (>18 years) general surgical patients? *If the numbers vary according to Level 2/3 occupancy, please indicate nominal figures:*	
4.2a	• Level 2	
4.2b	• Level 3	
4.3	What was the total number of level 2 admissions between 1st April 2012 and 31 March 2013? (*do not include patients who required admission, but who were not admitted due to bed-space issues*)	
4.3a	• All specialties	
4.3b	• General surgery (include upper and lower GI)	
4.4	What was the total number of Level 3 admissions between 1 April 2012 and 31 March 2013? (*do not include patients who required admission, but who were not admitted due to bed-space issues*)	
4.4a	• All specialties	
4.4b	• General surgery (include upper and lower GI)	

4.5	Is there a critical care outreach service responsible for the review patients 'at risk' and those with deranged physiological parameters? (*other names might include rapid response team etc*)	Yes/No **If No go to Q5**
4.5a	**If Yes**, please indicate when it is available:	
	• 24-hours per day, 7 days per week	
	or	**Please select all that apply**
	• Monday–Friday	08:00–17:59 18:00–23:59 00:00–07:59
	• Saturday–Sunday	08:00–17:59 18:00–23:59 00:00–07:59
5	**Surgical on-call commitments**	
5.1	How many consultant surgeons participate in the general surgical emergency rota?	
5.2	What are the subspecialties of the consultants on the general surgical emergency rota?	
5.2a	• Colorectal	Yes/No
5.2b	• Upper GI	Yes/No
5.2c	• General	Yes/No
5.2d	• Vascular	Yes/No
5.2e	• Breast	Yes/No
5.2f	• Endocrine	Yes/No
5.3	How many surgical tiers cover the emergency general surgical workload for each time frame? *This includes consultants, fellows, middle and SAS grades, core trainees and foundation doctors. Include all those whether resident or non-resident. If the number drops e.g. at 9pm, enter the lesser value. Enter the daily figures, not the weekly totals. See 'help' for more information*	
	• Monday–Friday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59

5.4	For each tier, please indicate whether at least one individual is free from all elective and non-acute commitments (e.g. elective lists, outpatient clinics) for the whole period while they are covering emergency general surgical workload: (*please refer to definitions if clarification is required*)	
5.4a	• Consultant (CCT holder)	Yes/No/Not on rota
5.4b	• Middle grade (with MRCS)	Yes/No/Not on rota
5.4c	• Core trainee/SAS doctor (without MRCS)	Yes/No/Not on rota
5.4d	• Foundation doctor	Yes/No/Not on rota
5.4e	• Nurse practitioner	Yes/No/Not on rota
5.5	Please indicate whether any of these tiers cover more than one hospital site when providing cover for emergency general surgical cases?	
5.5a	• Consultant (CCT holder)	Yes/No/Not on rota
5.5b	• Middle grade (with MRCS)	Yes/No/Not on rota
5.5c	Core trainee/SAS doctor (without MRCS)	Yes/No/Not on rota
5.5d	Foundation doctor	Yes/No/Not on rota
5.5e	Nurse practitioner	Yes/No/Not on rota
5.6a	Are emergency patients that still require assessment and treatment at the end of the consultant's period of on-call retained by the admitting consultant?	Yes/No **If Yes go to Q5.6c**
5.6b	**If No**, do you have a policy requiring consultant surgeons to formally hand over to one another in person?	Yes/No
5.6c	Is there a formal handover time built into the shifts for others?	Yes/No
6	**Anaesthetist on-call commitments**	
6.1	How many anaesthetic tiers cover the emergency general surgical workload for each time frame? *This includes consultants, fellows, middle and SAS grades, core trainees and foundation doctors. Include all those whether resident or non-resident. If the number drops, e.g. at 9pm, enter the lesser value. Enter the daily figures, not the weekly totals. See 'help' for more information*	
	• Monday–Friday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59

	• Saturday–Sunday	_____ 08:00–13:00 _____ 13:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
6.2	While covering the emergency general surgical workload, please indicate whether at least one individual from each of the following tiers is free at all times from covering other areas of the hospital (such as critical care, obstetrics and trauma calls) so they can immediately return to theatre	
6.2a	• Consultant (CCT holder)	Yes/No Not on rota
6.2b	• Middle grade (with FRCA)	Yes/No Not on rota
6.2c	• Core trainee/SAS grade (without FRCA)	Yes/No Not on rota
6.2d	• Foundation doctor	Yes/No Not on rota
6.2e	• Physician's assistant (anaesthesia)	Yes/No Not on rota
6.3a	Do you have a policy requiring consultants to formally hand over to one and other in person?	Yes/No
6.3b	Is there a formal handover time built into the shifts for others?	Yes/No
7	**Multidisciplinary input**	
7.1	What type of input does elderly medicine provide in the **pre-operative** period for patients admitted as emergency general surgical patients?	None Proactive (case finding by elderly medicine) On-request only
7.2	What type of input does elderly medicine provide in the post-operative period for emergency general surgical patients?	None Proactive (case finding by elderly medicine) Routine provision On request only
7.3	In the elderly patient undergoing emergency general surgery, are there formal pathways/protocols for the routine assessment of:	
7.3a	• Frailty	Yes (score used) Yes (not scored No

7.3b	• Nutritional status	Yes (score used) Yes (not scored No
7.3c	• Cognitive function	Yes (score used) Yes (not scored No
7.3d	• Functional status	Yes (score used) Yes (not scored No
7.4	What type of input is available from **general internal medicine** for emergency general surgical patients who suffer acute medical complications in the peri-operative period?	None Proactive (case finding) On request only
8	**Radiology, imaging and endoscopy**	
8.1	Is there 24-hour on-site access to **diagnostic X-ray?**	Yes/No
8.2	Is there 24-hour on-site access to **diagnostic ultrasound?**	Yes/No
8.3	With regard to access to on-site **diagnostic CT**, please indicate how this is provided:	Available and reported contemporaneously by radiologist with GI sub-specialisation Available and reported contemporaneously by general radiologist Available, but unreported by radiology at time of scanning Not available
	• Monday–Friday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
8.4	Is there a formal rota of radiologists who provide on-site **interventional** radiology:	
	• 24-hours per day, 7 days per week	
	or	**Please select all that apply**
	• Monday–Friday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59

	• Saturday–Sunday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
8.5	Is there a formal rota of clinicians for the provision of on-site **diagnostic endoscopy**:	
	• 24-hours per day, 7 days per week	
	or	**Please select all that apply**
	• Monday–Friday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
8.6	Is there a formal rota of clinicians for the provision of on-site **interventional endoscopy**?	
	• 24-hours per day, 7 days per week	
	or	**Please select all that apply**
	• Monday–Friday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
8.7	Are clinicians performing endoscopy supported by dedicated endoscopy staff as opposed to other nursing staff (e.g. from theatre)?	
	• 24-hours per day, 7 days per week	
	or	**Please select all that apply**
	• Monday–Friday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59
	• Saturday–Sunday	_____ 08:00–17:59 _____ 18:00–23:59 _____ 00:00–07:59

APPENDIX 5
AN OVERVIEW OF THE HOSPITAL EPISODES STATISTICS (HES) DATASET

The Hospital Episode Statistics (HES) database contains information about all patients admitted to National Health Service (NHS) hospitals in England. It was first established in 1989 and collects data on more than 12 million hospital admissions each year. A unique patient identifier allows admissions by the same patient to be linked. This enables the hospital care profile prior to, or after, an admission for emergency laparotomy to be described for each patient.

Records within HES contain information about the patient demographics, the hospital of treatment, the mode of arrival (elective, emergency, transfer) and the specialty of treatment, as well as the dates of admission/discharge. Diagnostic information can be entered in up to 24 fields, and is coded according to the International Classification of Diseases, 10th revision (ICD-10). The type (and date) of up to 20 procedures can also be entered, and are coded according to the Office of Population Censuses and Surveys classification, 4th revision (OPCS-4). Each record describes a Finished Consultant Episode (or episode), which corresponds to the time a patient is under the care of a particular consultant. An admission can be made up of more than one episode.

One advantage of using HES for evaluations of surgery is that it includes all admissions to English NHS hospitals, and this should minimise the risk of selection bias in any study. The use of a unique patient identifier also means that there should be minimal lost to follow up, especially in relation to short-term outcomes (complications, readmissions).

There are various limitations in using an administrative health database like HES to describe surgical practice and outcomes. First, there are limitations due to the coding classifications. The OPCS classification may not distinguish between subtypes of a procedure or describe them in a way that is incompatible with current medical terminology (e.g. oesophageal resections). Second, coding may be incomplete. Some procedures may not be coded, although the risk of this is small for major operations. It is more common for HES data to lack information on minor procedures that were performed at the same time as the major operation. HES can capture the surgical approach (open/laparascopic) by using additional OPCS codes, e.g. Y751 = laparoscopically assisted approach to abdominal cavity, but to date hospitals have not uniformly entered these codes for all operations. Similarly, while OPCS codes

for investigative procedures such as CT scans are available, they are not uniformly used. Third, there may be coding inconsistencies (errors) in the type of procedure and the diagnosis.

The impact of these limitations can be reduced by a careful review of coding within hospitals and the triangulation of information including treatment specialty, mode of arrival, and diagnostic and procedure information.

There are various ways to identify patients who undergo emergency laparotomy in HES. To date, there have been three studies that have used HES to examine issues related to this surgery, and each has taken a different approach.[1–3] None of the studies defined a cohort that matches the NELA selection criteria, partly due to their different aims.

References

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