



# Seventh Patient Report of the National Emergency Laparotomy Audit

December 2019 to November 2020



November 2021



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# Executive Summary


Results from 2019–2020 – the Seventh Year of the National Emergency Laparotomy Audit

(For data about the impact of COVID-19 please refer to the [Impact of COVID-19 on Emergency Laparotomy interim report](#)).


Principal performance statistics are available [here](#).


- 1** **21,846** patients who had emergency bowel surgery in England and Wales were included in the Year 7 audit

National **30-day mortality rate** has fallen to **8.7%** (11.8% in Year 1)



- 2** Improvements in care have reduced patients' average hospital stay from **19.2 days** in Year 1 to **15.1 days** in Year 7


**19.2 days**  
**15.1 days**


- 3** **85%** of patients now receive a preoperative assessment of risk (up from 84% last year, and 56% in Year 1)



- 4** **94.0%** of patients with a high documented risk had **consultant surgeon** input before surgery


**75.5%** of patients with a high documented risk had **consultant anaesthetist** input before surgery

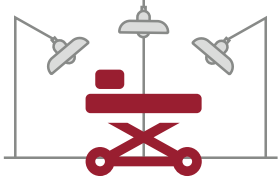

- 5** **82.3%** of high-risk patients were admitted to critical care (85.2% in Year 6)



- 6** **92.5%** of patients received a preoperative CT scan (90.5% in Year 6)

**65.9%** of these patients had their scan reported by a **consultant radiologist** (62.3% in Year 6)



- 7** Both **anaesthetic and surgeon consultant presence** during surgery is at 90.1%, and **increased from 77.4% (Year 6) to 85.2% out of hours** (00:00 to 08:00)


- 8** **Almost 1/3 of patients** needing **immediate surgery** did not get to the operating theatre in the recommended time frame

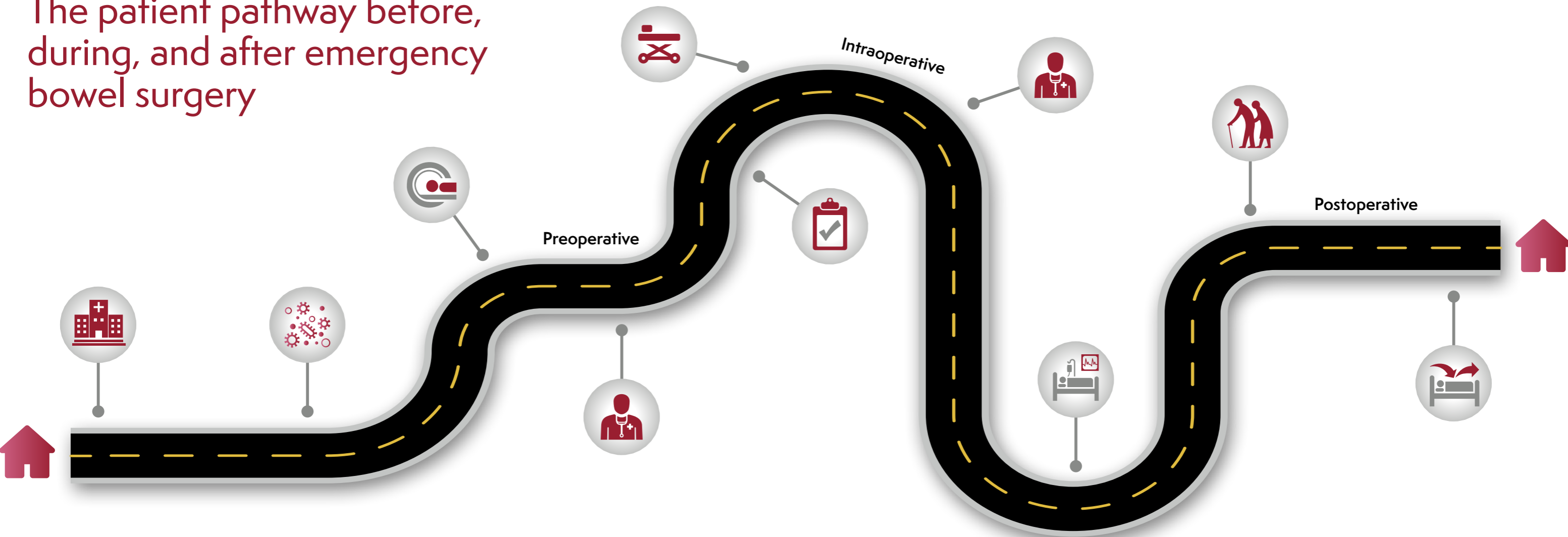

- 9** **Time to antibiotics in patients with suspected sepsis** remains poor with **78.3%** not receiving antibiotics **within one hour**


- 10** **55.4%** of patients are over the age of 65 and **18.1%** of patients are over the age of 80.

**Only 27.1%** of patients 80 or over or 65 and frail had geriatrician input



# The patient pathway before, during, and after emergency bowel surgery



## 1 At home

You have probably experienced abdominal pain at home and had appointments with your GP or visited the hospital Emergency Department (ED) before.

## 2 Arrival

Most patients make their own way to hospital, (sometimes after being seen by a general practitioner [GP]) and are admitted to hospital after initially being seen and assessed in the ED.

## 3 Sepsis (blood poisoning) management

If you have signs of sepsis you should receive antibiotics within one hour of arrival to hospital.

## 4 Radiology

Most patients will receive a computerised tomography (CT) scan as part of the initial assessment before surgery. This helps to establish the nature of your illness and guide what operation you will need.

## 5 Consultant Review

Most patients will be seen by a consultant surgeon and anaesthetist prior to their operation. Any questions or concerns can be discussed. In the most unwell patients who need immediate surgery this discussion may take place with another member of the surgical or anaesthetic team in order to avoid a delay.

## 6 Risk assessment

The risk of death associated with emergency laparotomy surgery should be assessed and discussed with you before your operation. This enables you to be fully involved in any decisions regarding surgery and ensures that you receive the appropriate levels of care before, during and after your operation.

## 7 Timely admission to theatre

It is important that you have your operation in a timely fashion. How quickly you have your operation is dependent on why you need surgery. In some circumstances it may be appropriate to try alternative treatments first.

## 8 Consultant presence

Emergency laparotomy is often high-risk surgery. This means that in most cases, you will benefit from the expertise of a consultant anaesthetist and a consultant surgeon will be required during your operation.

## 9 Critical care

Many patients who have an emergency laparotomy will be cared for in the Intensive Care (ICU) or High Dependency Unit (HDU) in the initial period after their surgery. This is so they can receive specialist organ support if necessary and be monitored closely for any possible complications.

## 10 Frailty assessment + geriatrician review

You may be seen by a geriatrician (specialist in elderly care) during your hospital stay as part of the team looking after you to help improve your recovery after surgery.

## 11 Discharge

Many patients will have had a long stay in hospital after an emergency laparotomy. During this time your teams should be helping prepare you for leaving hospital. You may feel tired, be unsure about what you can or can't do – now is the time to ask questions and seek answers from the team looking after you. It is important you know how and where to get help if needed after discharge.

## 12 Recovery

There will be an additional period of recovery required after discharge. Your GP and community nursing teams should be able to help advise you and provide support.

For more details on National Standards [please visit our website](#).

# Acknowledgements

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# 1 The NELA key messages and recommendations: improving outcomes and reducing complications

Care commissioners, executive and senior leadership teams are responsible for providing adequate resources, financial investment and infrastructure to facilitate the implementation of the recommendations made in this report.

Local clinical teams should continue to use data from the online [NELA webtool](#), including the NELA exponentially weighted moving average (EWMA) mortality charts and [quarterly reports](#), to monitor performance and patient outcomes.<sup>1</sup> The use of benchmarked data to raise concerns or challenge apparent gaps in care pathways is encouraged. Individual patient care can also be evaluated against recommended standards using the NELA 'Excellence and Exception' reports.

All clinical staff should keep up to date with topical [NELA webinars](#), through social media (@NELANews) and via NELA newsletters.

## KEY MESSAGE 1

**High-risk patients undergoing emergency laparotomy do not consistently benefit from early recognition of acute abdominal pathology through Emergency Department (ED) triage, assessment, investigation and surgical review (Chapters 4.2 and 4.5).**

**Recommendation 1.1:** Ensure NELA leads for Emergency Medicine are appointed with job planned time to work with Anaesthetic, Surgical and Radiology NELA leads. (Audience/s: Medical Directors).

**Recommendation 1.2:** Ensure inter-departmental pathways for patients with acute abdominal pathology:

- Incorporate triage, assessment, investigation and surgical review stages
- Are designed and implemented by multi-professional healthcare teams
- Are regularly evaluated, updated and supported by use of NELA data.

(Audience/s: ED, Anaesthetic and Surgical Clinical teams; local NELA team)

## KEY MESSAGE 2

**Patients with sepsis do not receive the recommended standard of care with respect to receiving antibiotic therapy and timely definitive source control through delays in surgical decision making and arrival in theatre for emergency laparotomy. Emergency laparotomy patients must remain a priority for clinical and theatre teams at all times (Chapter 4.4).**

**Recommendation 2.1:** Follow national guidance for the management of patients with suspected abdominal sepsis (United Kingdom Sepsis Trust, 2019; NICE, 2016) and:

- Commence antibiotic therapy immediately, in line with guidance
- Review the timeliness of interventions by using local NELA data via the NELA webtool on a monthly basis
- Present this information at inter-departmental governance meetings.

(Audience/s: ED, Surgical and Anaesthetic clinical teams; local NELA teams)

<sup>1</sup>Access to the NELA webtool can be requested through your local NELA leads or by emailing the NELA helpdesk: [NELA@rcoa.ac.uk](mailto:NELA@rcoa.ac.uk).



**Recommendation 2.2:** Ensure rapid access to emergency theatres for all emergency laparotomy patients. (Audience/s: Theatre teams; Surgical and Anaesthetic clinical teams).

## KEY MESSAGE 3

**Patients undergoing emergency laparotomy do not consistently benefit from in-house consultant reporting of preoperative computerised tomography (CT) scans. Outsourcing of radiology reporting is common with associated increases in discrepancy rates (Chapter 4.3).**

**Recommendation 3.1:** Ensure local workforce planning facilitates consultant reporting whenever possible. (Audience/s: Clinical Directors and Medical Directors).

**Recommendation 3.2:** Ensure appointment of NELA leads in Radiology with specific job planned time to perform this role. (Audience/s: Clinical Directors in Radiology and Medical Directors).

**Recommendation 3.3:** Implement in-house consultant supervision and co-validation of registrar reporting on preoperative CT scans before outsourcing radiology reports for external review. (Audience/s: Clinical Directors in Radiology and Medical Directors).

**Recommendation 3.4:** Ensure that reporting of CT scans is a standing item on review meetings, including radiology events and learning meetings (REALM). (Audience/s: NELA leads in Radiology).

## KEY MESSAGE 4

**As in the Year 6 report key messages, the care of frail, older patients remains a concern. Increased frailty is an independent marker of poor outcomes. Frail patients should be considered high-risk regardless of risk score. Despite this, consistent geriatrician input at hospital level remains variable but generally poor, with many older frail patients missing out on the care and expertise of geriatric and frailty teams (Chapter 7).**

**Recommendation 4.1:**

- Formally assess and document frailty of patients over the age of 65
- Consider frailty scoring an integral part of a formal risk assessment.

(Audience/s: ED, Surgical and Anaesthetic Clinical Teams; local NELA teams)

**Recommendation 4.2:** Ensure geriatric medicine services have adequate job planned capacity to work with local NELA leads in the delivery of consistent consultant geriatrician input for older emergency laparotomy patients. (Audience/s: Medical Directors).

## KEY MESSAGE 5

**A small proportion of patients have a 'negative' emergency laparotomy which has no benefit to their treatment or diagnosis. These patients may have undergone unnecessary major surgery. The detrimental effect on all aspects of these patient's lives may be significant, and they have a high 30-day mortality at 13.7% (Chapter 5.2).**

**Recommendation 5.1:**

- Audit 'negative' laparotomies quarterly and record a review of the rationale for surgery, and outcomes for these patients
- Feedback data and clinical learning points through departmental governance and quality improvement processes.

(Audience/s: Local surgical teams; local NELA leads)

## 2 Introduction

This report is the seventh report of NELA and covers the care received by NHS patients in England and Wales who underwent an emergency laparotomy (emergency bowel surgery) between 1 December 2019 and 30 November 2020. During this time, hospitals and staff were greatly impacted by the COVID-19 pandemic, and the impact of this is detailed in the [interim report](#) published by NELA in March 2021. Whilst acknowledging the effect of COVID-19 on processes of care and outcomes, this report will concentrate on other key issues and areas of concern for patients undergoing emergency bowel surgery. This data is for use by clinicians, hospital teams, executive boards, and commissioners in order to understand national processes of care and outcomes. It is important that care organisations regularly use this national data, combined with local hospital performance data to affect quality improvement and optimise ways of working. Patients should also be signposted to, and review, their local [hospital performance data](#).

Emergency laparotomy has one of the highest associated rates of death of all types of surgery performed, almost ten times greater than that of major elective gastrointestinal surgery (Pearse, 2012). Despite this, historically emergency perioperative care pathways have fallen short of the clinical standards, organisational structures and care processes that benefit most elective patients (NELA, 2017). Care organisations are now using NELA data to push boundaries in emergency surgical and perioperative care, through investment in workforce (emergency laparotomy nurse specialists, geriatric medicine specialists, allied healthcare professionals) and novel emergency surgical patient pathways starting at patient presentation to hospital. NELA modifies annual data collection to reflect changes in clinical practice whilst continuing to investigate processes of care and outcomes, highlighting variation in these. For patients, this means they can be assured that clinical staff and organisations who actively participate in NELA are continually assessing whether they are providing the best quality care possible, and that there is continuous evaluation to ensure that care is safe, effective, and timely.

# 3 Key findings of the Seventh Year of the National Emergency Laparotomy Audit

## Key process measure

### Final case ascertainment

#### Key findings

- Of 182 hospitals, 177 (97.3%) contributed data to this metric (see Technical Appendix). Overall case ascertainment was 78.8% (Table 3.1). The fall in case ascertainment in Year 7 is largely attributed to the COVID-19 global pandemic (NELA, 2021).

Table 3.1 Case ascertainment

	Total number of patients included in audit (%)	Number <sup>2</sup> of patients included in case ascertainment (%)	Case ascertainment rate <sup>3,4</sup> (Year 6)	Case ascertainment rate <sup>5</sup> (Year 7)
England	20,248 (92.7%)	19,864 (92.6%)	85.0%	78.0%
Wales	1,598 (7.3%)	1,579 (7.4%)	96.2%	88.7%
Overall	<b>21,846</b>	<b>21,443</b>	<b>85.8%</b>	<b>78.8%</b>

Total number of hospitals included in Year 7 report across England and Wales = 177.

<sup>2</sup>Patients from hospitals where Hospital Episode Statistics (HES)/Patient Episode Database for Wales (PEDW) estimates are uncertain were excluded from this analysis.

<sup>3</sup>Based on HES and PEDW estimated caseloads between December 2018 and November 2019.

<sup>4</sup>Some figures may differ from last year's reports. This takes into account any updated data subsequently provided by local teams.

<sup>5</sup>Based on HES and PEDW estimated caseloads between December 2019 and November 2020.

## Key process measures since Year 4 of NELA

NELA audits care against a set of [key standards](#) and rates individual hospitals according to their performance against these standards. In Year 7, 106 (59.9% vs 70.9% in Year 6) hospitals were rated green and 32 (18.1% vs 8.9% in Year 6) were rated red.

The Red, Amber, Green (RAG) tables provide a summary of hospital performance indicators and [are available here](#).<sup>6</sup> Table 3.2 below presents trends in the NELA key standards over time.

**Table 3.2 Trends in proportion of patients meeting standards nationally, and trends in proportion of hospitals RAG rated green in NELA patient reports for the key standards and supporting process measures**

Key Standards	Process measure	Trend over time			
		Year 4 (Dec 16–Nov 17)	Year 5 (Dec 17–Nov 18)	Year 6 (Dec 18–Nov 19)	Year 7 (Dec 19–Nov 20)
Hospitals which admit patients as emergencies must have access to both conventional radiology and CT scanning 24 hours per day, with immediate reporting	Proportion of all emergency laparotomy patients who received a preoperative CT report by an in-house consultant radiologist	64.1 N = 24,382	62.4 N = 24,788	62.3 N = 25,214	65.9 N = 21,846
An assessment of mortality risk should be made explicit to the patient and recorded clearly on the consent form and in the medical record	Proportion of patients in whom a risk assessment was documented preoperatively	74.5 N = 24,382	77.2 N = 24,788	83.8 N = 25,214	85.0 N = 21,846
Trusts should ensure theatre access matches need and ensure prioritization of access is given to emergency surgical patients ahead of elective patients whenever necessary	Proportion of patients arriving in theatre within a time appropriate for the urgency of surgery	82.5 N = 17,471	82.5 N = 17,984	82.7 N = 18,566	80.9 N = 15,849

<sup>6</sup>Full comparative details and individualised hospital level reports are provided online. Some figures may differ from last year's published RAG tables. This takes into account any updated data subsequently provided by local teams.

Key Standards	Process measure	Trend over time			
		Year 4 (Dec 16–Nov 17)	Year 5 (Dec 17–Nov 18)	Year 6 (Dec 18–Nov 19)	Year 7 (Dec 19–Nov 20)
Each high-risk patient should have a consultant surgeon, anaesthetist present in theatre during surgery	Proportion of patients with a preoperative risk of death $\geq 5\%$ for whom a consultant surgeon and consultant anaesthetist were present in theatre	82.3 N = 12,260	83.7 N = 12,069	88.5 N = 12,091	90.1 N = 10,525
	Proportion of patients with a calculated preoperative risk of death $\geq 5\%$ for whom a consultant surgeon was present in theatre	91.7 N = 12,260	92.6 N = 12,069	94.8 N = 12,091	96.3 N = 10,525
	Proportion of patients with a preoperative risk of death $\geq 5\%$ for whom a consultant anaesthetist was present in theatre	88.2 N = 12,260	89.0 N = 12,069	92.3 N = 12,091	93.1 N = 10,525
All high-risk patients should be admitted to critical care	Proportion of patients with a postoperative risk of death $\geq 5\%$ who were directly admitted to critical care postoperatively	80.1 N = 12,105	81.9 N = 12,054	85.2 N = 12,167	82.3 N = 10,442
	Proportion of patients with a postoperative risk of death $\geq 10\%$ who were directly admitted to critical care postoperatively	87.3 N = 7,273	88.1 N = 7,352	90.0 N = 7,254	87.6 N = 5,600

Key Standards	Process measure	Trend over time			
		Year 4 (Dec 16–Nov 17)	Year 5 (Dec 17–Nov 18)	Year 6 (Dec 18–Nov 19)	Year 7 (Dec 19–Nov 20)
Unplanned return to theatre*		<b>6.1</b> N = 24,039	<b>5.4</b> N = 24,421	<b>5.1</b> N = 24,940	<b>4.8</b> N = 21,638
Unplanned admission to critical care**		<b>3.4</b> N = 24,164	<b>3.4</b> N = 24,564	<b>3.0</b> N = 25,057	<b>3.2</b> N = 21,715
Each patient aged 65 or over and frail (CFS ≥5) or 80 or over should have multidisciplinary input that includes early involvement of geriatrician teams <sup>7</sup>	Proportion of patients aged 65 years or over and frail or 80 or over who were assessed by a care of the older person specialist	<b>25.7</b> N = 4,685	<b>27.5</b> N = 5,339	<b>29.2</b> N = 7,159	<b>27.1</b> N = 6,192

Key standards of care are rated as follows:

Green: ≥85%

Amber: 55–84%

Red: <55%

with the exception of the proportion of patients aged 65 years or over and frail or 80 or over who were assessed by a care of the older person specialist, which is rated as follows:

Green: ≥80%

Amber: 50–79%

Red: <50%

\*Not RAG rated, advisory only

<sup>7</sup>The question in the NELA webtool through which the data on geriatrician assessment is collected was changed in December 2019 from 'was the patient assessed by a specialist from elderly medicine' to 'was the patient assessed by a consultant geriatrician.'

# 4 Preoperative care

## 4.1 Who has emergency laparotomy?

Patients are heterogeneous in their demographics and pathology, but they all need access to the same processes of care to achieve the best possible outcomes. Table 4.1.1 below presents a snapshot of the top four procedures performed in high-risk patients and their associated mortality according to data from the Office for National Statistics (ONS).

**Table 4.1.1 Top four main procedures in high-risk patients (9,503 – 43.5% of all NELA patients) and 30-day mortality**

Top 4 main procedures	n	%	30-day ONS mortality
Small bowel resection	1,603	16.9	19.2
Adhesiolysis	1,531	16.1	11.8
Hartmann's procedure	1,332	14.0	15.5
Colectomy: right (including ileocaecal resection)	1,157	12.2	14.8
Total	5,623	59.2	–

21,846 patients

were entered into the audit from

177 hospitals

in England and Wales



43.5%

assessed as high-risk

with a NELA predicted mortality risk of  $\geq 5\%$

11.7%  
≤ 40yrs

32.9%  
> 40yrs & < 65yrs

55.4%  
≥ 65yrs



50.8%  
Female



49.2%  
Male

48.7%

required surgery  
within six hours

4.6%

have emergency laparotomy  
to treat complications after an  
elective operation

## 4.2 Timeliness of arrival in theatre

The current National Confidential Enquiry into Patient Outcome and Death (NCEPOD) classification of intervention came into effect in December 2004 and replaced previous NCEPOD categories. Further published guidelines include wider service improvements in acute care surgery and provide specific recommendations for those patients with sepsis or septic shock (Royal College of Surgeons of England, 2018).

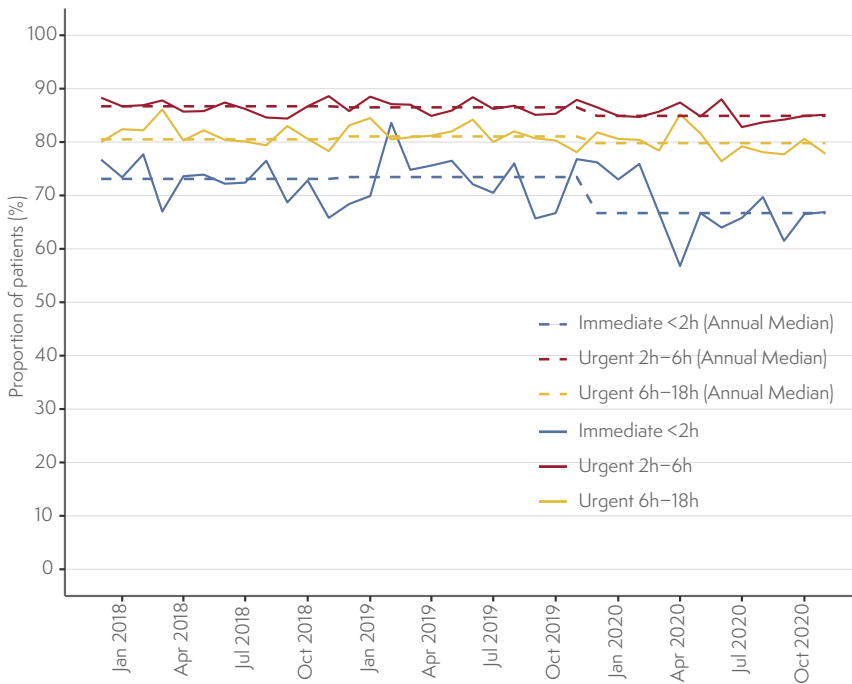
### Key process measure<sup>8</sup>

The proportion of patients arriving in theatre in a timescale appropriate for the urgency of surgery (minimum standard 85%).

### Key finding

- 80.9% of patients arrived within the appropriate timeframe to have their operation in accordance with their recorded category of NCEPOD urgency (82.7% in Year 6). As shown in Figure 4.2.1, the proportion of patients arriving in theatre according to NCEPOD category is as follows:
  - Immediate (< 2hrs): 68.4% (Year 7) vs 72.8% (Year 6)
  - Urgency (2–6hrs): 85.2% (Year 7) vs 86.6% (Year 6)
  - Urgency (6–18hrs): 79.7% (Year 7) vs 81.5% (Year 6)

**Figure 4.2.1 Trend in the overall proportion of patients arriving in theatre within an appropriate timeframe for their level of urgency (surgery within 2 hours, 2–6 hours and 6–18 hours)<sup>9</sup>**



(See supplementary data table 4.2.1).

<sup>8</sup>In the data collected on the date and time the patient was booked for surgery, timing was missing in 4.6% of patients. In the decision to operate data, date or time were missing for 10.7% of patients. 13.5% of patients did not have a complete date in either surgery or decision to operate.

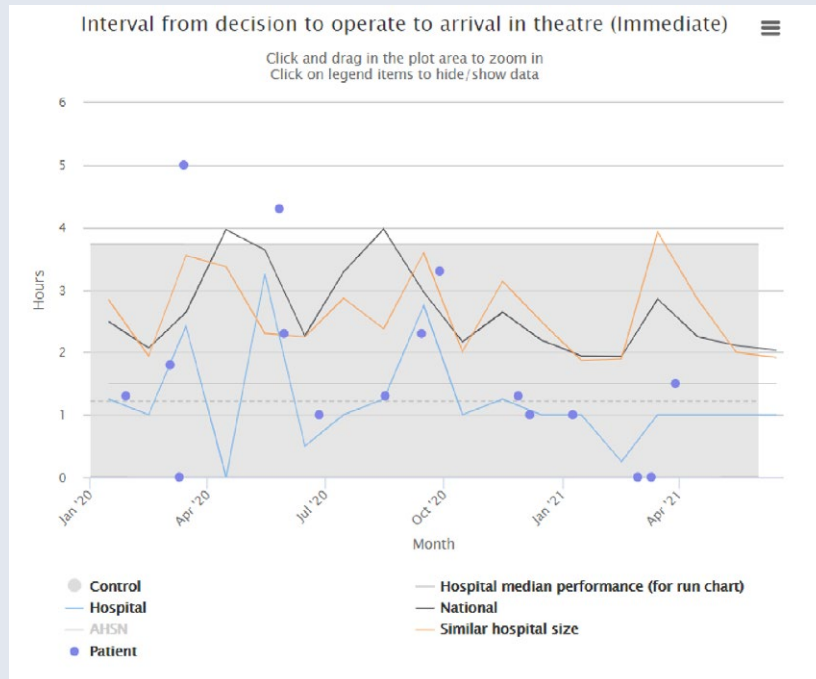
<sup>9</sup>'Annual median' refers to the audit year, not the calendar year.





## Improvement opportunity

The NELA QI dashboard provides patient level data on timeliness of arrival to the theatres (figure below). Teams can examine trends and highlight individual cases for discussion in multidisciplinary meetings. Some of the actions that teams could take are listed in the RCoA [‘Raising the Standards: RCoA Quality Improvement Compendium’](#), Section 4.2 and Section 4.3.



## 4.3 Radiology

### Key process measure<sup>10,11</sup>

The proportion of patients who received a CT scan which was reported by an in-house consultant radiologist before surgery (minimum standard 85%).

### Key findings

- 65.9% of patients had a CT scan which was reported by an in-house consultant radiologist before surgery (62% in Year 6)
- 7.1% of patients had a CT scan which was reported by a registrar
- 19.1% of patients had a CT scan which was reported by an outsourced consultant

16% of patients who underwent a laparotomy with normal findings did not have a preoperative CT scan. The NHS radiologist workforce is understaffed by 33% and forecast to hit 44% by 2025 (Royal College of Radiologists, 2021). This is concerning for patients who will require diagnostic imaging or radiological intervention as part of their patient pathway to emergency bowel surgery. However, despite increasing workforce pressures, 92.5% of patients had a preoperative CT scan performed, compared with 80% in Year 1.

NELA data demonstrates that the use of outsourced radiology reporting services has increased to 19.1% (14.9% in Year 5). Without more consultants in training, investment in new models of care, better staff retention and recruitment, the dependence on outsourcing of radiology reports will continue and may even increase.

<sup>10</sup>This metric only includes in-house consultant for Years 4–7, whereas Years 1–3 also included outsourced reports.

<sup>11</sup>Data on CT performed was missing in 0.7% of patients ('unknown' selected). This decreased from 1.3% in Year 1. The method of CT reporting was unknown in 0.7% of patients.

## What clinical factors affect CT reporting discrepancy rates?

Overall discrepancy rates according to person reporting the scans are:

- In-house consultant discrepancy rate: 4.8% (5.3% in Year 6)
- In-house registrar discrepancy rate: 5.1% (4.6% in Year 6)
- Outsourced radiology service discrepancy rate: 7.1% (6.2% in Year 6)

The accepted discrepancy rate is 5% regardless of who reports the CT scan (Howlett, 2017)<sup>12</sup> but there is a reported increased discrepancy rate in outsourced reported scans. NHS Trusts and health boards should work to the recommended standards from Royal College of Radiologists including ensuring that clinical factors do not affect the reported discrepancy rate (Royal College of Radiologists, 2014; Royal College of Radiologists, 2019).



### Improvement opportunity

The NELA 'Excellence and Exception' report can be filtered to give a list of patients who have a discrepancy noted between radiological reporting and surgical findings. This list can be discussed in multidisciplinary meetings and included in local discrepancy review meetings.

## 4.4 Management of patient sepsis

27% of all NELA patients have sepsis suspected on admission (National Early Warning Score [NEWS2]  $\geq 5$  or  $\geq 3$  in any one variable), and more than half of these patients are documented preoperatively as being high-risk (56.8%). Around 1 in 5 of those patients have antibiotics within an hour (21.6%) whilst 1 in 10 have their first dose of antibiotics in theatre (9%), with median time from admission to decision to operate 9.8 hours and admission to theatre 15.3 hours.

Patients with sepsis have an urgent need for adequate source control. Year 7 NELA data suggest that a patient attending the ED with a diagnosis of abdominal sepsis at 12 noon would experience delays in their emergency laparotomy pathway such that a decision to operate would not be made until nearly 10 pm, and their arrival in theatre for emergency laparotomy would not be until 3 am the next day (Figure 4.4.1).

10.3% of patients had suspicion of sepsis at decision for surgery without having suspicion of sepsis at admission. Time to theatre from decision to operate is the same for these patients as those with sepsis on admission, but time to first dose of antibiotics almost three times longer (9.3 hours) as those with sepsis on admission. These patients are at risk of sepsis on admission and are likely to benefit from more timely antibiotic administration.

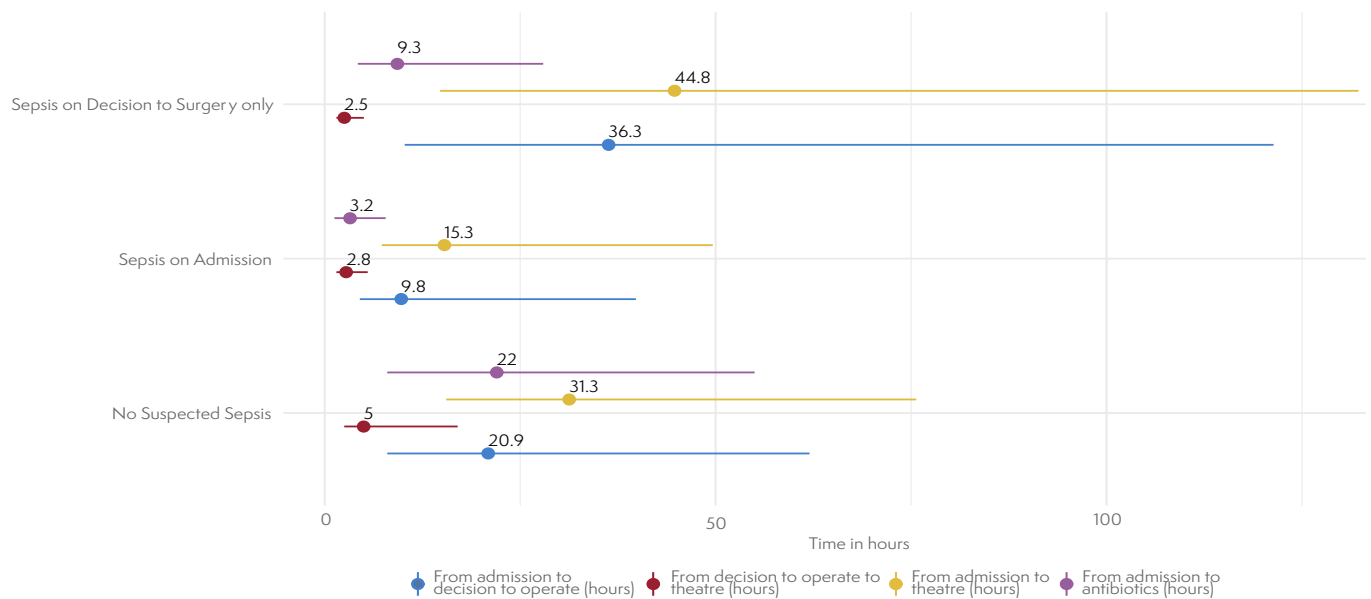
Unplanned returns to theatre for patients with suspected sepsis on admission with no documented risk and with a preoperative calculated NELA risk score of  $\geq 5\%$  are almost double (9.4%) when compared to high-risk patients with sepsis with documented risk (around 5%).

Overall, the 30-day mortality rate in patients with suspected sepsis on admission is 14.8%. 30-day mortality rates are increased in high-risk patients with sepsis suspected on admission compared with low-risk patients (23.3% versus 2%). 12.1% of patients with suspected sepsis on admission have no documented risk. Overall, the 30-day mortality rate in patients without sepsis suspected on admission or at decision to operate is 5.4%.

(See supplementary data tables 4.4.1 to 4.4.17).

<sup>12</sup>The definition of discrepancy was developed in conjunction with the Royal College of Radiologists and refers to a discrepancy between the reported CT and surgical findings. We are unable to state if discrepancies are related to the initial report or regarding any addendums. Similarly, despite out-sourced reports mainly being done by consultants, in-house consultant reports are defined as the gold standard as per the Royal College of Radiologists recommendations.

**Figure 4.4.1 Time intervals between key milestones for patients with suspected sepsis on admission and on decision to operate**



**NOTE: Median time (in hours) and interquartile range (IQR)**

### Actions

Use the NELA sepsis webtools to describe key standards of care in patients with sepsis (prompt administration of antibiotics, measurement of lactate and timely access to operating theatres). Examine the care of patients who fail to meet the above standards, who are listed within the sepsis webtool. The care can be examined as case reviews in multidisciplinary morbidity and mortality meetings or linking to your hospital’s surviving sepsis work. Action plans to improve the care for patients **with sepsis** will cross many departments and include improved cross specialty working, better use of data and improving the reliability of sepsis care bundles.

## 4.5 Risk assessment

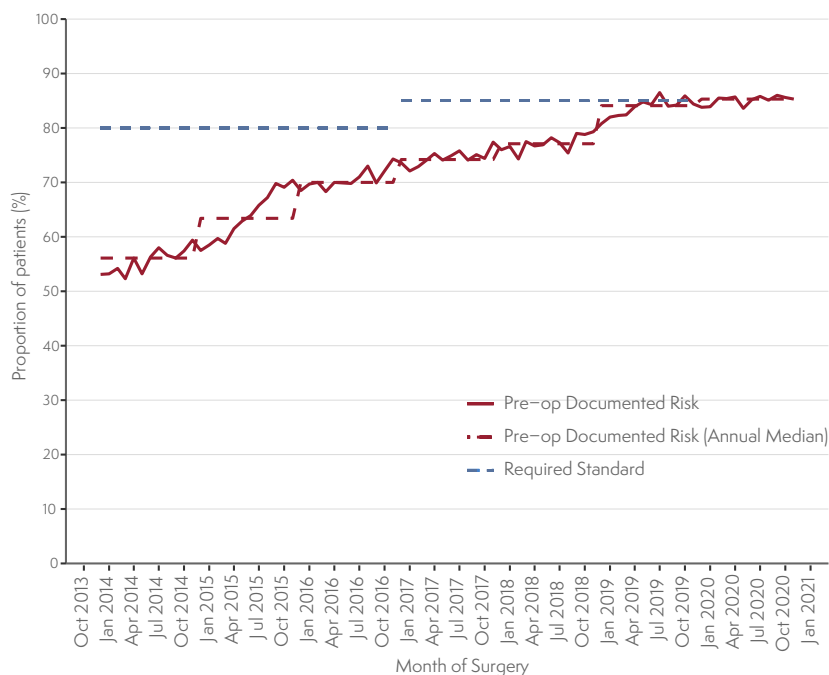
### Key process measure

The proportion of patients for whom a risk assessment was documented before surgery (minimum standard 85%).

### Key finding

- 85% of patients had a documented risk assessment before surgery (84% in Year 6)

**Figure 4.5.1 Trend in the overall proportion of patients whose risk was documented preoperatively**

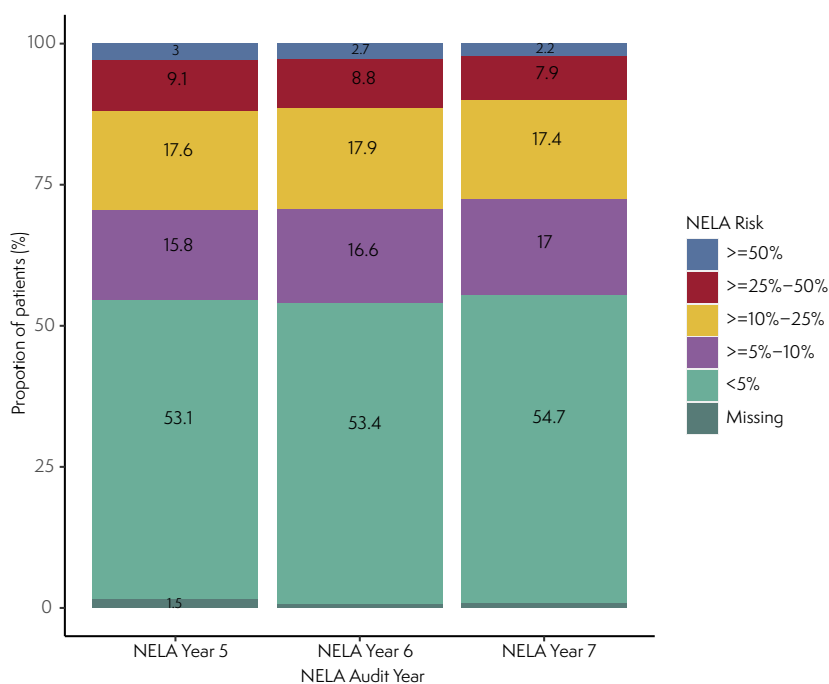


As demonstrated by Figure 4.5.1 above, documented risk assessment is becoming routine regardless of which risk group (high or low) patients fall into (see supplementary data tables 4.5.1 to 4.5.13).

### What is the distribution of risk each reporting year? Who are we operating on?

The data in Figure 4.5.2 below includes those determined to be high-risk based on the NELA risk prediction tool (Eugene, 2018). COVID-19 has not been included in this model. The number of patients falling into each risk category has not changed over time.

**Figure 4.5.2 Population risk profiles according to preoperative NELA predicted 30 day mortality, by NELA year of reporting**



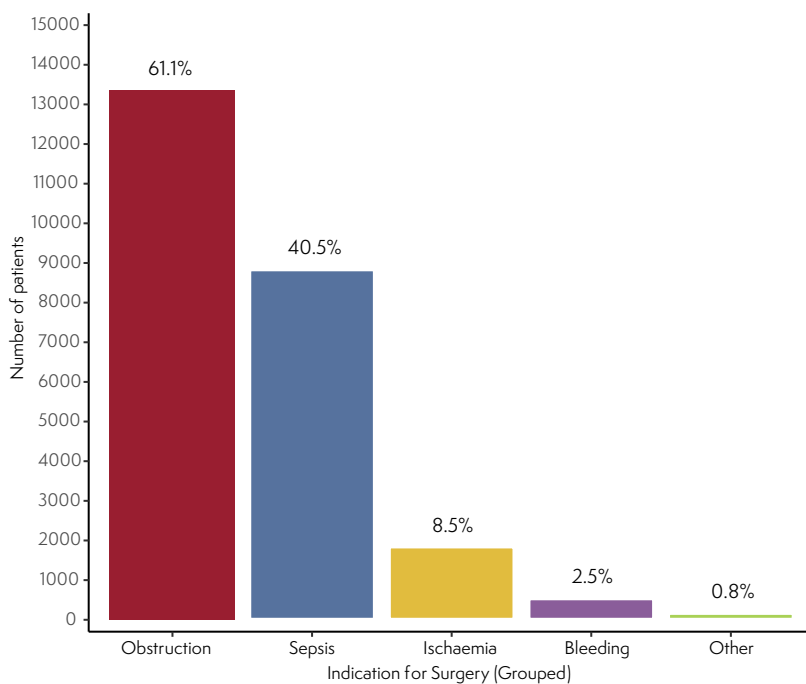
(See supplementary data table 4.5.14).

# 5 Care during surgery

## 5.1 What are the indications for emergency laparotomy?

The indications for emergency laparotomy are numerous but can be broadly divided into intestinal obstruction, sepsis, ischaemia, or haemorrhage (Figure 5.1.1). The indications for emergency laparotomy have remained unchanged over the last four years.

Figure 5.1.1 Indications for emergency laparotomy in Year 7<sup>13</sup>



(See supplementary data table 5.1.1).

## 5.2 What are the surgical findings at emergency laparotomy?

NELA has categorised the findings at laparotomy into the categories of bowel obstruction, intra-abdominal infection, cancer, ischaemia, postoperative complications, and haemorrhage. Data has been analysed in these groups. It is possible that a patient may have more than one surgical finding at surgery. It is important for NHS Trusts and health boards to audit discrepancies between surgical indications and findings in patients undergoing emergency laparotomy to help inform patient pathways and best practice.



**47.6% of patients** have bowel obstruction



**38.6% of patients** have evidence of infection/inflammation at emergency laparotomy



**4.7% of patients** had evidence of a postoperative complication



**11.2% of patients** have ischaemic bowel

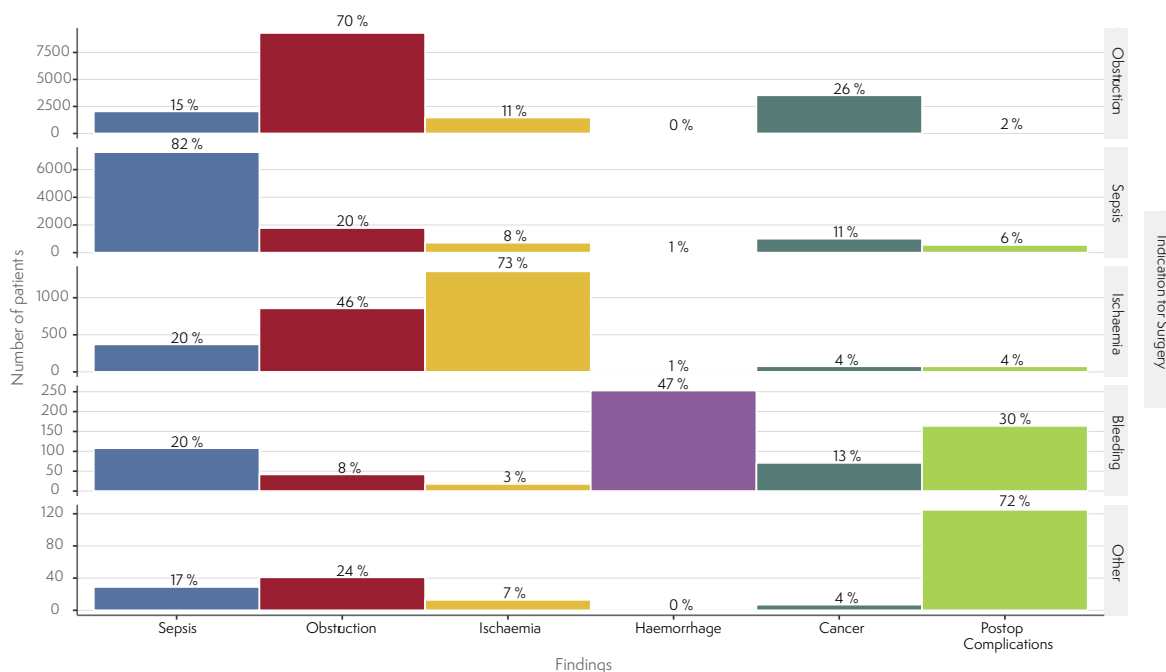


**1.4% of patients** are found to have bleeding

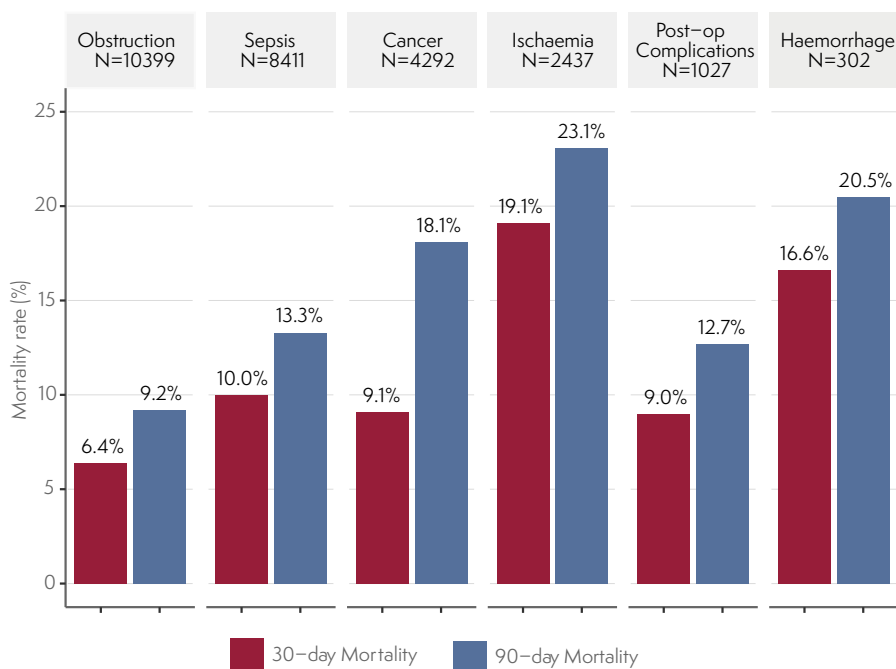
<sup>13</sup>A patient may have more than one indication for surgery.

Figure 5.2.1 below demonstrates the correlation between indications for surgery and findings at laparotomy. Surgical indication and surgical findings do not correlate in around one quarter of patients. Sepsis and bowel obstruction are common surgical findings and clinical suspicion for these conditions should remain high regardless of indication for surgery. Both 30- and 90-day mortality vary according to the findings at surgery (Figure 5.2.2).

**Figure 5.2.1 Indications for surgery and findings at emergency laparotomy**



**Figure 5.2.2 30-day ONS mortality for grouped intra-abdominal surgical findings**



## CT discrepancy rates and surgical findings

- The highest discrepancy rate (7.4%) is seen in patients who are found to have either ischaemia or bleeding at emergency laparotomy (8% in Year 6)
- The more urgent the need for surgery, the higher the discrepancy rate between the CT report and surgical findings. A discrepancy rate of 6.5% (6.8% in Year 6) is seen in patients requiring immediate surgery (<2 hours) compared with 4.4% (4.1% in Year 6) for those who require expedited surgery (>18 hours)
- Discrepancy rates ranged between hospitals from 0 and 20%

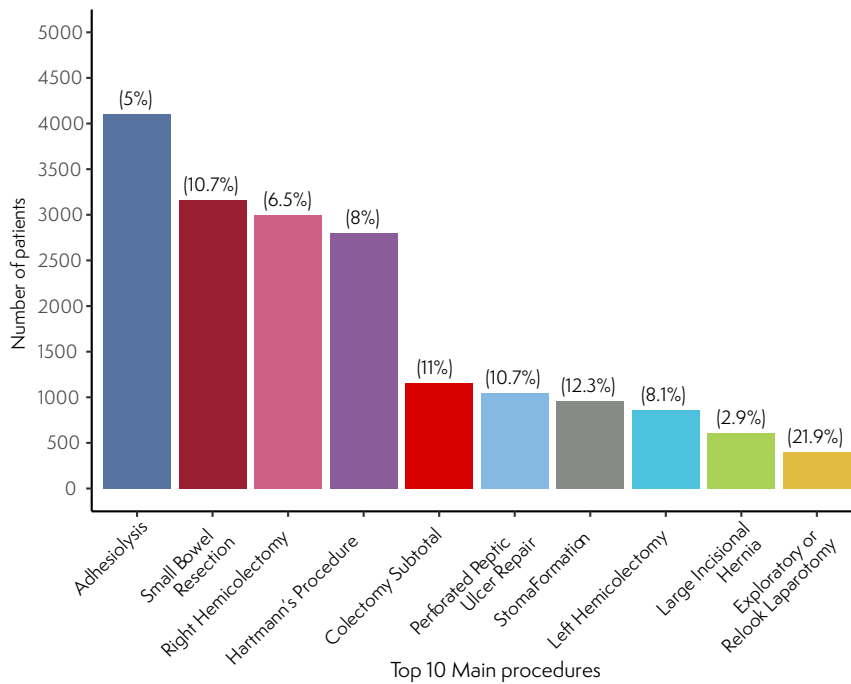
### Potentially unnecessary surgery

Over the last seven years of reporting, 2,221 patients (median: 355 annually) have undergone a negative laparotomy. **1.2% of patients are recorded as having undergone** a 'negative laparotomy' which means that there were no abnormalities, or normal intra-abdominal findings. These patients have had potentially unnecessary surgery. This group of patients had a high ONS 30-day mortality rate of 13.7%, with the most common indications for surgery in these patients reported as being for sepsis and obstruction. Despite this, more than 1 in 8 patients who underwent a negative emergency laparotomy in Year 7 did not have a consultant surgeon and anaesthetist present in theatre. The overall percentage of negative laparotomies is unchanged since Year 1.

## 5.3 What are the procedures performed at emergency laparotomy?

Figure 5.3.1 demonstrates the top ten most common procedures performed. It may sometimes be difficult to know when consenting patients for emergency laparotomy which procedure (or procedures) will be performed at laparotomy. The type of procedure performed often modifies the pre-existing physiological risk and is of importance in discussing risk with patients during the consent process. For example, in Year 7 NELA data, 30-day mortality rates are 66% higher in high-risk patients undergoing small bowel resection than high-risk patients undergoing adhesiolysis. The need for small bowel resection may not be known until performing the emergency laparotomy. Clinical teams should include a postoperative risk assessment in their patient pathways, e.g. during World Health Organization (WHO) sign-out in theatre. This can be utilised to ensure the identified facility for perioperative care meets the requirements of the patients taking into consideration findings during surgery and impact on risk (see supplementary data tables 5.3.4 to 5.3.5).

Figure 5.3.1 Top ten most commonly performed surgical procedures and associated 30-day ONS mortality.<sup>14</sup> Figures in parentheses are the 30-day ONS mortality for the procedure performed



## 5.4 Laparoscopic emergency bowel surgery

The benefits of minimally invasive surgery are well documented in elective practice but laparoscopic surgery is rarely used in emergency surgical patients (Harji, 2014). Emergency bowel surgery remains a predominantly open procedure with no increase reported in the NELA laparoscopic rate in Year 7 (10%, same as Year 6). Laparoscopic surgery is reserved for less unwell (57.6%), less urgent patients (65.7% Urgency 6–18hrs and Expedited >18hrs) and those having surgery during day time hours (70.9% from 08:00 to 18:00).

(See supplementary data tables 5.4.1 to 5.4.7).

- For patients undergoing laparoscopic surgery the ONS 30-day mortality is 3.2% compared to 9.7% if surgery is via an open approach. This likely represents the fact that these patients are less unwell as they have lower preoperatively predicted mortality
- Patients undergoing laparoscopic emergency bowel surgery have a much shorter length of stay than those undergoing open procedures (6 days versus 11 days)

(See supplementary data tables 5.4.8 to 5.4.9).

## 5.5 Consultant presence in theatre

Consultant presence in theatre has shown consistent improvement since Year 1 of NELA (Table 5.5.1).

<sup>14</sup>Hospital teams can see this data contemporaneously in their own database and in the NELA webtool.



**Table 5.5.1 Proportion of high-risk patients whose care during surgery was directly supervised by a consultant surgeon and consultant anaesthetist**

Audit year	Number of high-risk patients	Consultant surgeon present in theatre	Consultant anaesthetist present in theatre	Consultant surgeon and anaesthetist present in theatre
Year 1	11,635	86.0%	77.6%	69.0%
Year 2	12,793	88.0%	81.7%	73.5%
Year 3	13,005	90.5%	85.8%	79.1%
Year 4	12,260	91.7%	88.2%	82.3%
Year 5	12,069	92.6%	89.0%	83.7%
Year 6	12,091	94.8%	92.3%	88.5%
Year 7	10,525	96.3%	93.1%	90.1%

### Key process measure

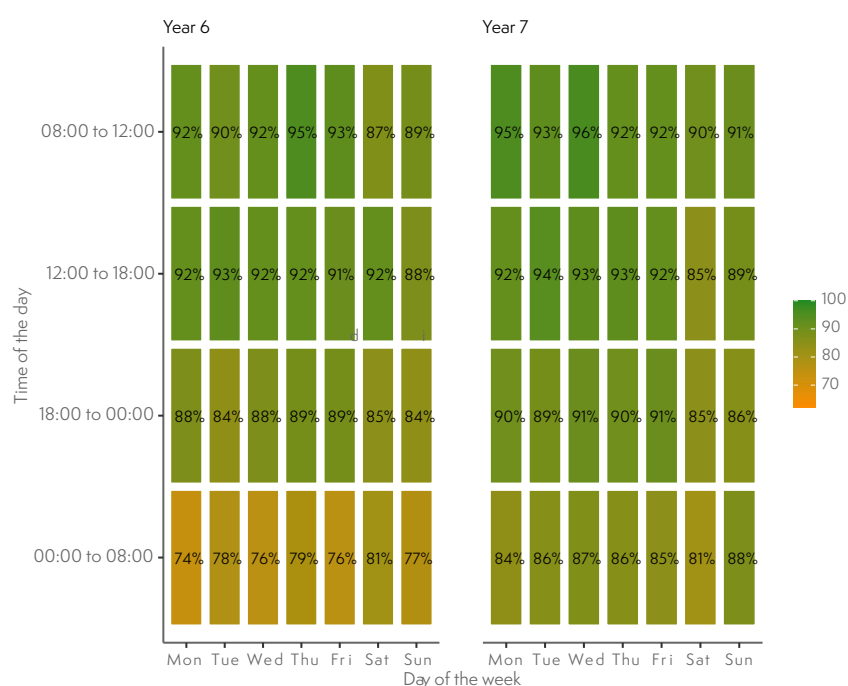
The proportion of patients who had BOTH a consultant surgeon and anaesthetist present in theatre when risk of death  $\geq 5\%$  (minimum standard 85%).

### Key findings

- 90.1% of patients had BOTH a consultant surgeon and anaesthetist present in theatre when risk of death  $\geq 5\%$  (88.5% in Year 6)
- 81% of patients had BOTH a consultant surgeon and anaesthetist present in theatre when risk of death  $< 5\%$  (79.4% in Year 6)
- Between the hours of 00:00 and 08:00, 85% of high-risk patients had BOTH a consultant surgeon and anaesthetist present in theatre for their procedure (77.3% Year 6) (Figure 5.5.1)

If risk is low or not documented patients are significantly less likely to have both a **consultant surgeon** and **anaesthetist** present in theatre.

**Figure 5.5.1 Proportion of high-risk patients who had a consultant surgeon and anaesthetist present in theatre, by time of day and day of the week**



# 6 Postoperative care

## 6.1 Postoperative admission to critical care

### Key process measure

The proportion of patients who were admitted directly to critical care when risk of death  $\geq 5\%$  (minimum standard 85%).

### Key finding

- 82.3% of patients were admitted directly to critical care when postoperative risk of death<sup>15</sup>  $\geq 5\%$  (85% in Year 6) (Figure 6.1.1)

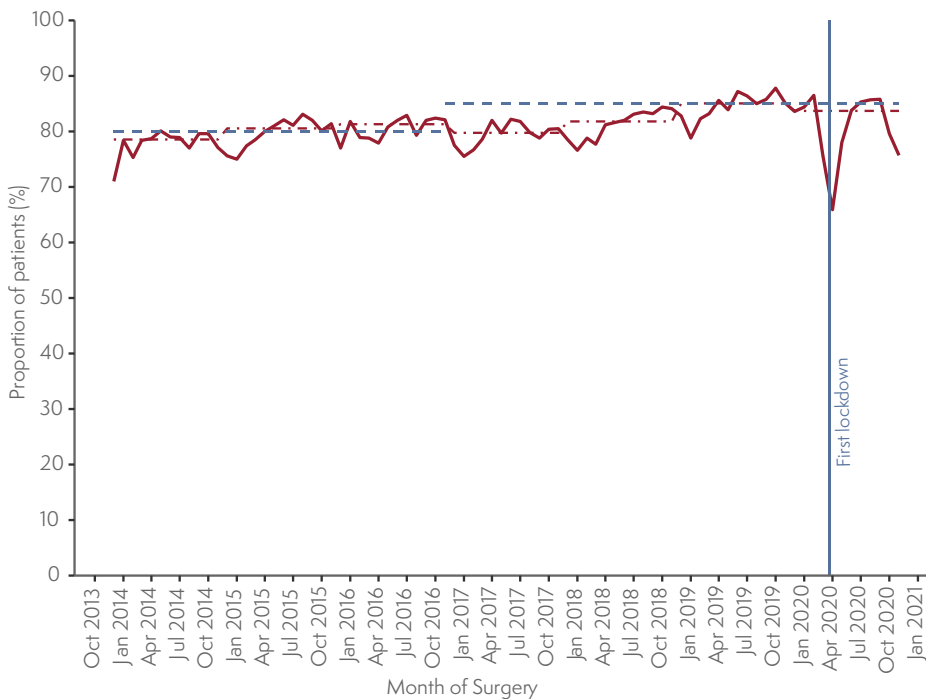
### Key process measure

The proportion of patients who were admitted directly to critical care when risk of death  $\geq 10\%$  (minimum standard 85%).

### Key finding

- 87.6% of patients were admitted directly to critical care when postoperative risk of death  $\geq 10\%$  (90.0% in Year 6)

Figure 6.1.1 Trends in the proportion of patients with a risk of death  $\geq 5\%$  admitted directly to critical care after surgery



<sup>15</sup>High-risk is defined as a predicted risk of death within 30 days greater than or equal to 5% when assessed by any means (including clinical judgement and/or risk prediction tools). Any patient within the NELA dataset who has a 'missing' value for their risk score is assumed to be high-risk in view of the findings of previous reports.

## Where were patients admitted to after their surgery?

In Year 7, NELA defined with more granularity what was meant by the term ‘enhanced care area’ to allow clinical teams to understand the categorisation of their local hospital bed base. In December 2019 the data collection webtool changed to replace ‘Other enhanced care area, e.g. post-anaesthetic care unit (PACU)’ with ‘Extended recovery area within theatres (e.g. PACU or overnight intensive recovery [OIR])’ and ‘Enhanced care area on a normal ward’.

There were proportionally fewer patients admitted to critical care across all patient groups in Year 7 than in Year 6 (Table 6.1). Enhanced care areas have become more utilised as pressure on critical care has increased during the COVID-19 global pandemic. Critical care bed utilisation during the pandemic is discussed in the [NELA Interim Report on COVID-19](#). It is important to maintain standards of postoperative care for patients undergoing emergency laparotomy in line with those undergoing elective major abdominal procedures, including identification of a suitable postoperative care facility. Hospitals should utilise NELA Excellence and Exception reports to identify high-risk patients before and after surgery who do not meet standards or any patients for whom all applicable standards of care were met. Instructions on how to download these reports can be found [here](#).

56.8% of all patients undergoing emergency laparotomy were admitted directly to a critical care unit (CCU) (63% in Year 6) (Table 6.1).

- 29.5% of the 12,408 patients admitted to critical care had a postoperative risk <5%
- 2.8% were admitted to another ‘enhanced care area’ on a normal ward
- 4.2% were admitted to extended recovery area within theatres (e.g. PACU or OIR)
- 36.1% were admitted onto the general surgical ward (31.4% in Year 6)
- Patients were more likely to be admitted to a CCU directly if older, frail, high American Society of Anesthesiologists Physical Status Score (ASA), or documented as high-risk preoperatively
- 73.5% of patients assessed to be frail (Clinical Frailty Scale [CFS] ≥5) were admitted to critical care (79.8% in Year 6)
- 65.5% of patients aged ≥65 years were admitted directly to critical care compared with 46% of patients <65 years old (72.1% vs 51.5% in Year 6)
- 53% of patients with undocumented risk aged ≥65 years were admitted directly to critical care compared with 39.3% of patients <65 years old (61% vs 43.1% in Year 6)
- 45.9% of patients with undocumented risk were admitted directly to critical care (51.8% in Year 6)

**Table 6.1 Number of patients by type of postoperative destination**

Audit Year	CCU n (%)	Died in theatre n (%)	Enhanced care area on a normal ward n (%)	Extended recovery area within theatres (eg PACU or OIR) n (%)	Other Enhanced care area (eg PACU) n (%)	Ward n (%)
NELA Year 4	14,980 (61.4%)	50 (0.2%)			1,109 (4.5%)	8,243 (33.8%)
NELA Year 5	15,133 (61%)	58 (0.2%)			1,461 (5.9%)	8,136 (32.8%)
NELA Year 6	15,892 (63%)	47 (0.2%)			1,369 (5.4%)	7,906 (31.4%)
NELA Year 7	12,408 (56.8%)	38 (0.2%)	608 (2.8%)	887 (4.1%)	15 (0.1%)	7,890 (36.1%)

(See supplementary data tables 6.1.1 to 6.1.9).

**For further reading on this topic**, please review The Faculty of Intensive Care Medicine’s report [Enhanced Care: Guidance on service development in the hospital setting](#) (May 2020).

# 7 Care of the older patient

## 7.1 Frailty,<sup>16</sup> age and patients having emergency laparotomy

**12,098 (55.4%)**  
patients were aged 65 or over

**4,194 (34.7%)**  
patients aged 65 or over were living with frailty (CFS  $\geq 5$ )



**3,963 (18.1%)**  
patients were aged 80 or over

**1,965 (49.6%)**  
patients aged 80 or over were living with frailty (CFS  $\geq 5$ )

NELA has previously reviewed three-year outcome data for patients following emergency laparotomy. In Year 7 longer term outcome data has been reviewed. Six-year survival data by age group is shown in Table 7.1 below. Further work will be done on long term outcome data across all age and risk groups.

**Table 7.1 Long-term survival by age group**

Age group	First year survival (%) n=134,191	Second year survival (%) n=110,755	Third year survival (%) n=87,546	Fourth year survival (%) n=64,810	Fifth year survival (%) n=41,565	Sixth year survival (%) n=19,451
18–39	94.9	93.4	92.6	92.0	91.3	90.8
40–49	91.0	88.0	86.3	84.9	83.8	82.9
50–59	85.4	80.3	77.1	73.9	71.4	69.2
60–69	78.0	71.6	66.7	63.2	60.4	57.8
70–79	72.0	64.4	58.6	53.2	48.4	43.9
80–89	64.9	56.1	48.4	41.3	34.3	28.7
$\geq 90$	57.8	46.8	37.0	27.2	19.8	12.7

### Key process measure<sup>17</sup>

The proportion of patients aged 80 and over OR aged 65 or over and frail (CFS  $\geq 5$ ) who were assessed by a geriatrician (minimum standard 80%).

- 27.1% of patients aged 80 and over OR aged 65 or over and frail had an assessment by a consultant geriatrician
- 27.3% of patients aged 65 or over and frail (CFS  $\geq 5$ ) were assessed by a consultant geriatrician (29.6% in Year 6)
- 28.7% of patients aged 80 or over were assessed by a consultant geriatrician (30.3% in Year 6)

<sup>16</sup>Frailty scoring is defined according to the Clinical Frailty Scale (CFS). CFS considers patients with CFS =4 as 'vulnerable' and CFS  $\geq 5$  as frail. NELA classified patients with a score between 1 and 4 as not frail and frail where the CFS  $\geq 5$ .

<sup>17</sup>The question in the NELA webtool through which the data on geriatrician assessment is collected was changed in December 2019 from 'was the patient assessed by a specialist from elderly medicine' to 'was the patient assessed by a consultant geriatrician'.

## Key process measure

The proportion of patients aged over 65 who had frailty assessed.

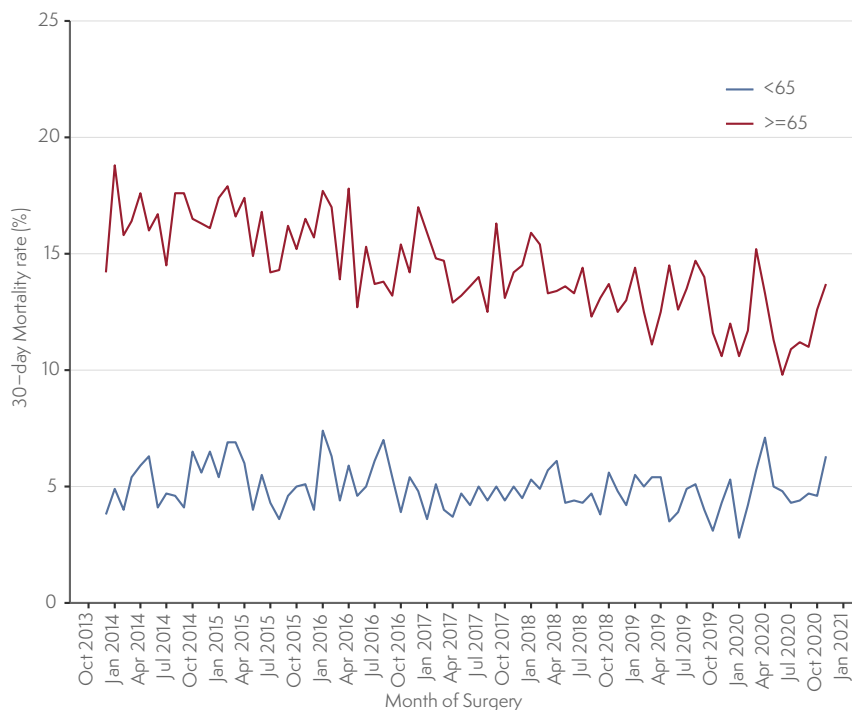
## Key findings

- 91.8% of patients over 65 had frailty assessed (86.9% in Year 6)
- Length of stay in those aged over 65 and frail (CFS  $\geq 5$ ) was 14 days (15 days in Year 6)
- Length of stay in those aged over 80 was 13 days (14 days in Year 6)
- 30-day mortality in those over 65 and frail (CFS  $\geq 5$ ) was 18.6% (19.7% in Year 6)
- 30-day mortality in those aged over 80 was 14.2% (16.1% in Year 6)

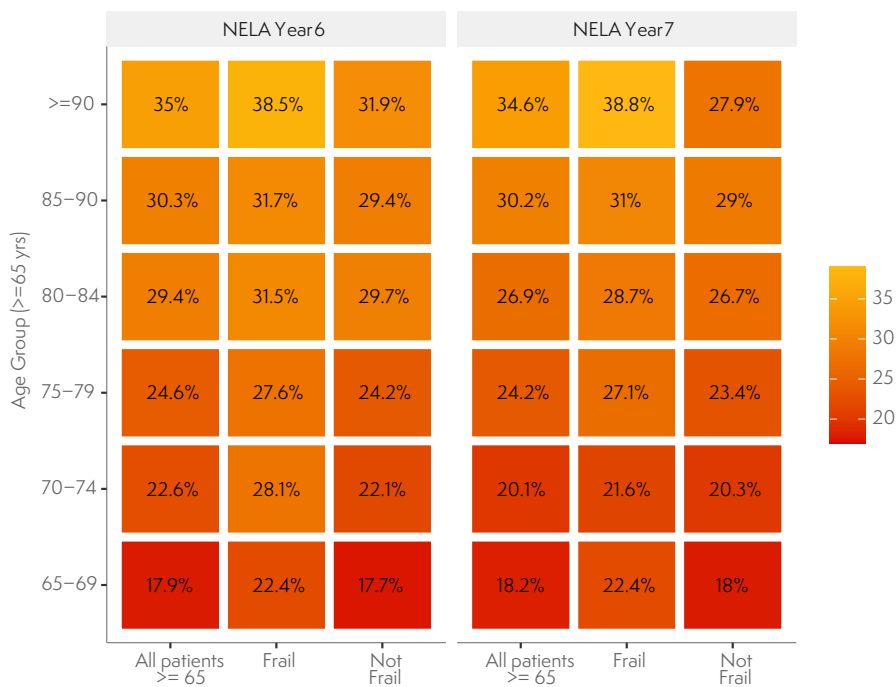
Older patients may suffer from multi-morbidity and may be frail. Frailty is defined as a syndrome of physiological decline in older people which makes them particularly vulnerable to adverse outcomes and deterioration in physical health after major stressors (such as emergency laparotomy). Frailty is a known risk factor for postoperative morbidity and mortality, and is independent of age (Fehlmann, 2021). The findings of the Emergency Laparotomy and Frailty (ELF) Study demonstrate that those patients with a CFS  $\geq 5$  are vulnerable to complications and adverse outcomes. It is important to note, however, that while frailty incidence increases with age, it is not an inevitable part of the ageing process and can also occur in younger patients (Parmar, 2019). NELA has previously reported on the risk of increased adverse outcomes and complications after surgery for older patients (Aitken, 2020). The use of comprehensive geriatric assessment methodology facilitates targeted patient-centred interventions that has shown to result in improved patient outcomes (Eamer, 2018). *The High-Risk General Surgical Patient* (Royal College of Surgeons of England, 2018), *British Geriatrics Society* (Shipway, 2020) and the *Guidelines for Perioperative Care for Emergency Laparotomy Enhance Recovery After Surgery (ERAS) Society* (Peden, 2021) all make recommendations for the assessment of older frailer patients. They state that all patients over the age of 65 should have frailty assessed, and if found to be frail the patient should be considered high-risk and should be reviewed by geriatricians. Trends for reduced mortality across the entire NELA dataset are more evident in patients aged 65 years or older despite no improvement in the proportion of patients aged 80 and over or aged 65 and over and frail who were assessed by a geriatrician (Figure 7.1.1, Figure 7.1.2).

(See supplementary data tables 7.1.1 to 7.1.12).

**Figure 7.1.1 Comparison of 30-day mortality in patients over the age of 65 years and patients under the age of 65 years**



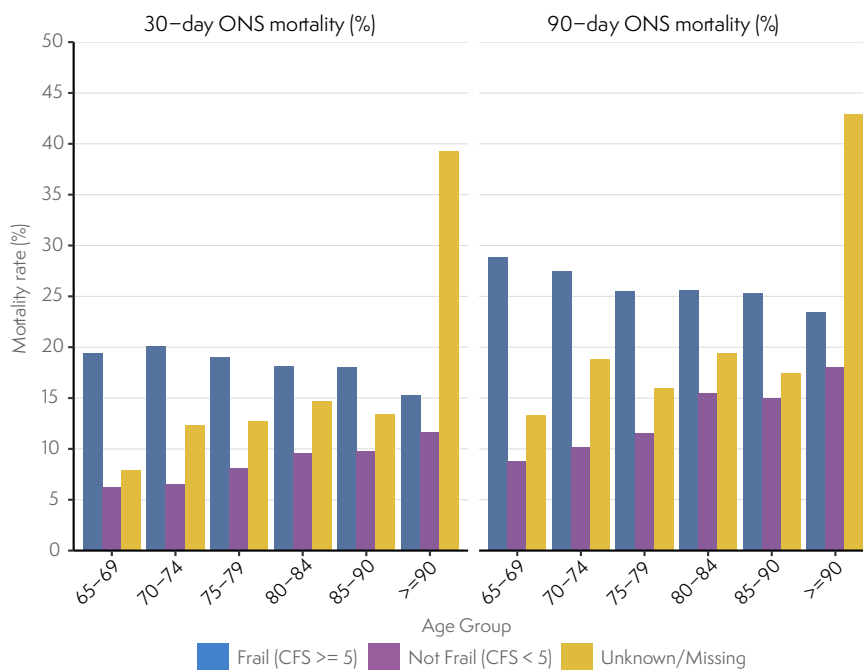
**Figure 7.1.2 Proportion of patients aged over 65 who were assessed by a consultant geriatrician according to frailty status**



### Outcomes of the frail patient after emergency laparotomy

Consistent with the findings of the ELF Study, NELA data demonstrates that those patients with a CFS  $\geq 5$  have increased mortality rates when compared with non-frail (CFS 1-4) patients at both 30 and 90 days (Figure 7.1.3).

**Figure 7.1.3 30-day and 90-day ONS mortality, by age and frailty assessment**



## Frailty and risk assessment

Of the patients with a CFS  $\geq 5$ , the majority (70.7% vs 72.7% in Year 6) were also documented as being in the high-risk group. However, 18.2% (16.5% in Year 6) of frail patients were documented preoperatively as being low-risk. Published data would suggest this to be unlikely as increasing frailty scores are independently associated with a higher mortality (Parmar, 2019). The NELA risk score only accounts for physiological and biochemical markers and population level data. It does not account for individual risk factors, co-morbidity or type of procedure performed. Frailty is a crucial part of the clinical assessment of risk. If frailty is present, the patient should be considered to be high-risk (Royal College of Surgeons of England, 2018).

A combination of being high-risk on NELA score AND frail results in a two-fold increase above the average mortality for patients undergoing emergency laparotomy.



### Improvement opportunity

The NELA 'Excellence and Exception' report can be filtered to focus on the care of older patients. This will be supported in 2021–2022 with QI dashboard enhancements to include more specific reporting for older and frail patients. The NELA webinar on improving care for older and frail patients can be viewed [here](#). Steps to improve the care of frail patients are listed in the RCoA [Raising the Standards: RCoA Quality Improvement Compendium](#), Chapter 1.8 and Chapter 4.4.

## 7.2 Deaths during surgery and end of life care pathways

- 38 patients (0.17%) died in theatre, more than half of whom had sepsis and 57.9% (78.7% in Year 6) of whom were aged over 65 years old
- Of those patients who died in theatre, 97.4% had both a consultant anaesthetist and surgeon present
- Patients undergoing emergency laparotomy out of hours are no more likely to die in the operating theatre than those who undergo surgery during daytime hours
- 335 patients were placed on an end of life pathway after their surgery, which was more likely in older patients. Patients with cancer or ischaemia found at laparotomy were more likely to be placed on an end of life pathway

(See supplementary data tables 7.2.1 to 7.2.6).

# 8 Outcomes

## 8.1 Risk-adjusted mortality

In previous NELA annual reports, the calculation of the risk-adjusted mortality rate for each hospital was based on the risk factors contained in the NELA risk prediction model (Eugene, 2018). For the current report, the calculation additionally took into account confirmed SARS-Cov-2 infection among the emergency laparotomy patients whose data were submitted to NELA. Adjusting for individual patients' infection status does not in itself take into account all of the pressures that hospitals have experienced during the COVID-19 pandemic.

Overall, in Year 7 30-day mortality<sup>18</sup> has fallen to 8.7%, and 90-day mortality to 12.6%.

### SARS-Cov-2 status and mortality risk

NELA started collecting data on emergency laparotomy patients' SARS-Cov-2 status after receiving approval from the Health Research Authority Confidentiality Advisory Group in June 2020. Participating hospitals were able to retrospectively collect this information from 23 March 2020. Mortality data by SARS-Cov-2 status are shown in Table 8.1.1.

**Table 8.1.1 30-day mortality rates by SARS-Cov-2 status in NELA Year 7**

		SARS-Cov-2 status					
		Confirmed positive		Unknown		Confirmed negative	
30-day mortality	Alive	1,107	86.7%	8,328	90.9%	10,506	92.1%
	Dead	170	13.3%	833	9.1%	902	7.9%
	Total	1,277	100.0%	9,161	100.0%	11,408	100.0%

When adjusting for preoperative risk using the predictors from the NELA risk model, positive status had a moderately higher risk of 30-day mortality compared to negative status (odds ratio [OR]: 1.58, 95% confidence interval [CI]: 1.41 – 1.76). There was little evidence of a difference in mortality risk between those with unknown and negative status after risk adjustment (OR: 1.04, 95% CI: 0.95–1.13).

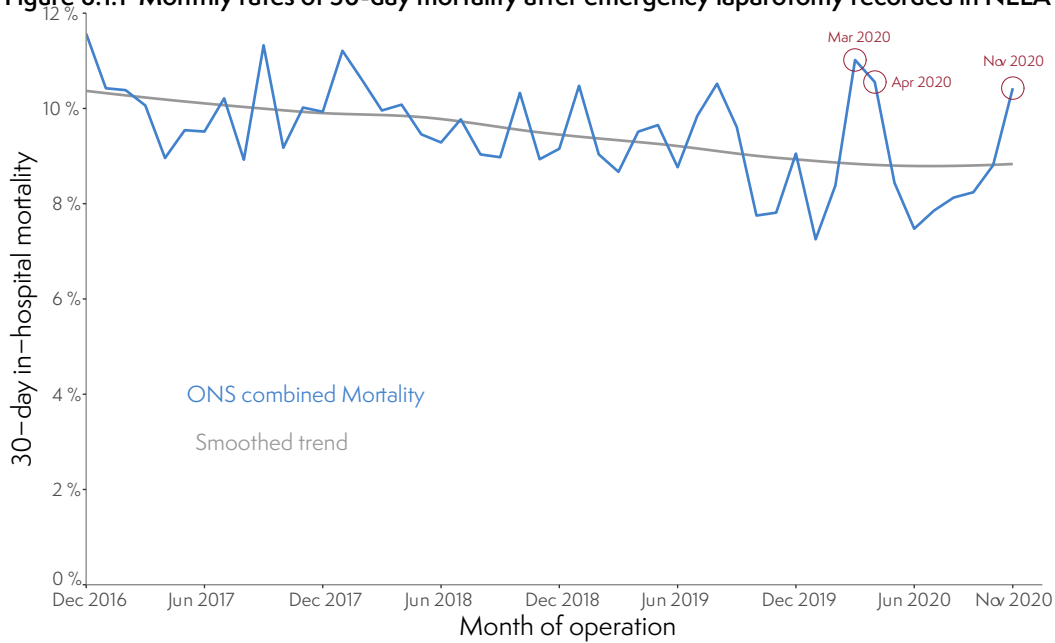
Positive SARS-Cov-2 status, then, is associated with an increased risk of death for the patient that is not otherwise predicted by the NELA risk model. Positive SARS-Cov-2 status was included in the risk model this year for the purpose of hospital comparison. To gauge the effect of this on the hospital comparisons, the ordinary NELA risk model was also run without adjusting for SARS-Cov-2 status, and produced an alternative funnel plot under this model (no distinction was made in either model between 'negative' and 'unknown' SARS-Cov-2 status). Adjusting for an individual patient's SARS-Cov-2 infection status does not in itself account for all the pressures hospitals have faced in the COVID-19 pandemic.

<sup>18</sup>NELA receives quarterly updates to ONS mortality data which has a small impact on previously published figures. An analysis is underway to assess how this impacts on previously published mortality data.

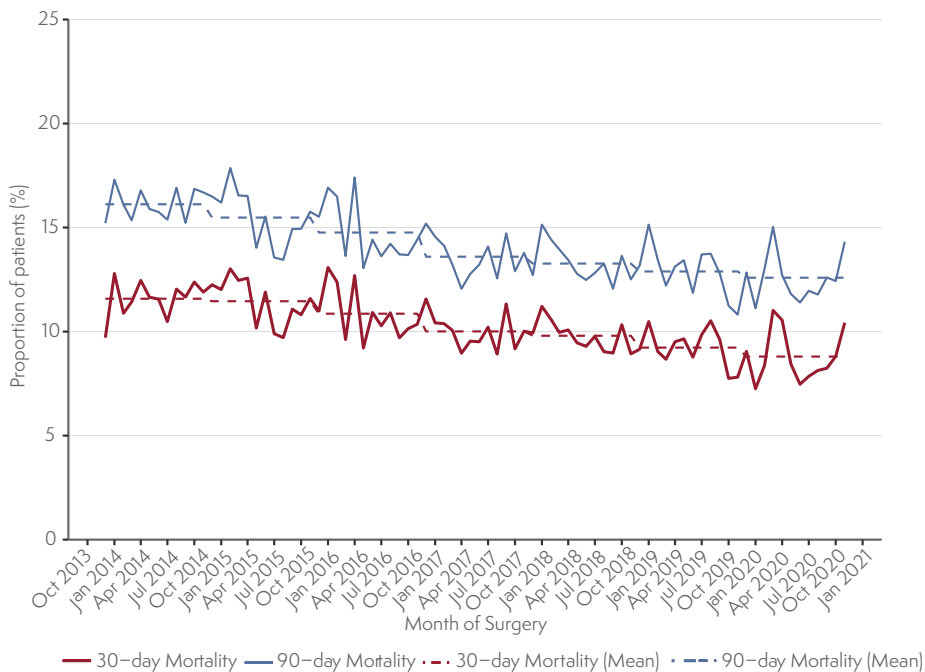


The trend of a gradual year-on-year fall in mortality after emergency laparotomy appears to have continued in Year 7, but the pandemic year also saw higher month-by-month variation in death rates than previous years. To explore this, Figure 8.1.1 shows monthly ONS combined mortality rates for audit years 4–7. The highest death rates in 2020 occurred in March, April, and November. These were the months with the highest national numbers of hospitalised COVID-19 patients (overall, i.e., not limited to laparotomy patients) in Year 7 (<https://coronavirus.data.gov.uk/details/healthcare>).

**Figure 8.1.1 Monthly rates of 30-day mortality after emergency laparotomy recorded in NELA**



**Figure 8.1.2 Trend in the overall unadjusted 30-day and 90-day ONS mortality rates by NELA dataset year**

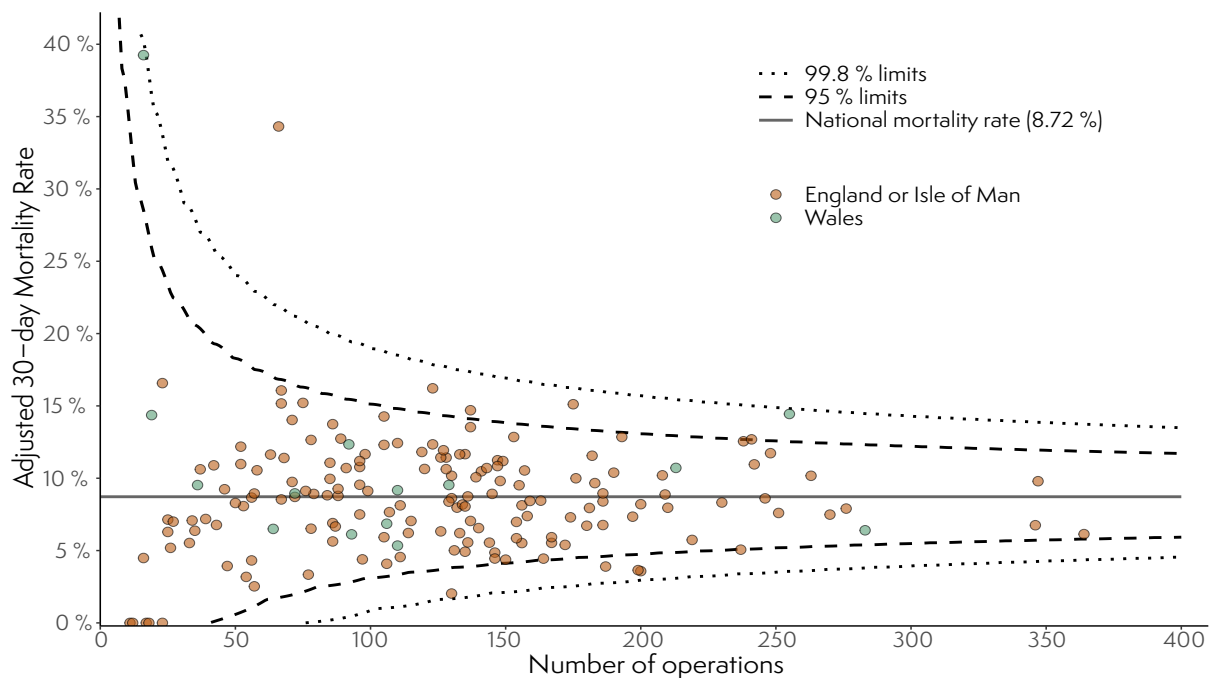


30-day mortality  
**8.72%**

90-day mortality  
**12.6%**

The funnel plot for outlier identification was based on 175 hospitals who submitted data about at least 10 operations. Two hospitals with fewer than 10 reported operations were excluded from the funnel plot and outlier identification analyses. The funnel plot using hospitals' risk-adjusted mortality rates, including adjustment for SARS-CoV-2 infection status, is shown in Figure 8.1.3.

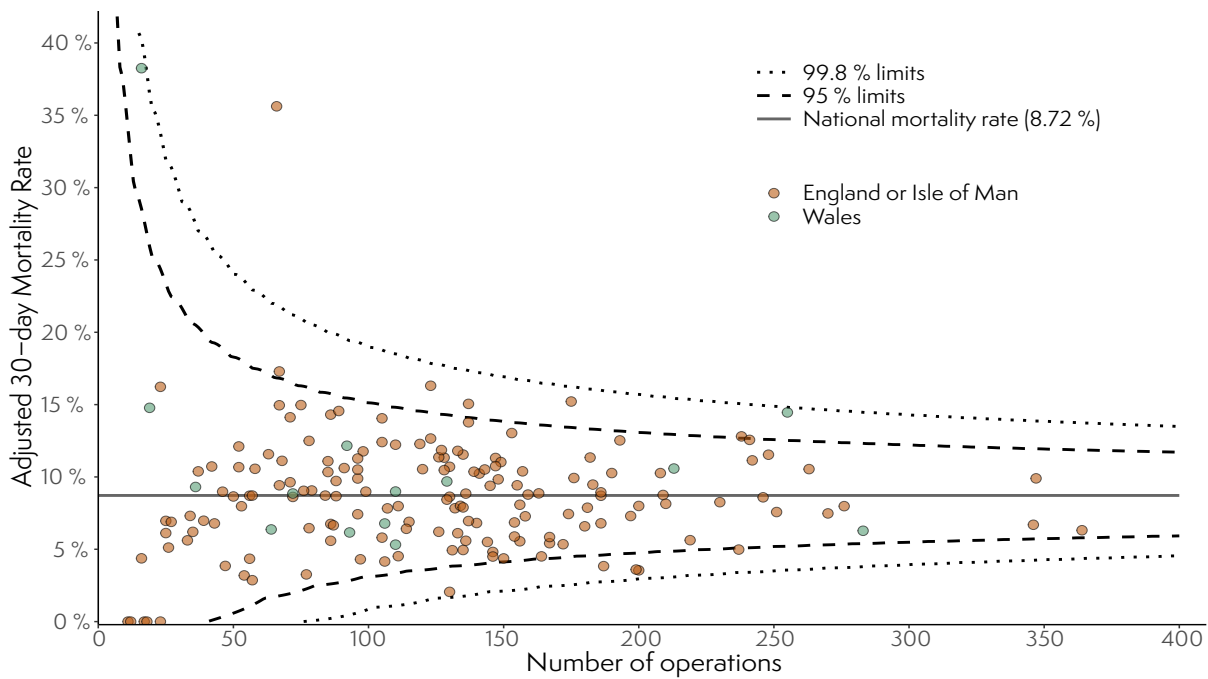
**Figure 8.1.3 Funnel plot of risk-adjusted mortality by number of operations (NELA risk model plus adjustment for patient COVID-19 status)**



**Notes:** This graph shows data from 175 hospitals. Two hospitals with fewer than ten operations in NELA Year 7 were excluded.

For comparison, Figure 8.1.4 shows a funnel plot calculated without adjusting for patient SARS-Cov-2 infection status. This illustrates that adjusting for the additional mortality risk conferred by known SARS-Cov-2 infection made little difference to most hospital's adjusted mortality rates and their relative positions to one another in the plot. For two out of 175 hospitals, the adjusted mortality rate differed by more than 1 percentage point when adjusting for patients' SARS-Cov-2 status compared to when using the NELA risk model only. In both cases, the adjusted mortality risk was lower when accounting for SARS-Cov-2 status.

**Figure 8.1.4 Funnel plot of risk-adjusted mortality by number of operations (ordinary NELA risk model, no adjustment for patient COVID-19 status)**



**Notes:** This graph shows data from 175 hospitals. Two hospitals with fewer than ten operations in NELA Audit Year 7 were excluded.

### Hospital level mortality

Of the 175 hospitals included in the outlier identification analysis (funnel plot), one had an adjusted mortality rate that triggered alarm status (above upper 99.8% control limit). For six hospitals, their adjusted mortality rate triggered alert status (between 95% and 99.8% upper control limits). Due to [changes in the outlier policy](#) made by NHS England due to the COVID-19 pandemic, only those hospitals which reached alarm status or double-alert status were required to undergo formal review of outliers for this audit year. Nevertheless, all hospitals (single alert, double alert, and alarm level) have been notified in advance of publication of this report and in accordance with NELA’s outlier policy, which can be found [here](#). Individual hospital outcomes are shown via the [NELA website](#).

### Alarm-level outliers

- Bedford Hospital

### Hospitals with the best outcomes

Four hospitals (shown in the table below) had a risk-adjusted mortality below the lower 95% control limit, indicating that these hospitals have some of the best outcomes in England and Wales. The hope is that collaborative learning events will provide opportunities for hospital teams to learn from one another and share how improved outcomes for patients can be sustained.

Table 8.1.2 Hospitals with risk-adjusted mortality below the lower 95% control limit<sup>19</sup>

Hospital	Caseload	Risk adjusted 30-day mortality
Addenbrookes Hospital	200	3.58
Huddersfield Royal Infirmary	187	3.90
Norfolk and Norwich University Hospital	237	5.06
Royal United Hospital	199	3.65



### Improvement opportunity

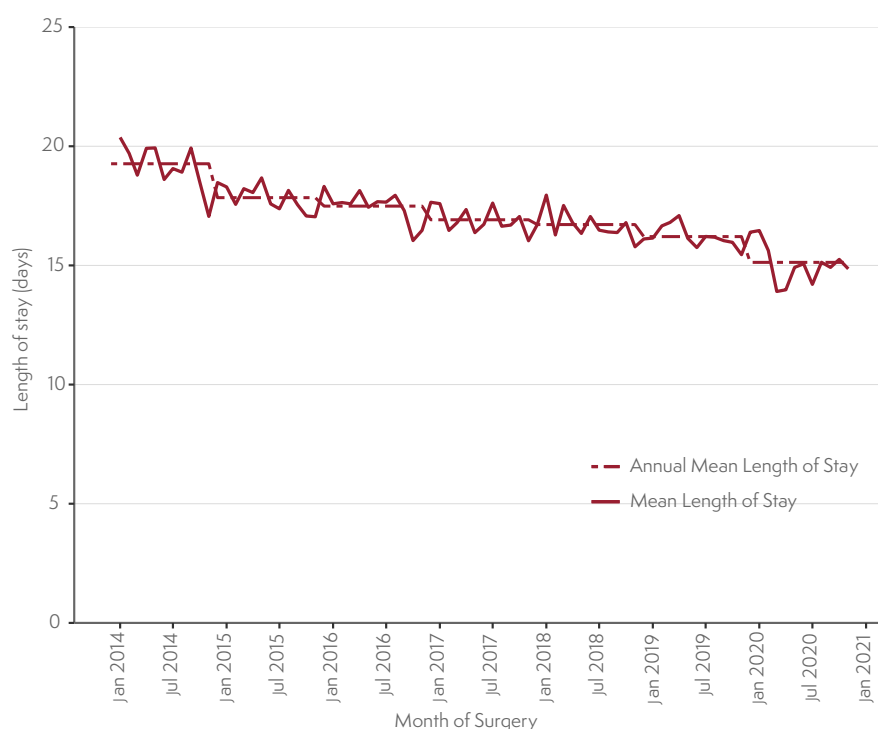
For the first time, teams can look at their real-time, risk adjusted in-hospital mortality from the QI dashboard EWMA chart. Teams can review these charts for changes in mortality. Suggested actions to take are listed on the [NELA website](#).

## 8.2 Length of stay (LOS)

Prolonged hospital stays are a significant burden for both patients and their families. A shorter length of stay may not only indicate good care processes and an uncomplicated recovery, but is also more desirable for patients who wish to return to their own home.

Mean length of stay in Year 7 was 15.1 days (16.2 in Year 6). This has fallen from 19.3 days since NELA's inception in 2013 (Figure 8.2.1) and represents a cost savings to acute Trusts of £42.4 million.<sup>20</sup>

Figure 8.2.1 Trend in the mean length of stay over time in patients surviving to hospital discharge



<sup>19</sup>Positive outlier status is achieved if a hospital's outcomes are better than the 95% control limit and case ascertainment is at least 90%.

<sup>20</sup>Based on 30,000 emergency laparotomy patients per year, which represents a savings of 114,000 bed-days. The cost saving was estimated based on the excess non-elective bed-day cost for 2017/18 of £337 per day (NHS Improvement, 2018).

## Length of stay<sup>21</sup> increases with:



**Increasing age:** <40 years LOS = 7 days (IQR 9–22), ≥90 years: LOS = 14 days (IQR 9–22)



**Higher risk profiles:** high preoperative documented risk LOS = 14 days (IQR 9–25), low-risk = 8 days (IQR 5–13)



**More co-morbidities:** ASA 1 = 7 days (IQR 5–10), ASA 4 = 18 days (IQR 10–33)



**An unplanned return to theatre** which more than doubles the median LOS from 9 up to 28 days

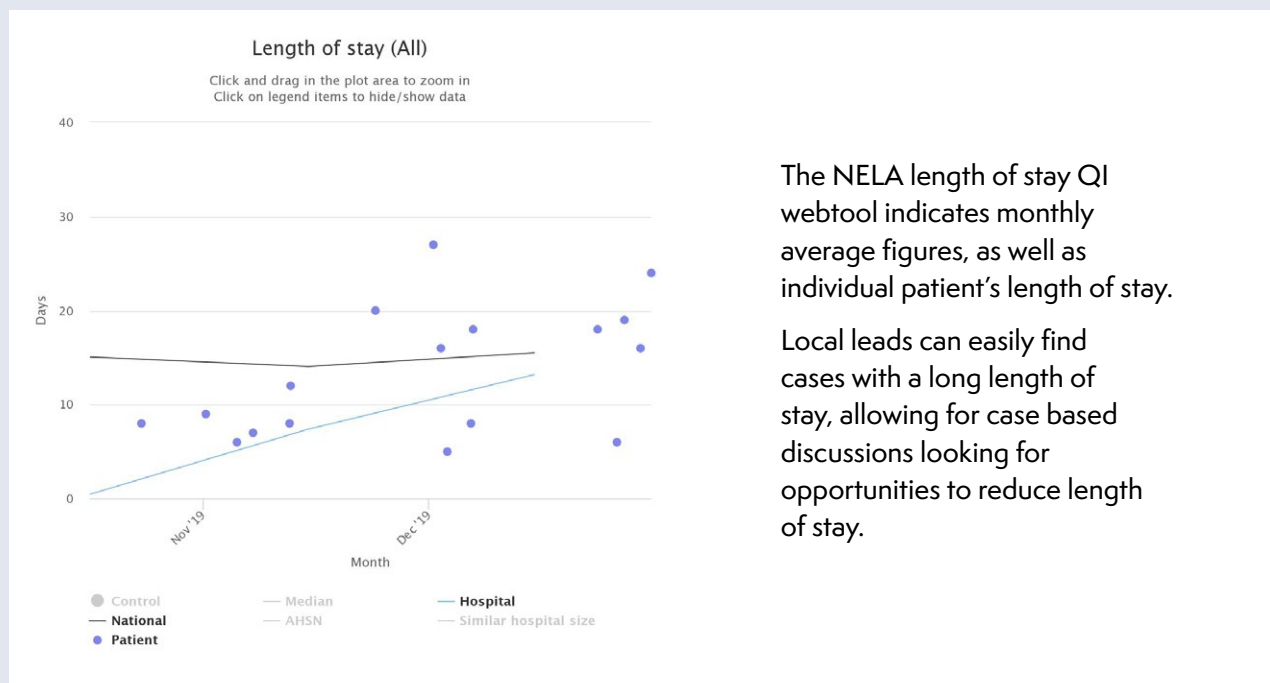


**An unplanned admission to critical care** which is associated with a significantly prolonged LOS with around an extra 12 days in hospital (unplanned admission median LOS = 22.5 days [IQR 13–40] vs no unplanned admission LOS = 10 days [IQR 6–17])

(See supplementary data tables 8.2.1 to 8.2.5).



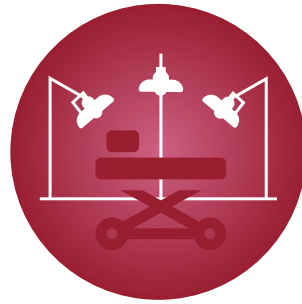
## Improvement opportunity



<sup>21</sup>Between Years 1 and 6, length of stay calculations only included patients who survived to discharge. From Year 7, length of stay also includes patients in hospital at 60 days. In Year 7, 252 patients had their records locked while still in hospital at 60 days (359 in Year 6).

## 8.3 Unplanned returns to theatre

**1,779 patients (8.1%)**  
needed to return  
to theatre for further planned or  
unplanned operative intervention



**607 patients (2.8%)**  
are as a planned return, usually  
following initial 'damage  
control' surgery

**1,043 patients (4.8%)**  
had an unplanned return to theatre

(See supplementary data tables 8.3.1 to 8.3.2).

It is important to try and identify which patients are at risk of an unplanned return to theatre and to have appropriate pathways in place to ensure these patients are managed promptly with appropriate consultant level input.

- Unplanned return to theatre is:
  - more likely if the patient documented risk is high ( $\geq 5\%$ ) (5.5% vs 3.9%)
  - 1.4 times more likely if the patient required immediate surgery (<2 hours)
- Patients requiring an unplanned return to theatre are just as likely to have a consultant surgeon and anaesthetist present at their initial laparotomy as those who do not require a return to theatre
- Outcomes are worse for patients who have an unplanned return to theatre:
  - average length of stay increases from 9 days to 28 days
  - ONS 30-day mortality is 14.1%

(See supplementary data tables 8.3.3 to 8.3.8).

## 8.4 Unplanned admission to critical care

Three-quarters of those with unplanned admission to critical care were admitted to critical care directly after their emergency laparotomy, and, once discharged, subsequently required re-admission to critical care (Table 8.4.1). Importantly, unplanned admission to critical care is associated with significantly higher 30-day mortality and a longer length of stay (Table 8.4.2).



**698 (3.2%) patients** had an unplanned admission to critical care during their hospital stay



The rate of unplanned admission **varied between 0% and 28.6%** between hospitals



Unplanned admission to critical care resulted in a **longer median duration of stay of 22.5 days** (IQR 13–40) compared with 10 days if there was no unplanned admission



**Mortality was 17.6%** if an unplanned admission to critical care occurred



The **mean preoperative predicted mortality** of the patients who went to the ward postoperatively and then were **admitted to critical care was 4.3% (same in Year 6)**

**Table 8.4.1 Original postoperative discharge destination of patients after emergency laparotomy who required a subsequent unplanned admission to critical care**

Postoperative destination following original laparotomy for patients with an unplanned admission to critical care	Total number of patients [n (%)]
Critical care	495 (70.9%)
Enhanced care area on a normal ward	12 (1.7%)
Extended recovery area within theatres (e.g. PACU or OIR)	18 (2.6%)
Ward	173 (24.8%)

**Table 8.4.2 Number of patients who had an unplanned admission to critical care and 30-day mortality (excluding patients who died in theatre or where there was a decision for palliative care)**

	Number of patients (% of total)	ONS 30-day mortality
No unplanned admission to critical care	21,017 (96.3%)	8.3%
Unplanned admission to critical care	698 (3.2%)	17.6%
Unknown	93 (0.4%)	22.4%
Missing	15 (0.1%)	

# Using NELA: impact beyond quality improvement and audit

NELA is more than 'just an audit'. As the world's largest dataset of emergency laparotomy patients, holding information on over 170,000 patients who have emergency laparotomy, it is a powerful and important resource that can be used to support improvement work, assurance work and research that enhances the care of patients undergoing emergency laparotomy.

NELA was one of the national audit projects that successfully continued collecting data during the COVID-19 global pandemic. Teams across the UK have continued to enter data into the NELA dataset therefore capturing the impact of COVID-19 on patients needing emergency laparotomy throughout this period. This is testament to the engagement of contributors and their recognition of the value the NELA dataset has for their patients. This report would not have been possible without such dedication.



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# 11 Glossary and abbreviations

## **Abdomen/Abdominal**

Anatomical area between chest and pelvis, which contains numerous organs, including the bowel

## **Adhesiolysis**

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

## **Anastomotic Leak**

Leak from a join in the bowel

## **ASA**

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

## **Average**

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

## **Bowel**

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

## **CCU**

Critical Care Unit

## **CFS**

Clinical Frailty Scale

## **CI**

Confidence Interval

## **Colitis**

Inflammation of the colon

## **Colon**

Part of the large intestine

## **Colorectal Resection**

Surgical procedure to remove part of the bowel

## **Colostomy**

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

## **COVID-19**

Coronavirus disease caused by SARS-CoV-2

## **CT**

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

## **ED**

Emergency Department

## **Elective**

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

## **ELF Study**

Emergency Laparotomy and Frailty Study

## **Emergency laparotomy**

Opening of the abdomen to undertake emergency bowel surgery that, due to underlying conditions, must be carried out without undue delay

## **EWMA**

Exponentially Weighted Moving Average

## **GP**

General Practitioner

## **Hartmann's Procedure**

Surgical procedure to remove part of the large bowel resulting in the formation of an end colostomy, and leaving part of the rectum in-situ

## **HQIP**

Healthcare Quality Improvement Partnership

## **ICU**

Intensive Care Unit

## **Ileostomy**

Surgical procedure to divert one end (or two ends in a loop colostomy) of the small intestine (small bowel) through an opening in the abdomen (tummy). An ileostomy bag is used to collect bowel contents

## **Intestine**

Part of the bowel

## **Intra-abdominal**

Inside the abdomen/tummy

## **Intraoperative**

During surgery

## **IQR**

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

## **Ischaemia**

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

**Laparoscopic**

Keyhole surgery

**LOS**

Length of Stay

**Mean**

Mathematical average

**Median**

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

**NCEPOD**

National Confidential Enquiry into Patient Outcome and Deaths

**NELA**

National Emergency Laparotomy Audit

**NEWS2**

National Early Warning Score

**Obstruction**

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

**OIR**

Overnight Intensive Recovery

**ONS**

Office for National Statistics

**OR**

Odds ratio

**PACU**

Postanaesthetic Unit

**PEDW**

Patient Episode Database of Wales

**Perforation**

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

**Perioperative**

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

**Peritonitis**

Infection or inflammation within the abdomen, causing severe pain. It has the potential to make people very unwell very quickly and can be life threatening

**Postoperative**

After surgery

**Preoperative**

Before surgery

**RAG**

Red, Amber, Green

**RCoA**

Royal College of Anaesthetists

**WHO**

World Health Organization

## National Emergency Laparotomy Audit (NELA)

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