



Royal Australasian  
**College  
of Surgeons**



**ANZCA**  
FPM

# Australian and New Zealand Emergency Laparotomy Audit – Quality Improvement (ANZELA-QI)

First ANZELA-QI program summary report  
1 June 2018 to 30 June 2020

Report date: November 2020



## **Collaborating Organisations**

This program is co-led by the Royal Australasian College of Surgeons and the Australian and New Zealand College of Anaesthetists.

The pilot project was funded by:

Royal Australasian College of Surgeons (RACS)

Australian and New Zealand College of Anaesthetists (ANZCA)

General Surgeons Australia (GSA)

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Australian Society of Anaesthetists (ASA)

New Zealand Society of Anaesthetists (NZSA)

Additional collaborating partners:

Australasian College for Emergency Medicine

College of Intensive Care Medicine

Australian and New Zealand Society for Geriatric Medicine

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The following committees are recognised for the direction and advocacy they have provided to this project.

### **ANZELA-QI Governance Committee**

Dr Richard Perry, Dr Vanessa Beavis, Mr John Biviano, Mr John Ilott, Mr James Aitken, Associate Professor Wendy Babidge.

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Members: Mr James Aitken, Dr Ben Griffiths, Dr Ed O'Loughlin, Professor David Fletcher, Dr Jill Van Acker, Dr John Treacy, Professor David Watters.

Invited guests: Dr Tony Sparnon, Dr Rod Mitchell, Professor Guy Maddern, Dr Carmel Crock, Dr Siva Senthuran, Dr Lewis Macken, Professor Richard Turner, Mr Gowan Creamer, Dr Jeremy Fernando, Dr David Elliot, Mr Brian McGowan, Professor David Story, Dr Phillipa Hore, Dr Vanessa Beavis, Dr Leona Wilson, Dr Ming Loh, Mr John Biviano, Mr John Ilott, Dr Tom Poulton, Dr Helena Kopunic, Associate Professor Wendy Babidge.

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## Chair's report

I am pleased to present the first report from the Australian and New Zealand Emergency Laparotomy Audit – Quality Improvement (ANZELA-QI) program.

The report focuses on the results of the ANZELA-QI pilot. It includes a brief summary explaining its development and methods, but considerable additional detail related to the database and the inclusion/exclusion criteria can be found on the ANZELA-QI website. This report does include an explanation as to how ANZELA-QI has presented its data using quality improvement methods, as this is a central part of ANZELA-QI's approach and will not be familiar to many.

The trigger that initiated ANZELA-QI was the visit to Sydney in mid-2017 by Dave Murray, the then Clinical Lead for NELA in England and Wales. His visit brought together a group of clinicians who felt there was merit in a local audit. A working party was established in September 2017, and ANZELA-QI commenced data collection in July 2018.

The working party had two aims. The first was to demonstrate that a prospective quality improvement project was possible in the local medical system. The second was to determine if there is a need for a local emergency laparotomy audit. The working party set out to recruit up to 12 pilot hospitals. Almost 60 registered their interest—a clear demonstration as to the value that clinicians attached to the project.

The working party were clear from the outset that ANZELA-QI was to be a clinician-lead, near-real-time prospective quality improvement project that would focus on compliance with evidence-based standards of care. The working party were of the view that the traditional audit model, in which data managers gathered retrospective data over a year then analysed those data and responded up to another year later, was no longer appropriate. The working party agreed that it would be necessary for the data to be identifiable at the hospital level, so all could learn from the best.

When reading this report, it is important to recognise how two particular barriers hindered ANZELA-QI establishment and limited its scope. The first was that there was not, and still is not, any nationally agreed framework to facilitate the establishment of clinical registries. That meant the working party had no agreed ethical or governance framework to work with. It had to negotiate with individual states and territories, health providers and hospitals. Each had their own differing requirements, and the time and cost of managing this has been enormous.

The second barrier was that there is no funding mechanism for national registries, not even seed funding for a pilot project. ANZELA-QI would never have commenced without seed funding from RACS, ANZCA, GSA, NZAGS, ASA and NZSA. The working party is immensely grateful for their support.

Because of these limitations, the working party identified a small number of representative key goals and limited its scope to delivering these. There is considerable opportunity to extend ANZELA-QI's data collection and real-time analysis, but that will require proper national infrastructure and adequate funding.

ANZELA-QI made two other important observations. The first is that ANZELA-QI has shown that quality improvement methodology is a powerful driver of rapid change and with greater availability of electronic data there is enormous scope to extend its methods. The second is that ANZELA-QI has shown clinicians respond rapidly when shown their data, whereas hospitals are much slower. NELA made the same observation and stated that improvements within the gift of individual clinicians have plateaued and wider system or organisation changes will be required to achieve further improvement.

This report makes a compelling case for ANZELA-QI to become a national clinical registry. For that to eventuate there are two key requirements. Firstly, state and federal governments must provide the political and governance framework to facilitate the establishment of clinical quality registries. The governance barriers that ANZELA-QI has confronted are common to all fledgling Australian clinical registries. These barriers have defeated some. The value of clinical registries has long been recognised overseas, where some have been established for more than 20 years. Australia has been very slow to appreciate their worth, despite the world-leading Australian Orthopaedic Association National Joint Replacement Registry repeatedly demonstrating its value.

The second requirement is that Australian clinical registries, including ANZELA-QI, must be nationally funded. Negotiation with individual states and then with each public and private health provider has proven to be near impossible. The funding ANZELA-QI requires—less than \$4 million over five years—is tiny

when compared to the likely total cost of emergency laparotomies. A reduction in average length of stay by one day will likely save approximately \$34 million per annum.

The reality is that establishing future clinical quality registries will be slow until governments actively support the national framework for clinical quality registries recently published by the Australian Commission for Safety and Quality in Health Care (ACSQHC). This will require robust political leadership.

I extend my sincere thanks to the many organisations and people who helped progress ANZELA-QI to where it is today. Of note, ANZELA-QI was extremely fortunate that Tom Poulton (NELA Anaesthetic Fellow, 2016 and 2017) commenced work in Perth in February 2018. His expertise, enthusiasm and help were invaluable. I especially acknowledge the financial support provided by the Colleges and Societies, the input from the working party, the RACS staff in Adelaide for their day-to-day support in very constrained conditions, and specifically Wendy Babidge, who led the funding discussions with the states. I also acknowledge the invaluable support from the WA Health, led by Executive Director of Patient Safety and Clinical Quality Audrey Koay, who greatly assisted ANZELA-QI in its funding journey.

James Aitken

Chair, ANZELA-QI Working Party

## Abbreviations

|           |   |
|-----------|---|
| ACSQHC    | Australian Commission on Safety and Quality in Health Care                  |
| ACTA      | Australian Clinical Trials Alliance   |
| ANZCA     | Australian and New Zealand College of Anaesthetists                         |
| ANZELA-QI | Australian and New Zealand Emergency Laparotomy Audit — Quality Improvement |
| ASA       | Australian Society of Anaesthetists   |
| CADENZAA  | Care Delivery in New Zealand for the Acute Abdomen                          |
| CCU       | critical care unit  |
| CT        | computed tomography   |
| CTANZ     | Clinical Trials Network Australia New Zealand                               |
| FFS       | fee for service   |
| HREC      | Human Research Ethics Committee   |
| GSA       | General Surgeons Australia  |
| IHI       | Institute for Healthcare Improvement  |
| KPI       | key performance indicator   |
| NCEPOD    | National Confidential Enquiry into Patient Outcome and Death                |
| NELA      | National Emergency Laparotomy Audit   |
| NZAGS     | New Zealand Association of General Surgeons                                 |
| NZSA      | New Zealand Society of Anaesthetists  |
| RACS      | Royal Australasian College of Surgeons                                      |
| RAGG      | Red, Amber, Green, Grey   |
| REDCap    | Research Electronic Data Capture tool                                       |
| RCS       | Royal College of Surgeons of England  |
| SD        | standard deviations   |
| SPC       | statistical process control   |
| SSA       | site-specific assessment  |



## Executive Summary

This ANZELA-QI report relates to data collected on 2,886 patients at 24 participating hospitals in the two-year reporting period (1 July 2018 to 30 June 2020). It focuses on two analyses. The first relates to eight standards of care — or ANZELA-QI Key Performance Indicator (KPI), for which the overall results are provided at the end of this Executive Summary. The second analysis included five other outcomes: mortality, length of hospital stay, discharge destination, return to theatre after initial emergency laparotomy and Clavien-Dindo complication grade.

For the patients described in this report, 63.0% were aged between 65 and 84 years. The majority (92.4%) of cases were admitted as emergency patients. The largest category of surgical urgency was of patients needing an emergency laparotomy between 2 and 6 hours from diagnosis (39.3%). In more than half of cases (52.3%) the preoperative indication was for small bowel obstruction or for a perforation.

For the ANZELA-QI KPIs:

- Although an abdominal computed tomography (CT) scan was performed prior to surgery in 88.9% of cases, a report from a consultant radiologist was only available for 68.1% of cases.
- Less than half of all patients (45%) had a preoperative risk assessment documented.
- Approximately three-quarters of all patients (78.4%) had a surgical urgency of less than 18 hours, but only 59.7% of these patients arrived in theatre within the appropriate timeframe.
- Of those patients who had a preoperative risk assessment both consultants (surgeon and anaesthetist) were present in theatre for 75.2% and no consultant present for 6.8%. For patients with the highest-risk ( $\geq 10\%$ ) preoperative assessment both consultants were present in theatre for 77.1% and no consultant present for 7.9%.
- For those patients with a preoperative NELA risk assessment score of  $\geq 10\%$  only 69.6% were admitted to critical care following surgery.
- For patients aged 65 years or over, only 17.7% received a postoperative assessment by a specialist in gerontology or a gerontology team.

Five additional outcomes were assessed in addition to the standard of care KPIs:

- The overall in-hospital mortality was 7.1%. After excluding hospitals with no mortality there was a 5.8-fold variation of inter-hospital mortality (2.3% to 13.3%).
- The average length of stay in hospital was 15.5 days, with a 2.7-fold variation of inter-hospital stay (range 8.6 to 22.7 days).
- Over two-thirds (66.7%) of patients returned to their prehospital residence following discharge from hospital, while 14.2% did not (for the remainder the discharge location was unknown).
- Overall, 1.0% of patients had a return to theatre after the original emergency laparotomy.
- Patients with an unknown NELA preoperative risk assessment had higher Clavien-Dindo grade V complication rates.

This report shows the ANZELA-QI has successfully answered its two aims. First, it has clearly demonstrated it is possible to undertake a national prospective quality improvement project. The quality improvement methods used in ANZELA-QI could be extended to many other areas of medicine. Second, it has demonstrated there is a need for a national emergency laparotomy audit as many patients did not receive best evidence-based standards of care. This will adversely impact on patient outcomes.

The two international outcomes that prompted interest in audit of emergency laparotomy were 30-day mortality and average length of stay. Of particular concern was the wide inter-hospital variation. Average length of stay is a useful surrogate marker for quality, as a short stay normally equates with efficient and uncomplicated care and it is the single biggest driver of cost. Historical international studies reported a 30-day mortality around 15%. It is now nearer 11%, and the average length of stay around 16 days.

Although ANZELA-QI has demonstrated an overall in-hospital mortality of 7.1%, there is at least a 5.8-fold inter-hospital variation, as well as an average length of stay of 15.5 days but with an almost 3-fold inter-

hospital variation. The wide inter-hospital variation suggests there is considerable scope for improvement. To reduce this inter-hospital variation will require greater compliance with well-established evidence-based standards of care known to improve outcomes. ANZELA-QI has used monthly run charts to show hospitals both their own and national compliance with these standards. In six of the eight evidence-based standards, compliance was less than 80% as seen in Table 1.

The ANZELA-QI Pilot project has clearly shown the benefit of a quality improvement initiative. With adequate support and funding much more can be achieved to improve the quality of care for these critically ill patients.

## **Key messages**

1. It is feasible to conduct prospective clinical quality improvement registries in Australia.
2. In Australia there is wide inter-hospital variation in outcomes following emergency laparotomy and a widespread failure to achieve internationally defined benchmarked standards of care. This suggests there is considerable scope to improve care.
3. Only 46% of patients had a preoperative risk assessment, the key driver to appropriate care.
4. Less than 20% of patients over the age of 65 were assessed by a gerontology team, a known determinant of outcome.
5. Further improvement will require system and organisation changes.
6. There is an urgent need for a nationally agreed policy to coordinate governance and funding of national clinical registries. This will require robust political support.

## **Recommendations**

1. Ensure the wide dissemination of this ANZELA-QI report.
2. Continue data collection in pilot hospitals and others on a nominal fee basis and send reports to participating hospitals monthly.
3. Refine the database using experience of the ANZELA-QI pilot; that is, based on findings in this report.
4. Engage ANZELA-QI with federal, state and territory governments in its quest to be fully funded.
5. Commit, if funded, to:
  - a. develop a bespoke database that permits true real-time data feedback
  - b. expand the standard of care KPIs it monitors and returns to hospitals
  - c. explore how more data can be recovered from routine administrative data
  - d. extend follow-up to determine long-term outcomes.
6. Ensure the Colleges continue to impress on federal, state and territory governments, as well as the Australian Commission on Safety and Quality in Health Care, the urgent need to address the existing governance framework that has hindered the establishment of ANZELA-QI. Without the necessary changes it will remain difficult, time consuming and expensive to establish high-quality clinical quality registries.

## Key performance indicator summary

**Table 1: Proportions of patients meeting standards nationally and proportions of hospitals rated on the Red, Amber, Green, Grey (RAGG) ANZELA-QI patient reports for the key standards and supporting process measures**

| Key standards*   | Key performance indicator   | Percentage of hospitals achieving RAGG standards by ANZELA-QI | Number of hospitals green RAGG rated (total hospitals = 24) |
|--|---|---|---|
| <b>Hospitals that admit patients as emergencies must have access to CT scanning 24 hours per day</b>   | Proportion of all emergency laparotomy patients who received a preoperative CT scan which was reported on by a consultant radiologist preoperatively (KPI 1)                  | <b>68.1%</b><br>n = 1747                                      | 5   |
| <b>An assessment of mortality risk should be made explicit to the patient and recorded clearly on the consent form and in the medical records</b>                                    | Proportion of patients with risk assessment documented preoperatively (KPI 2)   | <b>45.0%</b><br>n = 1299                                      | 1   |
| <b>Hospitals should ensure theatre access matches need and ensure prioritisation of access is given to emergency surgical patients ahead of elective patients whenever necessary</b> | Proportion of patients arriving in theatre within a time appropriate for the urgency of surgery (KPI 3)   | <b>59.7%</b><br>n = 1351                                      | 0   |
| <b>Each high-risk case should have the active input of a consultant surgeon/anaesthetist</b>   | Proportion of patients with a calculated preoperative risk of death $\geq 5\%$ for whom both a consultant surgeon and consultant anaesthetist were present in theatre (KPI 4) | <b>75.2%</b><br>n = 445                                       | 7   |
|  | Proportion of patients with a calculated preoperative risk of death $\geq 5\%$ for whom a consultant surgeon was present in theatre (KPI 5)                                   | <b>84.1%</b><br>n = 498                                       | 10  |
|  | Proportion of patients with a calculated preoperative risk of death $\geq 5\%$ for whom a consultant anaesthetist was present in theatre (KPI 6)                              | <b>90.4%</b><br>n = 535                                       | 14  |
| <b>Highest-risk patients should be admitted to critical care</b>   | Proportion of patients with a preoperative risk of death $\geq 10\%$ who were directly admitted to critical care postoperatively (KPI 7)                                      | <b>69.6%</b><br>n = 296                                       | 8   |
| <b>Each patient over the age of 65 should have multidisciplinary input that includes early involvement of geriatrician teams</b>   | Proportion of patients age 65 years or over who were assessed by a specialist in gerontology (KPI 8)  | <b>17.7%</b><br>n = 271                                       | 1   |

Notes:

\* Key standards used here have been based on NELA's standard of care

n=number of cases meeting the KPI

Green: standard met by greater than or equal to 80% of patients

Amber: standard met by 50–79% of patients

Red: standard met by less than 50% of patients

# 1. Introduction

This introduction provides a brief outline to explain some of the important features of ANZELA-QI. It is not a comprehensive account. Additional details are available on the ANZELA-QI website: <https://www.surgeons.org/en/research-audit/morbidity-audits/morbidity-audits-managed-by-racs/anz-emergency-laparotomy-audit-quality-improvement>.

In the first decade of this millennium, the only data reporting the outcome following emergency laparotomy were derived from retrospective analyses of administrative data, which have well-recognised limitations. The lack of reliable data prompted the prospective United Kingdom Emergency Laparotomy Network study, which confirmed an overall postoperative mortality of 15%, and 25% for those aged 80 years or over (Saunders et al. 2012). It also showed poor compliance with care processes known to improve outcomes. Importantly, it confirmed the wide inter-hospital variation noted in earlier studies.

Based on this and other data, the Health Quality Improvement Partnership funded the NELA in England and Wales (NELA 2018). More recently, three prospective studies that used quality improvement techniques demonstrated that compliance with a bundle of individual care standards significantly improved outcomes (Huddart et al. 2015; Tengberg et al. 2017; Aggarwal et al. 2019).

Prior to 2017, there was no Australian data but prompted by NELA a number of local studies have now been published (Broughton et al. 2017; Ho et al. 2017; Stevens et al. 2018; Burmas et al. 2018; Tocaciu et al. 2018; Watson et al. 2019; Eliexer et al. 2020). Collectively these suggested that many of the problems identified overseas are also relevant to Australia.

A working party was established in September 2017 to determine the feasibility of establishing an emergency laparotomy audit across Australia and New Zealand—ANZELA-QI. While the pilot was fortunate to obtain funding from RACS, ANZCA, GSA, NZAGS, ASA and NZSA, this was seed funding. This minimal funding constrained the scope of ANZELA-QI, concentrating focus on a small number of achievable goals, rather than attempting a larger project that would risk falling short.

The primary goals of ANZELA-QI were:

1. to create an ANZELA-QI database centred around the NELA dataset, but modified as required for local practice
2. to identify and record compliance with selected standards of care known to impact on outcome (e.g. KPIs)
  - using the same care standards as NELA would deliver a comparative international baseline to collect data near real time on a cloud-based database
3. to download the data around the beginning of each month, to analyse it and return it to hospitals in the second week of each month.
  - data for the previous month would then be available at monthly mortality and morbidity meetings
4. to return monthly data in different formats:
  - a RAGG chart showing overall results for a snapshot period
  - run charts showing every hospital its own results for each KPI, as well as the overall data for all participating hospitals
  - a patient report for each hospital showing which patients had achieved, or not achieved, each KPI
5. to generate reports by named individual hospitals so all could identify and learn from the best
6. to report the traditional benchmarks of in-hospital mortality and average length of stay at least once a year.

## Standards of care

The bundle of care concept was originally developed in 2001 by the Institute for Healthcare Improvement (IHI) (IHI 2020). It was also adopted by the Surviving Sepsis Campaign for management of severe sepsis and septic shock, as it sought to promote the early identification of sepsis, the prompt delivery of antibiotics and timely source control (Dellinger et al. 2008, 2013).

In 2011, the Royal College of Surgeons of England (RCS) published *The higher risk general surgical patient: towards improved care for a forgotten group* (2011). The standards of care it recommended were based on recommendations from the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) and other organisations such as the Surviving Sepsis Campaign.

The bundle of care concept underpinned the three emergency laparotomy audits that used quality improvement methodology (Huddart et al. 2015; Tengberg et al. 2017 Aggarwal, et al. 2019).

In 2018, the RCS updated its recommendations using the lessons learned from NELA and other emergency laparotomy projects. The 2018 document states ‘it is the opinion of this expert group that implementation of the new key recommendations should be mandatory in all acute hospitals with adult surgical services and that doing so would save lives and make further appreciable differences to patient outcomes. All those managing the emergency general surgical patient should be familiar with its recommendations.

## Ethical and site-specific assessment approval

ANZELA-QI is confidential to the extent that identifiable patient information is not disclosed. However, within ANZELA-QI, patients will need to be identifiable or re-identifiable to permit linkage to other registers; for example, the death register and to link patients who are transferred between hospitals.

ANZELA-QI obtained Human Research Ethics Committee (HREC) approval with waiver of patient consent. Hospitals still need to obtain site-specific assessment (SSA) approval to participate. Obtaining SSAs has proven to be a major constraint to hospital recruitment. ANZELA-QI is a quality and safety audit collecting readily available data; it is not a research project. Thus, it was the expectation of the working party that, having obtained ethical permission, assessment approval and local governance clearance would be rapid and uncomplicated. However, the barriers to SSA approval were numerous, varied and continually changing. The legal issues underlying SSA are not specific to ANZELA-QI and have significant implications for the development of all Australian clinical registries.

The ANZELA-QI Working Party has advised the RACS Council of these difficulties and discussions have been held with both federal and state governments, health departments and the ACSQHC. The ACSQHC is seeking to establish a national process for ethics and governance that will be valid in all jurisdictions and hospitals, which cannot be rejected on an individual basis.

## Surgical trainee collaboratives

Surgical trainee collaboratives are well established in the United Kingdom and exist in many formats. One of the successes of NELA has been involvement with surgical collaboratives that have used its infrastructure to add value to its data. Several first-class projects have been completed using their data and published in high-impact peer-reviewed journals.

The establishment of such collaboratives has been somewhat slower to eventuate in Australia and New Zealand. However, RACS has now established the Clinical Trials Network of Australia and New Zealand (CTANZ), chaired by David Watson. A separate organisation—the Australian Clinical Trials Alliance (ACTA), chaired by Steve Webb—has also been established. ANZELA-QI has underpinned one ongoing trainee collaborative and at least one other is in preparation.

In 2022, the regulations guiding general surgical training will be changed to include a substantial research component. Surgical trainee collaboratives will provide an ideal way for trainees to obtain the research points they require, and ANZELA-QI is ideally placed to serve this demand. In General Surgery, ANZELA-QI can be a pathfinder audit that will establish the principles of surgical trainee collaboratives.

## **The future of ANZELA-QI in New Zealand**

A New Zealand arm of ANZELA-QI has been established: Care Delivery in New Zealand for the Acute Abdomen (CADENZAA). The CADENZAA team has approval from five hospitals to begin collecting cases and is trialling different approaches for data collection at each site. In several New Zealand hospitals, key IT developments have occurred to enable delivery of the project in a pure electronic format at the point of care delivery. This, along with the aim of improving quality of care for these patients, was the fundamental purpose of the New Zealand project.

CADENZAA has completed a national organisational survey including all hospitals that either admit and/or operate on acute abdominal conditions. These results are currently being analysed. Funding is being sought for CADENZAA from various sources. CADENZAA has begun collecting cases, but these have not yet been incorporated into the central ANZELA-QI Research Electronic Data Capture tool (REDCap) database. In New Zealand, while funding is being sought, steps have been taken to enable 'in house' running of the project at both Auckland City and North Shore hospitals. This will produce data from two large tertiary hospitals that can be exported to the ANZELA-QI binational dataset. While some hospitals have collected cases, they have not yet been incorporated into the central REDCap database and are therefore not included in analyses for this report.

## 2. Data collection and management

The ANZELA-QI program aims to collect real-time data that is then used to drive the care of the individual patient. Monthly feedback is provided to each participating hospital.

### 2.1 Data inclusion criteria

Data included in this report are from patients who met the following criteria:

- Aged 18 years or over
- Hospital admission date between 1 June 2018 and 30 June 2020
- Had an emergency laparotomy or laparoscopy
- Required the laparotomy/laparoscopy urgently (within 24 hours)

The full ANZELA-QI inclusion and exclusion criteria can be found at:

<https://umbraco.surgeons.org/media/2544/2018-apr-anzela-qi-pilot-inclusion-exclusion-matrix-final.pdf>

### 2.2 Data collection

Surgeons, anaesthetists and other clinical staff are encouraged to enter data into ANZELA-QI's web-based REDCap database at the time of presentation (<https://redcap.surgeons.org/>). If the case information is recorded in theatre it takes about seven minutes to enter all relevant data into REDCap, with the only remaining data related to discharge.

If a hospital has already collected data as part of its routine internal prospective data collection process, these data can be provided to ANZELA-QI staff for automatic upload to REDCap. These ANZELA-QI data are then used to create reports that are provided to the participating hospitals.

Preoperative assessment of the patient's risk of death is calculated using the NELA risk calculator (<http://data.nela.org.uk/riskcalculator/>).

Results of the risk assessment are stratified into three risk categories (lower risk, high risk and highest risk). The risk thresholds for the high and highest categories used by the ANZELA-QI differ slightly from those set by the NELA (Table 2).

**Table 2: Risk assessment categories for ANZELA-QI and NELA**

| Risk category label | ANZELA-QI risk threshold (%) | NELA risk thresholds (%) |
|---------------------|------------------------------|--------------------------|
| Lower               | <5.0                         | <5.0                     |
| High                | 5.0–9.9                      | 5.0–10.0                 |
| Highest             | ≥10.0                        | >10.0                    |

### 2.3 Data analysis and feedback to hospitals

Data are exported from REDCap at the beginning of each month. The data are sorted, analysed and visualised using custom templates in QlikView (version 11.20.13607.0 SR17 64-bit Edition [x64]), pandas package (version 1.0.5) for the Python programming language (version 3.7.6), and the R environment for statistical computing and graphics (version 3.6.3) with RStudio 1.2 to generate reports that are sent to the participating hospitals.

## ANZELA-QI KPIs and key associated outcomes collected

Eight standards of care KPIs were collected, categorised by whether they occurred before, during or after surgery (Table 3).

**Table 3: ANZELA-QI eight key performance indicators**

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### **Before surgery**

*KPI 1: Proportion of all emergency laparotomy patients who received a preoperative CT scan by a consultant radiologist*

*KPI 2: Proportion of patients for whom a risk assessment was documented preoperatively*

*KPI 3: Proportion of patients arriving in theatre within a time appropriate for the urgency of surgery*

### **During surgery**

*KPI 4: Proportion of patients with a calculated preoperative risk of death  $\geq 5\%$  for whom a consultant surgeon and consultant anaesthetist were present in theatre*

*KPI 5: Proportion of patients with a calculated preoperative risk of death  $\geq 5\%$  for whom a consultant surgeon was present in theatre*

*KPI 6: Proportion of patients with a calculated preoperative risk of death  $\geq 5\%$  for whom a consultant anaesthetist was present in theatre*

### **After surgery**

*KPI 7: Proportion of patients with a preoperative risk of death  $\geq 10\%$  who were directly admitted to critical care postoperatively*

*KPI 8: Proportion of patients age 65 years or over who were assessed by a specialist in gerontology*

---

These data were returned to each hospital each month as an RAGG chart and as run charts. More recently, a patient-level summary has been included that identified compliance of each KPI for each patient.

Knowledge of the extent of compliance with processes of care and at what time point in a patient's hospital admission they occur can guide decisions about resource allocation.

To obtain a more comprehensive understanding of how processes of care can impact a patient's outcome, the following additional outcomes of care were analysed for this report:

- Mortality
- Average (mean) length of hospital stay
- Destination on discharge from hospital
- Return to theatre
- Clavien-Dindo complication grade (Dindo 2004)

ANZELA-QI provides the following reports to participating hospitals:

1. RAGG chart of performance on the eight KPIs (Table 3) over a defined period (example in Appendix A, Figure A1)
  - a. red is when  $< 50\%$  of patients meet the KPI
  - b. amber is when between  $50\%$  and  $79\%$  of patients meet the KPI
  - c. green is when  $\geq 80\%$  of patients meet the KPI
  - d. grey is when no data is recorded
2. Individual hospital mini-report that includes run charts (example in Appendix A, Figure A2)
3. Patient-level summary (example in Appendix A, Figure A3)

These data are distributed to hospitals during the second week of each month for use at local meetings. As the data are near real time, discussion of individual patients and events can be easily recalled.



## 2.4 Statistical process control, run charts and quality improvement

The statistical process control (SPC) techniques used in manufacturing were initially described in the 1930s. They are credited with improving the quality of Japanese cars after the Second World War. There have been very few publications reporting the use of SPC in surgery, but there are three related to emergency laparotomy (Huddart et al. 2015; Tengberg et al. 2017 Aggarwal, et al. 2019).

SPC run charts are central to ANZELA-QI, so this section has been included to outline their principles. A full description of SPC techniques is well beyond the scope of this report. Guidelines from the Scottish Patient Safety Programme (National Health Service, Scotland) and Perla, Provost and Murray's paper (2011) provide a good overview.

A run chart plots a series of data points (minimum 12 to 15) along the x-axis (typically a time period) and the parameter under review on the y-axis. The median of the data is plotted (shown by a horizontal line) as are the discrete data events. In a normally operating system, the data points will be randomly distributed either side of the median (so-called normal cause variation). It is not normal if the data points are not randomly distributed (so-called special cause variation).

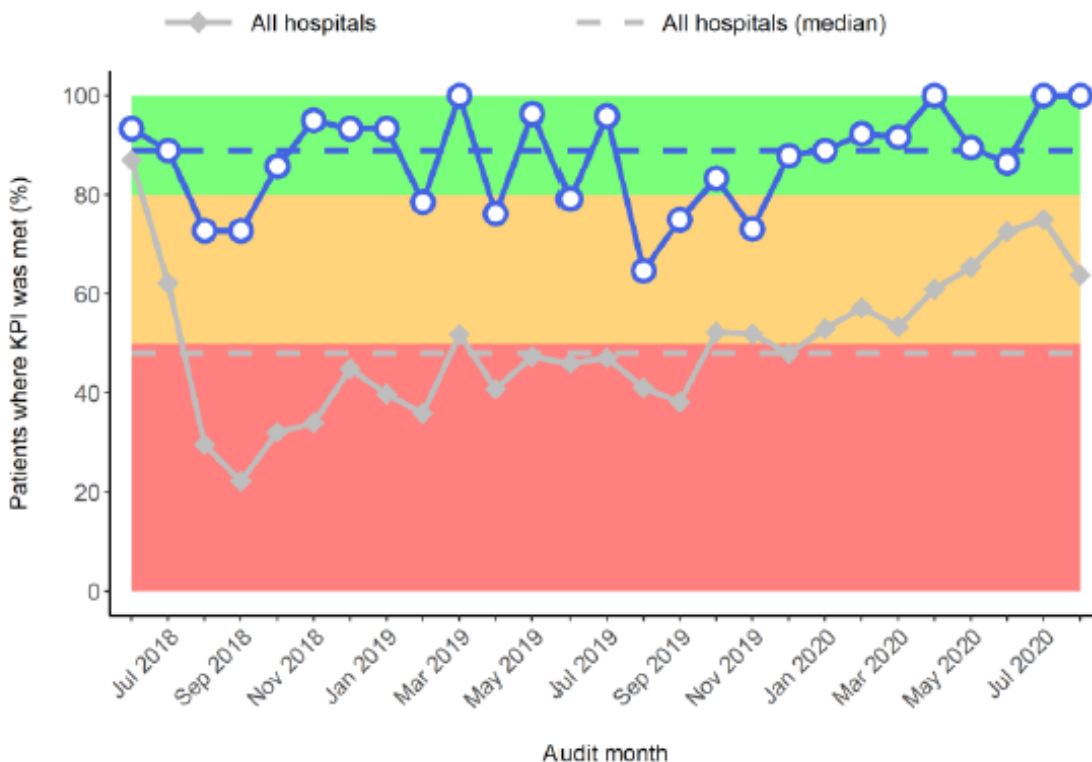
More sophisticated SPC present the data using statistical input to show the upper and lower control limits (3 Standard Deviations (SD) from the mean). In this case the mean rather than the median is used as the baseline.

### A worked example of quality improvement using risk assessment

Appendix A has an example of the monthly run charts returned to one of the ANZELA-QI hospitals. KPI 2, reporting risk assessment, is used here as an illustrative example in Figure 1.

**Figure 1: Example of monthly run chart returned to ANZELA-QI hospital – KPI 2, reporting risk assessment**

KPI 2: Risk of death documented before surgery



The background colour shows the thresholds as used in the RAGG chart. The solid blue line shows the proportion of cases for which that hospital recorded a preoperative risk assessment, and the dotted blue line is that hospital's median. The median is recalculated with the addition of each month. The solid grey line shows the proportion of cases in which all participating hospitals recorded a preoperative risk assessment, and the dotted grey line is the median for all hospitals.

There are a number of relevant observations:

1. Each month this hospital normally, but not always, achieves the 80% standard of care.
2. This hospital is obviously performing better than the national average. ANZELA-QI identifies hospitals participating in the program. This facilitates contact and the ability to share learning.
3. There were two periods, both in August, when its performance fell. This is likely to be related to the rotation in surgical registrars who were not familiar with risk assessment. As these data are returned each month, this can be detected almost immediately and corrected.
  - a. If a standard of care is important, its completion should not be adversely impacted by junior staff rotations.
4. The grey solid line shows that over the first two years the national recording of preoperative risk assessment increased from 20% to over 60%.
  - a. The consecutive series of increasing monthly recordings during the first half of 2020 is, in SPC terms, a 'trend'. If more than five, as here, the trend is significant.

### 3. Findings

#### 3.1 Who has emergency laparotomy surgery?

This report is based on 2,886 patients who had an emergency laparotomy at one of 24 Australian hospitals (see list of participating hospitals in Appendix B, Table B1).

Just over half of the patients were aged over 65 years (53.1%; 1,532/2,886), with a median age of 66 years. Most emergency laparotomies (92.4%; 2,666/2,886) followed an emergency admission (Table 4).

**Table 4: Characteristics of patients included in this report**

| Patient characteristic         | Patient characteristic group  | Patients, n (%) |
|--------------------------------|-------------------------------|-----------------|
| <b>Sex</b>                     | Male                          | 1,447 (50.1)    |
|                                | Female                        | 1,431 (49.6)    |
|                                | Intersex or indeterminate     | 2 (0.1)         |
|                                | Missing                       | 6 (0.2)         |
| <b>Ethnicity<sup>a</sup></b>   | Aboriginal person             | 69 (2.4)        |
|                                | Torres Strait Islander person | 12 (0.4)        |
|                                | Māori person                  | 13 (0.5)        |
|                                | Pacific Islander person       | 11 (0.4)        |
|                                | Any other ethnicity           | 2,305 (79.9)    |
|                                | Unknown                       | 476 (16.5)      |
| <b>Age (years)</b>             | 18–24                         | 58 (2.0)        |
|                                | 25–34                         | 150 (5.2)       |
|                                | 35–44                         | 235 (8.1)       |
|                                | 45–54                         | 364 (12.6)      |
|                                | 55–64                         | 547 (19.0)      |
|                                | 65–74                         | 661 (22.9)      |
|                                | 75–84                         | 609 (21.1)      |
|                                | 85–94                         | 253 (8.8)       |
|                                | ≥95                           | 9 (0.3)         |
| <b>Hospital admission type</b> | Emergency                     | 2,666 (92.4)    |
|                                | Elective                      | 193 (6.7)       |
|                                | Missing                       | 27 (0.9)        |
| <b>Urgency of surgery</b>      | 0–2 hours                     | 267 (9.3)       |
|                                | 2–6 hours                     | 1,134 (39.3)    |
|                                | 6–18 hours                    | 862 (29.9)      |
|                                | 18–24 hours                   | 623 (21.6)      |

Notes:

Missing: responses where numerous fields contribute to the answer; however, one or more of these fields are blank.

<sup>a</sup> Multiple selection possible. Values still add to 2,886 because 18 patients did not have a recorded ethnicity, but 18 patients selected 2 ethnicities.

The preoperative indications are shown in Table 5. These mainly consist of obstruction or perforation of the bowel.

**Table 5: Preoperative indications for surgery as recorded on surgical booking form**

| <b>Preoperative indications for surgery</b> | <b>Patients, n (%)</b> |
|---|------------------------|
| Obstruction — small bowel                   | 885 (30.7)             |
| Perforation                                 | 623 (21.6)             |
| Obstruction — large bowel                   | 279 (9.7)              |
| Peritonitis                                 | 260 (9.0)              |
| Ischaemia                                   | 239 (8.3)              |
| Hernia — incarcerated                       | 184 (6.4)              |
| Sepsis                                      | 170 (5.9)              |
| Haemorrhage                                 | 147 (5.1)              |
| Abdominal abscess                           | 144 (5.0)              |
| Volvulus                                    | 115 (4.0)              |
| Anastomotic leak                            | 91 (3.2)               |
| Phlegmon/inflammatory mass                  | 81 (2.8)               |
| Hernia — incisional                         | 68 (2.4)               |
| Pneumoperitoneum                            | 66 (2.3)               |
| Colitis                                     | 44 (1.5)               |
| Necrosis                                    | 34 (1.2)               |
| Bile leak                                   | 33 (1.1)               |
| Hernia — internal                           | 33 (1.1)               |
| Planned relook                              | 33 (1.1)               |
| Foreign body                                | 27 (0.9)               |
| Iatrogenic injury                           | 21 (0.7)               |
| Abdominal wound dehiscence                  | 20 (0.7)               |
| Intussusception                             | 20 (0.7)               |
| Acidosis                                    | 10 (0.3)               |
| Pseudo-obstruction                          | 10 (0.3)               |
| Abdominal compartment syndrome              | 9 (0.3)                |
| Intestinal fistula                          | 9 (0.3)                |
| Hernia — hiatus                             | 5 (0.2)                |

### 3.2 ANZELA-QI KPIs

The following section relates to the eight KPIs. Performance on each KPI is discussed under the following headings:

- Importance of KPI
- Findings
- Additional analyses (if relevant)
- Clinical commentary and recommendations

#### 3.2.1 Radiology

*KPI 1 — Proportion of all emergency laparotomy patients who received a preoperative CT scan, reported on by a consultant radiologist prior to surgery*

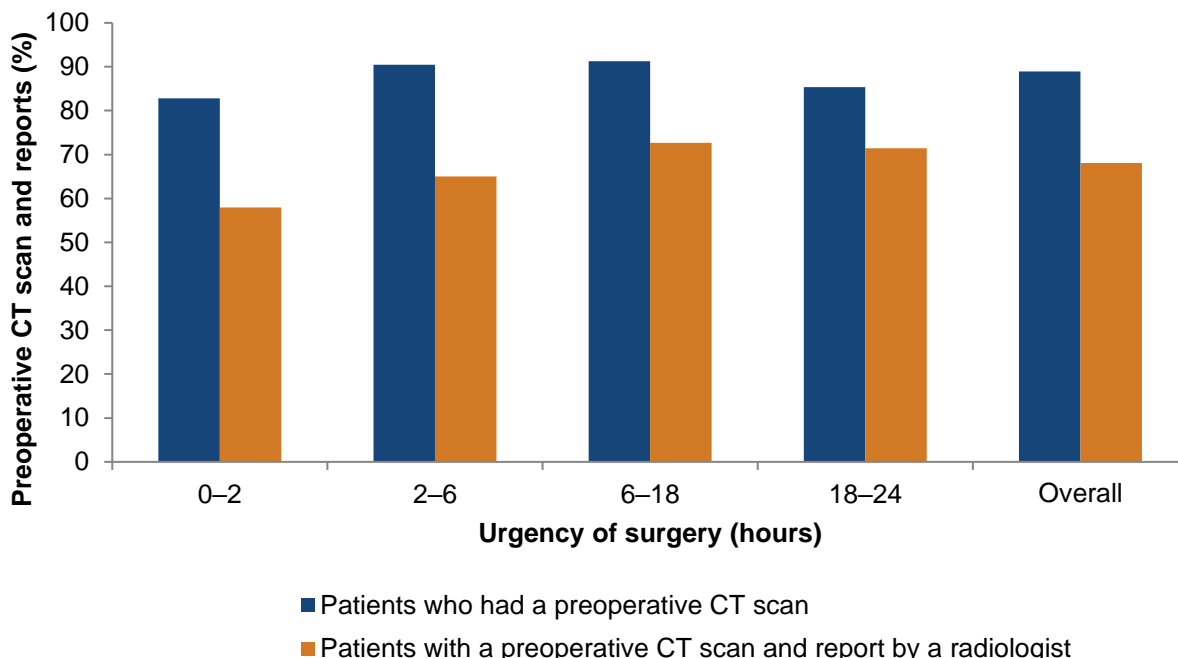
##### Importance of KPI

There is a view that most patients being considered for an emergency laparotomy should have a preoperative CT scan (RCS 2018). Inaccuracy when reporting an abdominal CT scan may adversely influence decisions. Ideally, a consultant radiologist should report CT scans prior to surgery.

##### Findings

An abdominal CT scan was performed prior to surgery in 88.9% (2,566/2,886) of cases. Of the patients who had a CT scan prior to surgery, a report from a consultant radiologist was available for 68.1% (1,747/2,566; Figure 2). Only 57.9% (128/221) of CT scans in patients with an urgency of less than two hours were reported by a consultant radiologist prior to surgery. For patients with a surgical urgency of 18–24 hours, 71.4% (380/532) of CT scans were reported by a consultant radiologist prior to surgery.

**Figure 2: Preoperative CT scan and report by consultant radiologist by category of surgical urgency**



## Clinical commentary and recommendations

Scanning rates between categories of urgency ranged from 82.7% (0–2 hours) to 91.3% (6–18 hours), and reports by radiologists ranged from 57.9% (0–2 hours) to 71.4% (6–18 hours). The more time before the planned emergency laparotomy, the more likely a CT scan would be performed, and a report made available.

### 3.2.2 Risk assessment

#### *KPI 2 — Proportion of patients for whom a risk assessment was documented preoperatively*

##### Importance of KPI

Many patients undergoing an emergency laparotomy are high risk with a predicted overall mortality of  $\geq 5\%$ . For many, a good outcome is critically dependent on timely treatment. Identifying high-risk patients preoperatively will permit their care to be appropriately escalated (urgent theatre access, consultant supervision, postoperative admission to CCU, etc.). It can also aid discussion with patients, their family and carers regarding the decision to operate, goals of care and postoperative ceilings of care. A risk assessment should be used to aid but not replace clinical judgement and decision-making. A high-risk score in isolation should not exclude a patient from receiving a surgical intervention. ANZELA-QI uses the NELA risk assessment tool. A recent study has demonstrated that the NELA risk assessment is a sensitive and useful tool in Australia (Eliezer et al. 2020).

##### Findings

Less than half of all patients (45.0%; 1,299/2,886) had a documented preoperative risk assessment score. A small number of patients (6.8%; 197/2,886) had a NELA risk assessment calculated postoperatively (Table 6). Median scores within each risk category were 1.3% (lower risk), 7.0% (high risk) and 20.0% (highest risk) (data not shown).

**Table 6: Documentation of NELA risk of death scores**

| <b>Documented preoperatively</b>  |                               | <b>Patients, n (%)</b> |
|-----------------------------------|-------------------------------|------------------------|
| <b>Lower risk of death (%)</b>    | <b>&lt;5.0</b>                | 655 (22.7)             |
| <b>High risk of death (%)</b>     | <b>5.0–9.9</b>                | 219 (7.6)              |
| <b>Highest risk of death (%)</b>  | <b>10.0–24.9</b>              | 265 (9.2)              |
|                                   | <b>25.0–49.9</b>              | 124 (4.3)              |
|                                   | <b><math>\geq 50.0</math></b> | 36 (1.2)               |
| <b>Other</b>                      |                               | <b>Patients, n (%)</b> |
| <b>Documented postoperatively</b> |                               | 197 (6.8)              |
| <b>Score not documented</b>       |                               | 1,390 (48.2)           |

Notes:

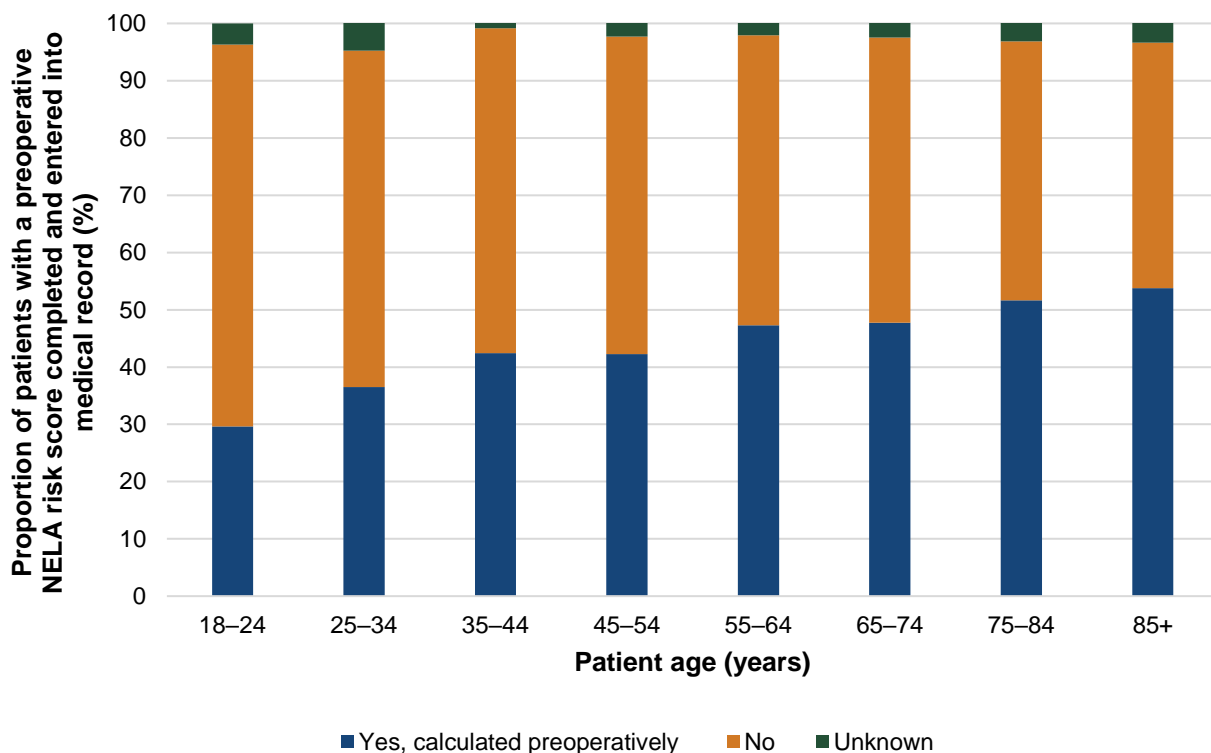
n (%): number (percentage) of patients. Percentages in this table are of the total number of subjects (N=2,886).

Score not documented: the risk was calculated preoperatively but the score was not recorded. (n=32 [n=25 NELA; n=7 P-POSSUM]); the score was not recorded, or it is unknown if it was documented as preoperatively taken (n=1320); score is missing because numerous fields contribute to the answer; however, one or more of these fields is blank (n=38).

Which patients are more likely to have risk predicted?

Patients are more likely to have a preoperative risk assessment score completed with increasing age (Figure 3). This may be partly due to younger patients having a higher urgency of surgery or younger patients being perceived as lower risk due to their age (Wong et al. 2020).

**Figure 3: Risk of death assessment completion across different age groups**



Notes:

Yes: a risk of death score for the patient calculated and entered into medical record preoperatively. n=1331 (n=1299 with preoperative NELA risk assessment with score; n=32 where the risk was calculated preoperatively but the score was not documented [n=25 NELA; n=7 P-POSSUM]).

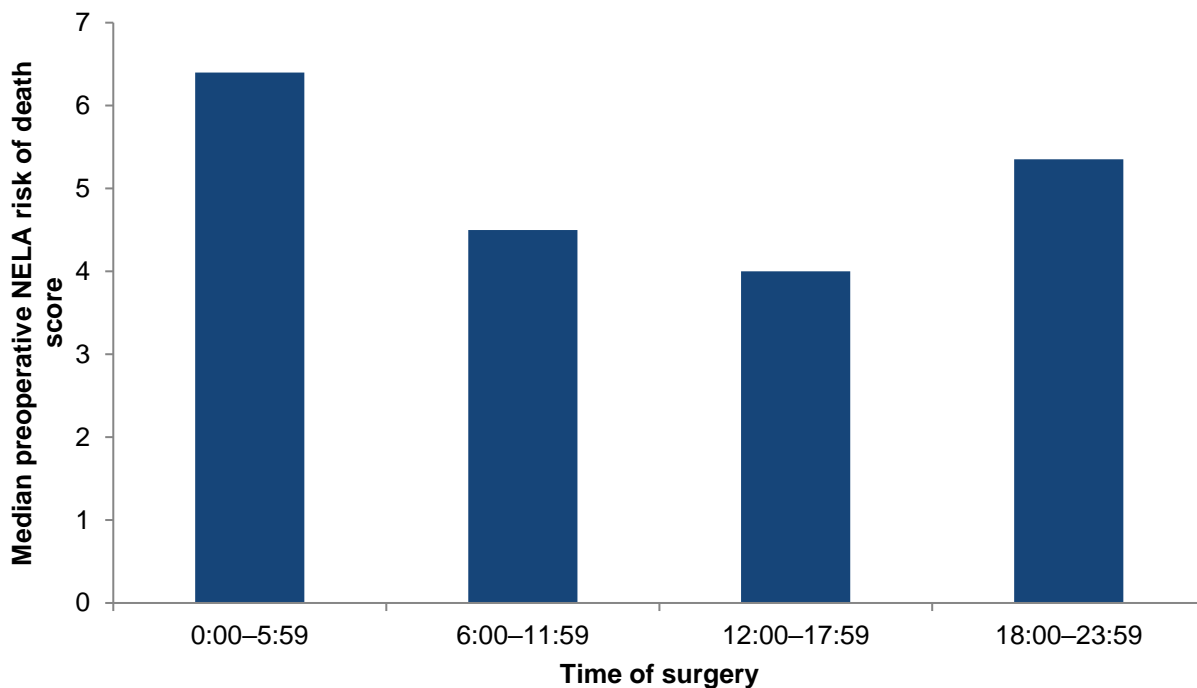
No: calculated and entered into the medical record postoperatively (n=197) or calculated but not entered into medical record (n=17) or not calculated or entered into medical record (n=1212).

Unknown: it is not known if a risk of death score for the patient calculated and entered into medical record preoperatively (n=91). Not included in this figure is n=38.

Does preoperative risk assessment score affect time of surgery?

Patients who had surgery overnight or in the evening had the highest median predicted risk (Figure 4). This would be expected as only very unwell patients would undergo surgery at these times.

**Figure 4: Median preoperative NELA risk of death score, by time of surgery for emergency laparotomy**



Notes:

Time of surgery refers to the time of day that the surgery took place (e.g. time provided for knife to skin or wheels in operating theatre, depending on what is typically collected at each hospital).

#### Clinical commentary and recommendations

The risk assessment is the most important KPI as it is that which drives subsequent care. Assessing and recording a preoperative risk is best practice (RCS 2018). Some studies have shown patients who did not have a risk assessment have a worse outcome (Broughton et al. 2017). Hospitals should aim to achieve 100% compliance with this KPI.



### 3.2.3 Timeliness of arrival in theatre

*KPI 3 — Proportion of patients arriving in theatre within a time appropriate for the urgency of surgery*

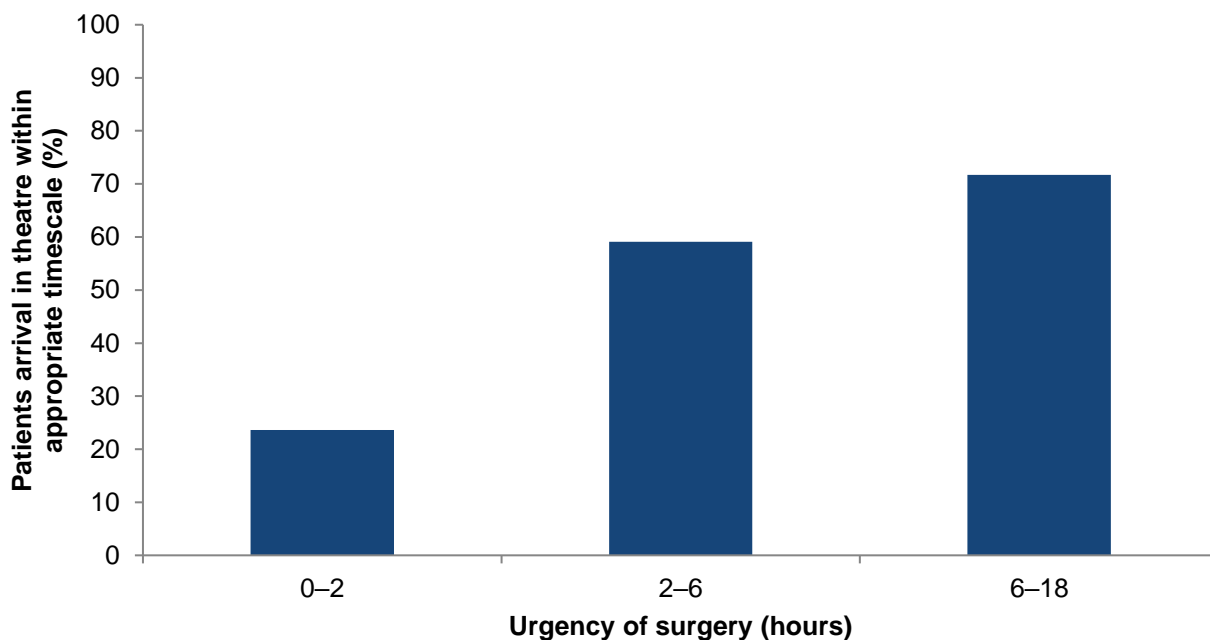
#### Importance of KPI

Many patients undergoing an emergency laparotomy have sepsis (UK National Surgical Research Collaborative, 2017). Time from admission to source control has a direct impact on outcome; surgery should occur in less than 6 hours, and within 3 hours if there is septic shock (RCS 2018). ANZELA-QI stratified urgency into four categories: less than 2 hours, 2 to 6 hours, 6 to 18 hours, and 18 to 24 hours from hospital admission. KPI 3 is based on the three most urgent categories (i.e. patient was assessed as needing to arrive in surgery within 18 hours of their admission to hospital).

#### Findings

Just over three-quarters of all patients (78.4%; 2,263/2,886) had a surgical urgency of less than 18 hours. Of these patients, 1,351 of 2,263 (59.7%) arrived in theatre within the appropriate timeframe. Only 63 of 267 (23.6%) patients with an urgency of less than 2 hours arrived in theatre within the appropriate timeframe (Figure 5). Of patients with an urgency of 2 to 6 hours, 670 of 1,134 (59%) arrived in theatre within the appropriate timeframe (Figure 5).

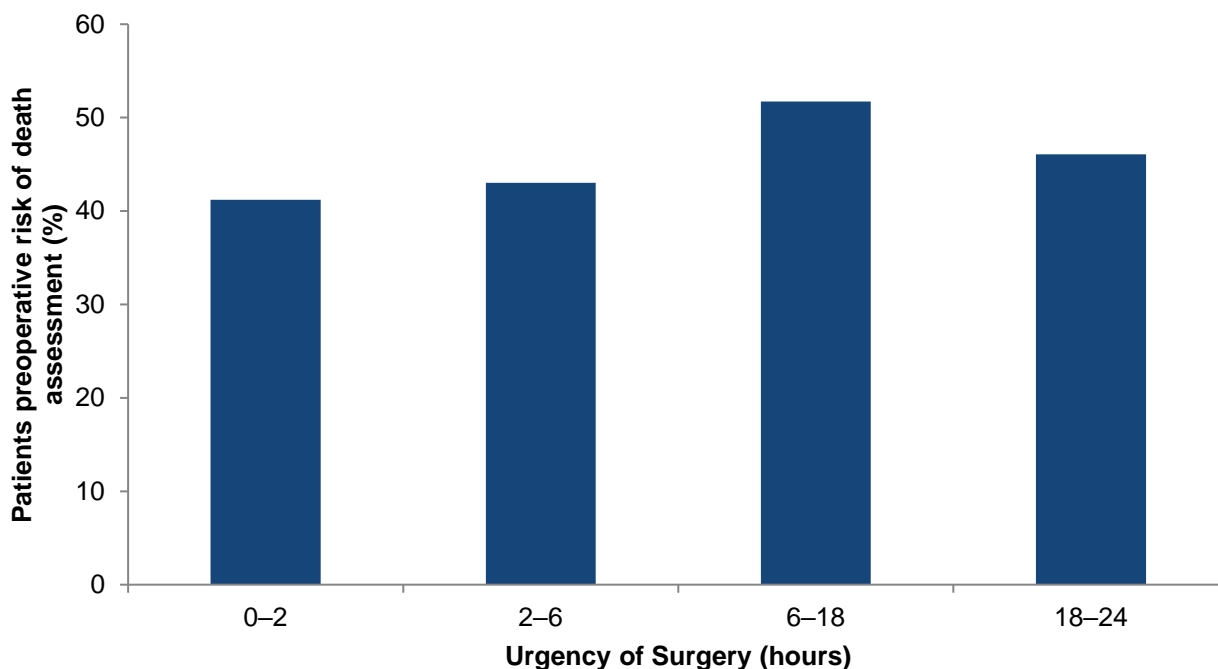
**Figure 5: Proportion of patients arriving in theatre within the appropriate timeframe**



Does urgency of surgery affect whether a risk assessment score is completed?

Patients who had an urgency of 6 to 18 hours were most likely to have had a preoperative assessment score documented (Figure 6).

**Figure 6: Proportion of patients with preoperatively documented risk of death, by documented urgency of surgery**



Notes:

Total 1331: n=1299 with preoperative NELA risk assessment with score; n=25 with preoperative risk assessment, but the NELA (and P-POSSUM) risk score has been left blank (question is unanswered); n=7 with preoperative P-POSSUM score.

### Clinical commentary and recommendations

Numerous studies have demonstrated that the mortality from sepsis rises with each additional hour of delay. There are clearly defined standards of care (RCS 2018). In the current study, those whom the surgeon wanted to get into theatre in the shortest possible time—so by definition the most unwell—were the least likely to achieve this standard. Hospitals that have not met this KPI need to review their assessment and theatre access processes.

### 3.2.4 Consultant input during surgery

*KPI 4 — Proportion of patients with a calculated preoperative risk of death  $\geq 5\%$  for whom a consultant surgeon and consultant anaesthetist were present in theatre*

*KPI 5 — Proportion of patients with a calculated preoperative risk of death  $\geq 5\%$  for whom a consultant surgeon was present in theatre*

*KPI 6 — Proportion of patients with a calculated preoperative risk of death  $\geq 5\%$  for whom a consultant anaesthetist was present in theatre*

#### Importance of KPI

It would be normal practice for both a consultant surgeon and a consultant anaesthetist to be present in theatre for a high-risk elective general surgical patient. The same standard of care should be delivered to high-risk emergency general surgical patients.

While the aim should be that both a consultant surgeon and a consultant anaesthetist are present in theatre (KPI 4), the results are also reported for each speciality separately in KPI 5 (consultant surgeon) and KPI 6 (consultant anaesthetist).

#### Findings

Data reporting consultant presence in theatre were available for 91.9% (592/644) of patients who had a documented preoperative high-risk assessment score (i.e.  $\geq 5\%$ ). Of these patients, more patients in the highest risk group (77.1%; 303/393) than in the high-risk group (71.4%; 142/199) had both consultants present during their surgery (Table 7). However, 6.8% (40/592) of these high-risk cases (high and highest risk) had neither consultant present during their surgery (Table 7).

**Table 7: Consultant presence during surgery for high-risk patients (preoperative risk of death score  $\geq 5\%$ )**

| Preoperative risk of death score | Patients with risk of death $\geq 5\%$ | Consultant(s) present during surgery |                          |                               |                          |
|----------------------------------|--|--------------------------------------|--------------------------|-------------------------------|--------------------------|
|                                  |  | Both consultants n (%)               | Consultant surgeon n (%) | Consultant anaesthetist n (%) | Neither consultant n (%) |
| High ( $\geq 5\%$ to 9.9%)       | 199                                    | 142 (71.4)                           | 166 (83.4)               | 171 (85.9)                    | 9 (4.5)                  |
| Highest ( $\geq 10\%$ )          | 393                                    | 303 (77.1)                           | 332 (84.5)               | 364 (92.6)                    | 31 (7.9)                 |
| <b>Overall</b>                   | 592                                    | 445 (75.2)                           | 498 (84.1)               | 535 (90.4)                    | 40 (6.8)                 |

Notes:

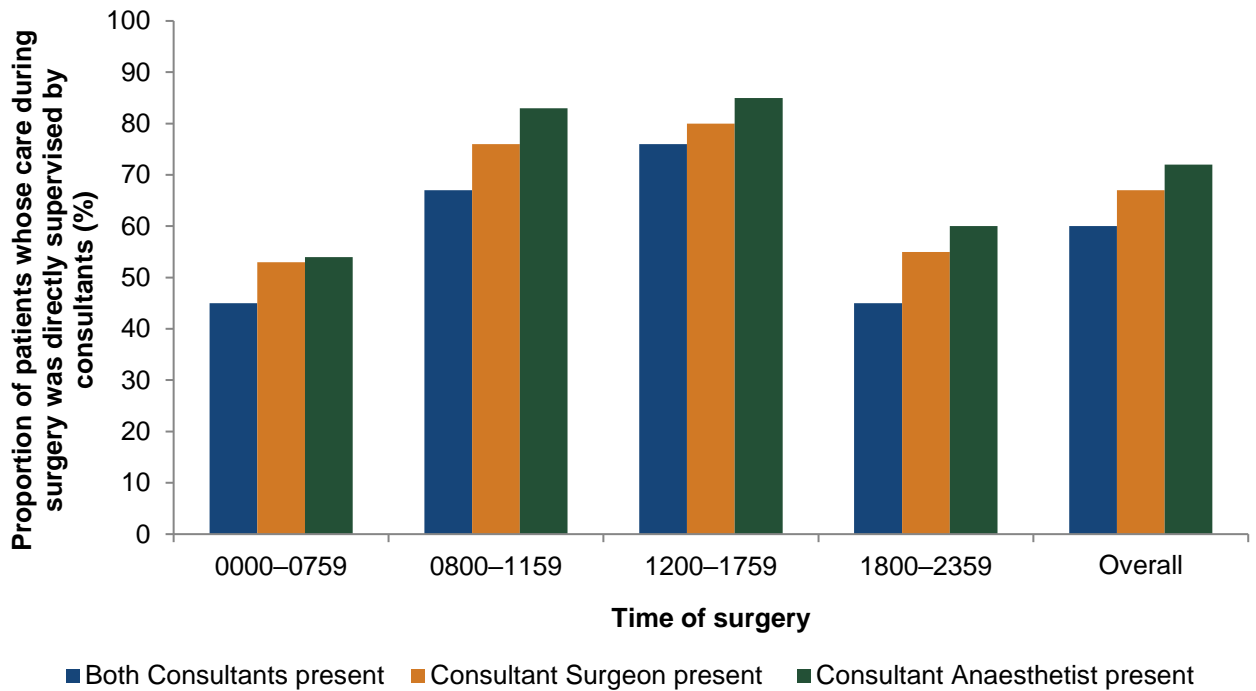
n (%): number (percentage) of patients

This table does not include n=52 patients who had a preoperative high-risk score but consultant presence during their surgery was not recorded.

#### Does time of surgery affect whether a consultant is present in theatre?

The presence of consultants in theatre on weekdays and on weekends is shown in Figures 7 and 8. Consultant anaesthetists were more likely to be present than consultant surgeons across all time ranges and on weekdays and weekends.

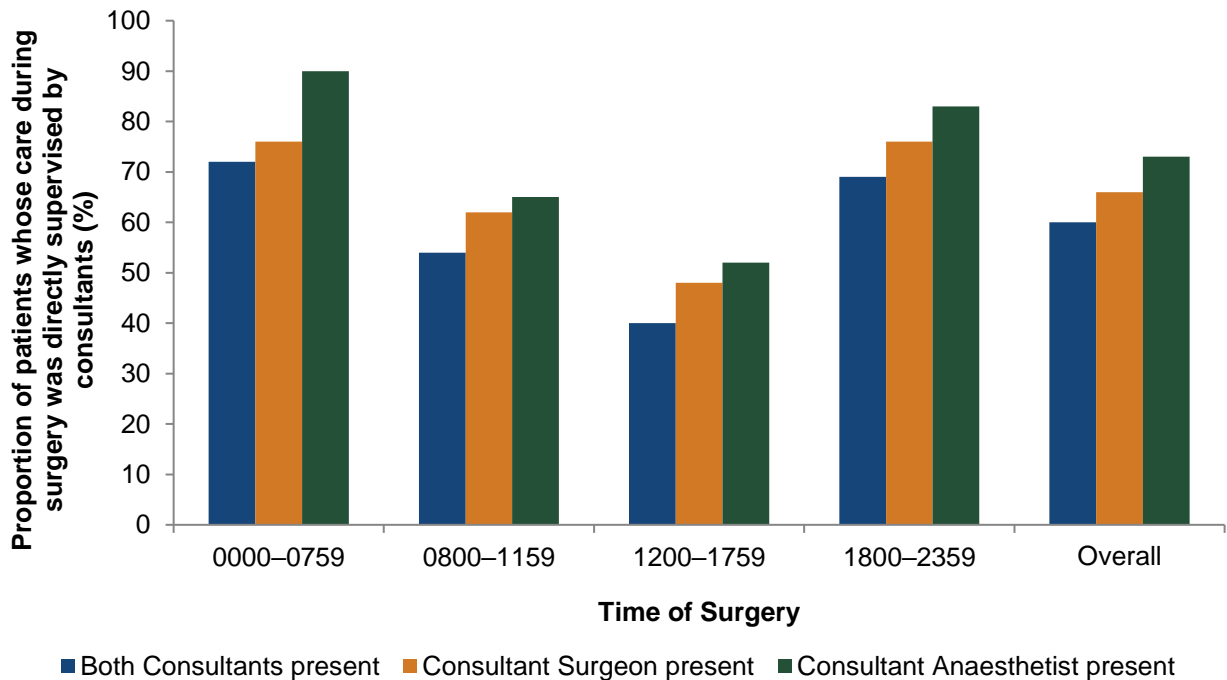
**Figure 7: Consultants present in theatre on a weekday for patients with a risk of death score  $\geq 5\%$ , by time of emergency laparotomy surgery**



Notes:

Time of surgery refers to the time of day that the surgery took place (e.g. time provided for knife to skin or wheels in operating theatre, depending on what is typically collected at each hospital).

**Figure 8: Consultants present in theatre on a weekend for patients with a risk of death score  $\geq 5\%$ , by time of emergency laparotomy surgery**



Notes:

Time of surgery refers to the time of day that the surgery took place (e.g. time provided for knife to skin or wheels in operating theatre, depending on what is typically collected at each hospital).

## Clinical commentary and recommendations

On weekdays between 08:00 and 17:59, a consultant surgeon and a consultant anaesthetist were present for between 67% and 76% of cases. This is likely to reflect the provision of dedicated daytime emergency general surgical theatre lists in public hospitals. It is normal practice to only undertake 'life and limb'–saving surgery overnight, and these will be the most unwell patients. However, for cases operated on overnight during the week a consultant surgeon and anaesthetist were present in 50% and 60%, respectively, and both were present in 45% of cases. The proportions of consultants present overnight on weekdays are considered very low.

Perhaps unexpectedly, over weekends the presence of both a consultant surgeon and anaesthetist were higher overnight than during the week, but lower during the weekend day than during the week.

These data display the average consultant presence. In Australia, a consultant will be present for all (100%) occasions if they are paid Fee For Service (FFS), either because the patient is private or because they are a Visiting Medical Officer. These cases are included in this analysis. To 'balance' this 100% attendance means that consultant attendance in many public hospitals, where consultants are not paid FFS and there are junior staff, must be less than the average. At present ANZELA-QI is not able to undertake a more detailed analysis, but the clear implication is that consultant attendance in public hospitals could be lower than as displayed in Figures 7 and 8. As hospitals with junior staff are more likely to manage the most unwell patients, and many will have been transferred for that reason, this has important implications.

### 3.2.5 Postoperative admission to critical care

*KPI 7 — Proportion of patients with a preoperative risk of death  $\geq 10\%$  who were directly admitted to critical care postoperatively*

#### Importance of KPI

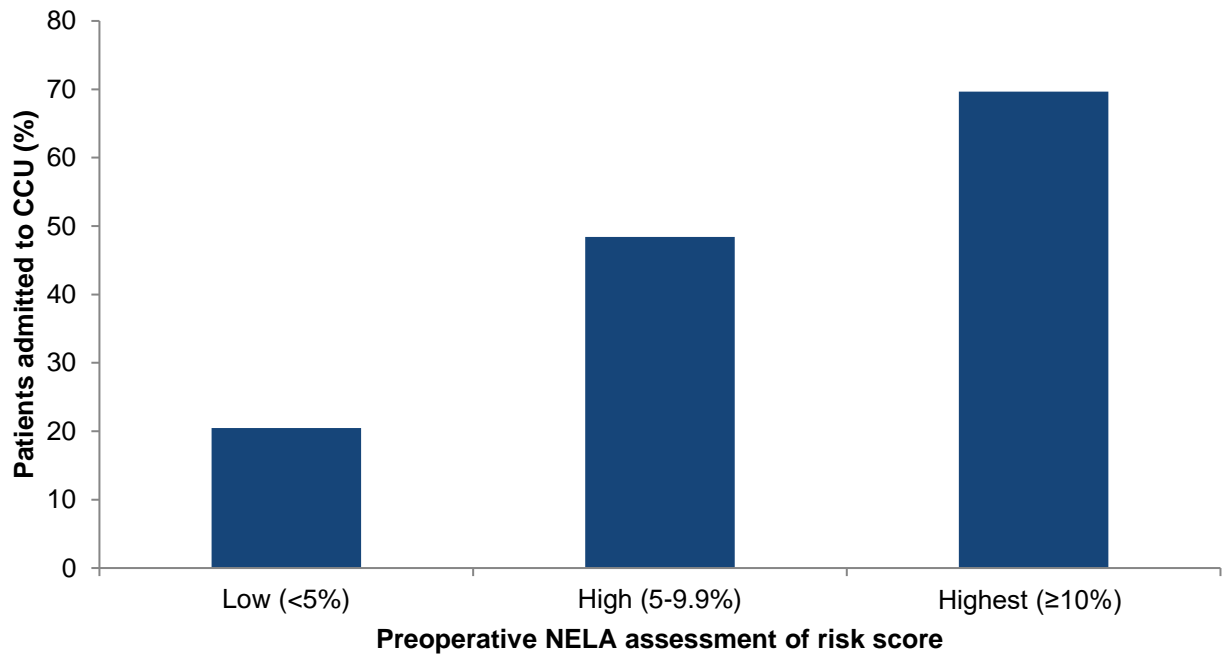
Major elective vascular and cardiothoracic cases would be admitted to a critical care unit (CCU) to the extent that if a bed is not available the surgery is likely to be deferred. These patients have an average mortality of 2%. In the current study the average mortality was 7%, and 30% of patients who had a risk assessment had a predicted mortality of  $\geq 10\%$ . Most patients having an emergency laparotomy should have their initial postoperative care in a CCU.

#### Findings

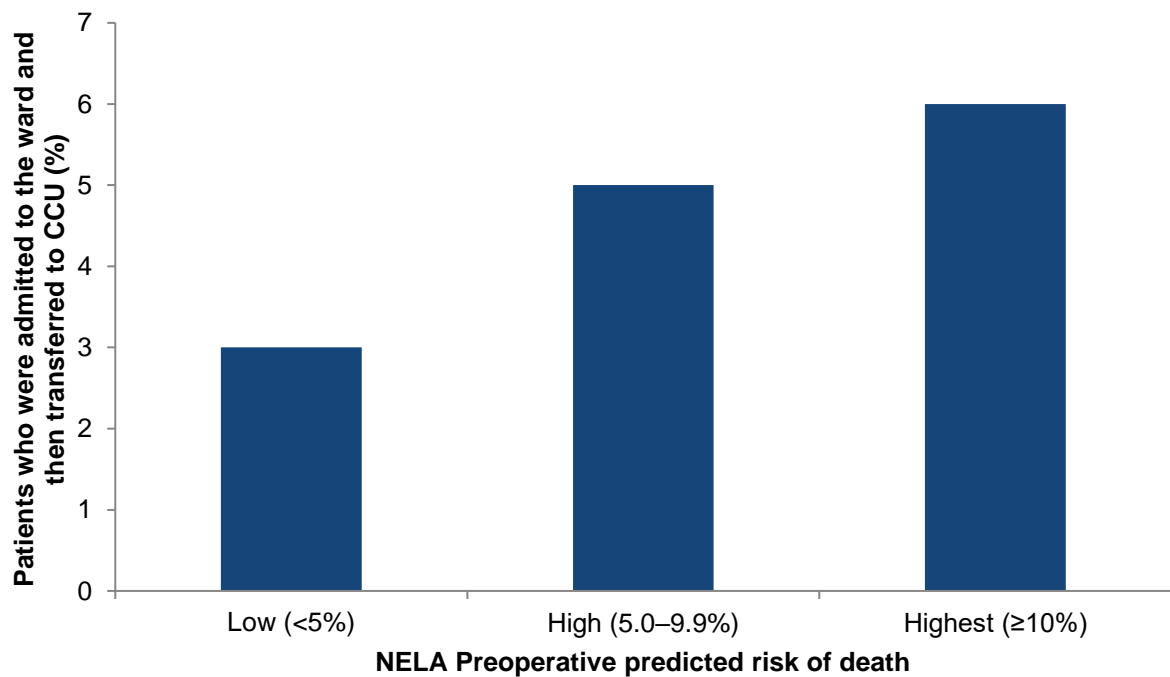
A total of 296 of 425 (69.6%) patients with a preoperative NELA risk assessment score of  $\geq 10\%$  were admitted to critical care following surgery. Admission to critical care after surgery was associated with higher preoperative risk of death scores (Figure 9).

Overall, 67 of 2,886 (2.3%) patients had an unplanned postoperative transfer from the ward to CCU (data not shown). Of the patients who had a risk assessment, the highest risk patients were most likely to be admitted to the ward and then transferred to CCU (Table 10).

**Figure 9: Proportion of patients admitted directly to CCU, by documented preoperative NELA assessment of risk**



**Figure 10: Proportion of high-risk patients admitted to the ward and then transferred to CCU, by preoperative risk assessment score**



**Clinical commentary and recommendations**

It is of concern that 30% of patients with a preoperative risk score within the highest risk grade were not admitted directly to critical care.

All patients undergoing an emergency laparotomy should have a preoperative risk score and if ≥10% should be routinely admitted into CCU. The recommendation of NELA is that patients with a preoperative risk score ≥5% should be admitted into CCU.

### 3.2.6 Patients over the age of 65 having emergency laparotomy

*KPI 8 — Proportion of patients aged 65 years or over who were assessed by a specialist in gerontology*

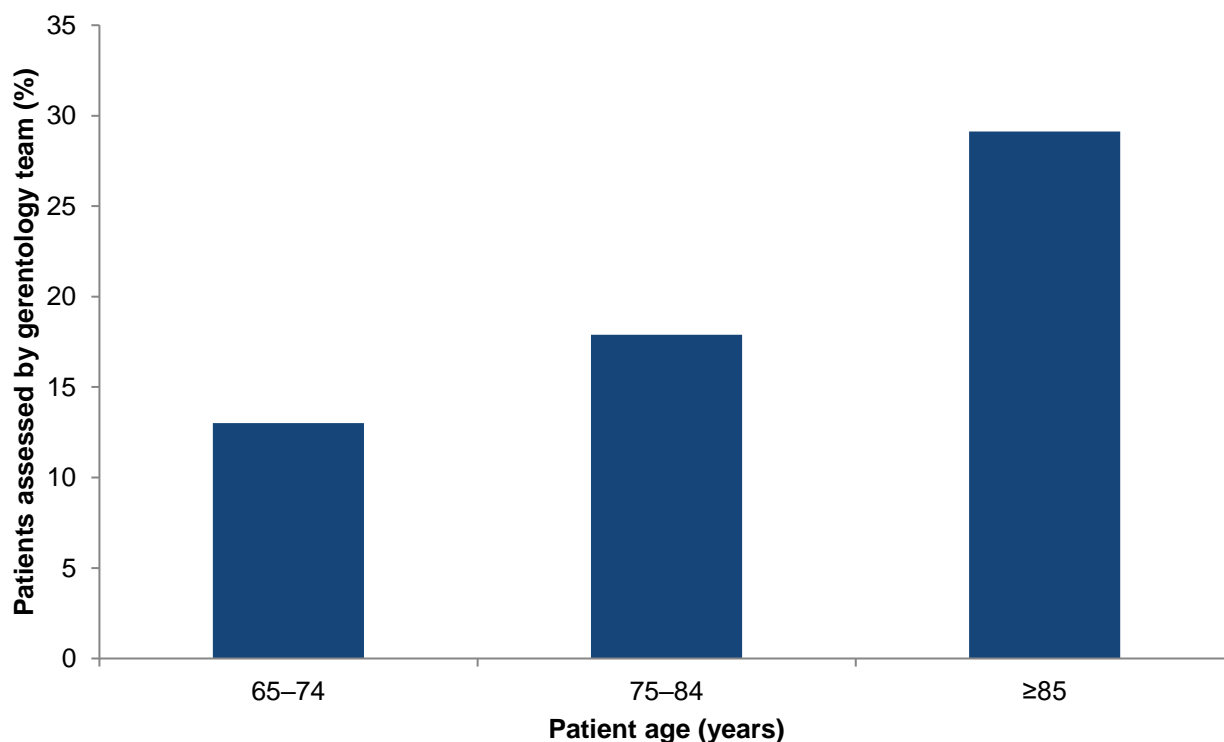
#### Importance of KPI

Older patients are more likely to be frail or have multiple comorbidities that make their perioperative care more complex. There are now multiple studies that show these patients will benefit from pre-emptive multidisciplinary care, including from a specialist in gerontology. NELA has shown that involvement of a gerontology team is associated with a statistically significant reduction in postoperative mortality (Oliver 2018; Aitken et al. 2020).

#### Findings

Data were collected from 1,532 patients aged 65 years or over. Of these patients, only 271 (17.7%) received a postoperative assessment by a specialist in gerontology or a gerontology team. Patients aged between 65 and 84 years were half as likely to receive an assessment by the gerontology team as were patients aged 85 years or over (Figure 11).

**Figure 11: Proportion of patients aged 65 years or over assessed after surgery by a specialist in gerontology or a gerontology team**



#### Clinical commentary and recommendations

Overall, this was the most poorly met KPI. NELA has shown assessment by a gerontologist prior to surgery is an independent predictor of lower mortality (Oliver et al. 2018). However, this standard is achievable. In one ANZELA-QI hospital, 79% of patients aged 65 years or over were assessed by a gerontologist.

### 3.3 Additional patient outcomes

In addition to the standard of care KPIs, an additional five outcomes were assessed:

- Mortality
- Length of stay in hospital
- Destination on discharge from hospital
- Return to theatre
- Clavien-Dindo complication grade

Associations were explored between type of admission (emergency or elective), preoperative NELA risk score and documented urgency of surgery.

#### 3.3.1 Mortality

The overall in-hospital mortality rate was 7.1% (196/2,755). Excluding hospitals with no mortality, there was a 5.8-fold variation of inter-hospital mortality (range 2.3 to 13.3) (Table 8) (Figure 12). Patients with increasing age, particularly those aged 65 years and over, had an increasing mortality rate (Figure 13).

**Table 8: Mortality rates of patients, by NELA risk assessment**

| NELA risk assessment completed | Patients (n=2755) <sup>a</sup> | Patients deceased on discharge, n (%) |
|--------------------------------|--------------------------------|---------------------------------------|
| Yes, preoperative              | 1,280                          | 91 (7.1)                              |
| Yes, postoperative             | 190                            | 17 (9.0)                              |
| Score not documented           | 1,285                          | 87 (6.7)                              |

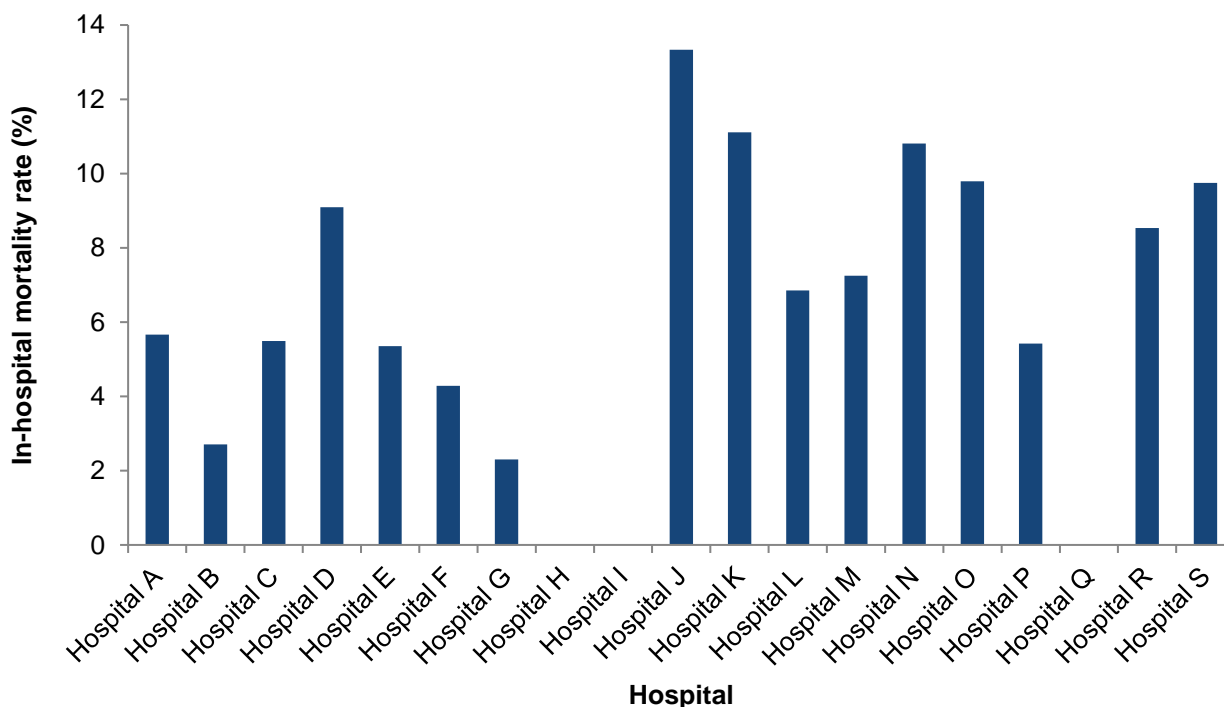
Notes:

<sup>a</sup>n is 2,755 because it does not include n=131 patients where it was clear they had more than one case recorded during their admission. Missing: responses where numerous fields contribute to the answer; however, one or more of these fields are blank.

Score not documented: risk assessment not conducted (n=1,150); risk assessment calculated by not entered (n=17); unknown (n=83); missing (n=35).

Unknown: these questions are answered, but often due to retrospectively entering the data the answer cannot be recalled.

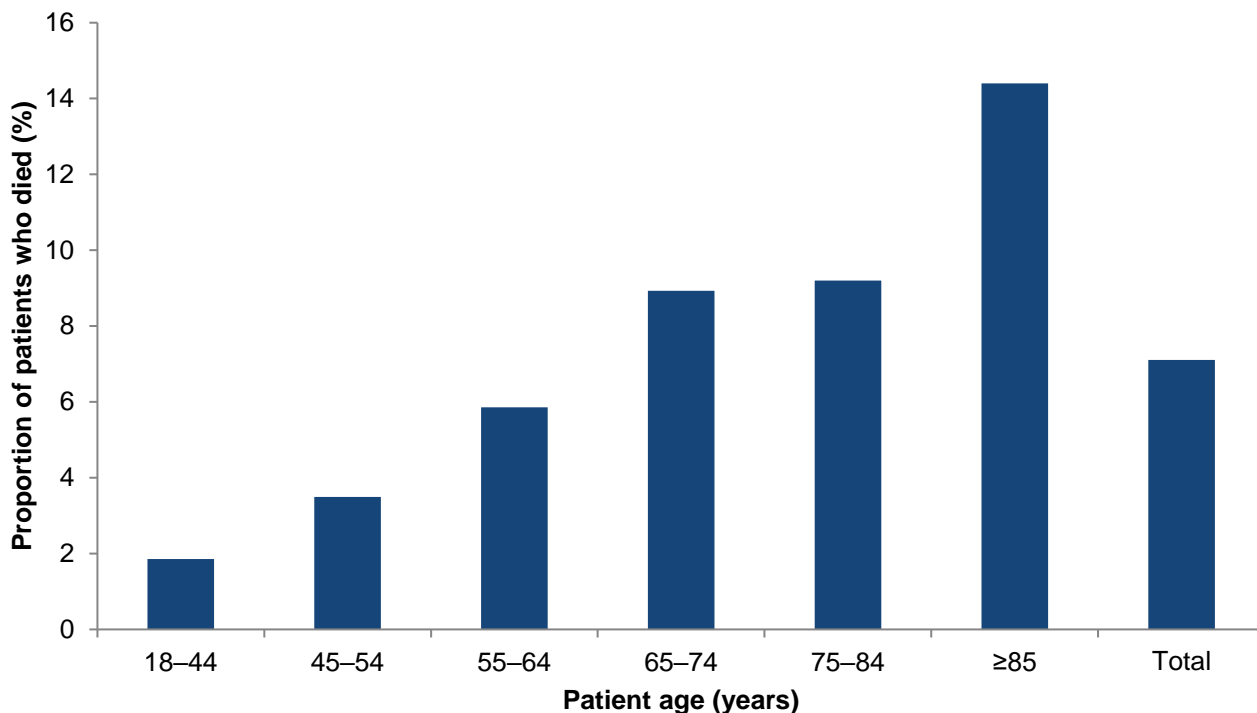
**Figure 12: In-hospital mortality rate of participating hospitals**





Patients aged 85 years or over were more likely to die than those in any other age group (Figure 13).

**Figure 13: Proportions of patients who died, by patient age group**



#### Clinical commentary and recommendations

One of the most important stimuli to the establishment of NELA was the high overall 30-day mortality (then ~15%) and associated wide inter-hospital variation (up to 10-fold). The ANZELA-QI mortality data are important for comparative purposes. Because of the constraints imposed on ANZELA-QI, it can only report in-hospital mortality rather than 30-day mortality. Other emergency laparotomy audits have shown little difference between the two (Rosenthal et al. 2000).

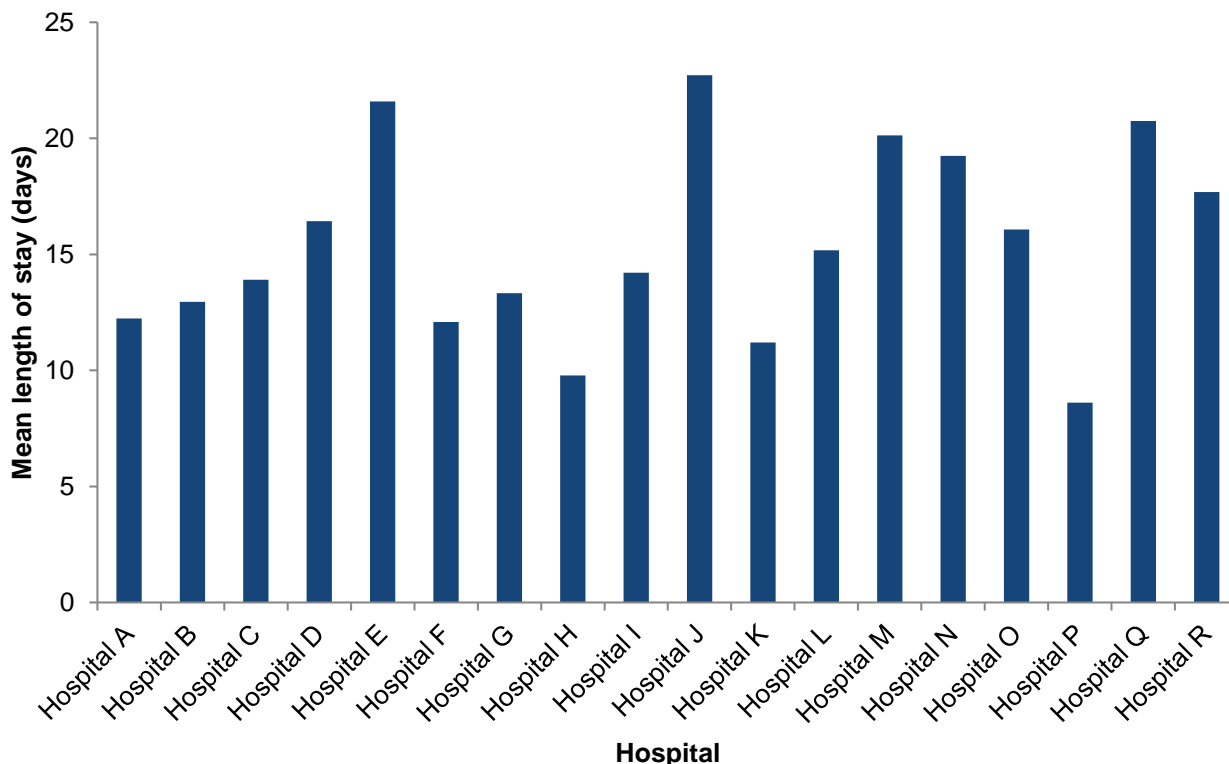
Although the overall mortality of 7.1% reflects well on the care in Australia, the almost six fold inter-hospital variation suggests there is much room for improvement. This mortality data should be interpreted with caution because:

1. When NELA commenced, the 'accepted' overall 30-day mortality was ~15%. Contemporary data suggests the overall 30-day mortality is ~11%.
2. These data are a snapshot from participating hospitals and may not reflect mortality at non-participating hospitals.
3. At this time the ANZELA-QI numbers are small, and a single death may significantly impact on hospital outcome.
4. No allowance has been made for transfers.
5. There has been no adjustment for risk.
6. The impact of non-operative cases has not been assessed. There is increasing evidence this is important, and hospitals can and should record in the ANZELA-QI database all eligible cases who do not have an emergency laparotomy.

### 3.3.2 Length of hospital stay

The mean length of stay of patients who were alive at discharge was 15.5 days with a 2.7-fold variation of inter-hospital stay (range 8.6 to 22.7 days; Figure 14). Patients where it is unknown if a risk assessment was completed had the highest mean length of stay (Figure 15).

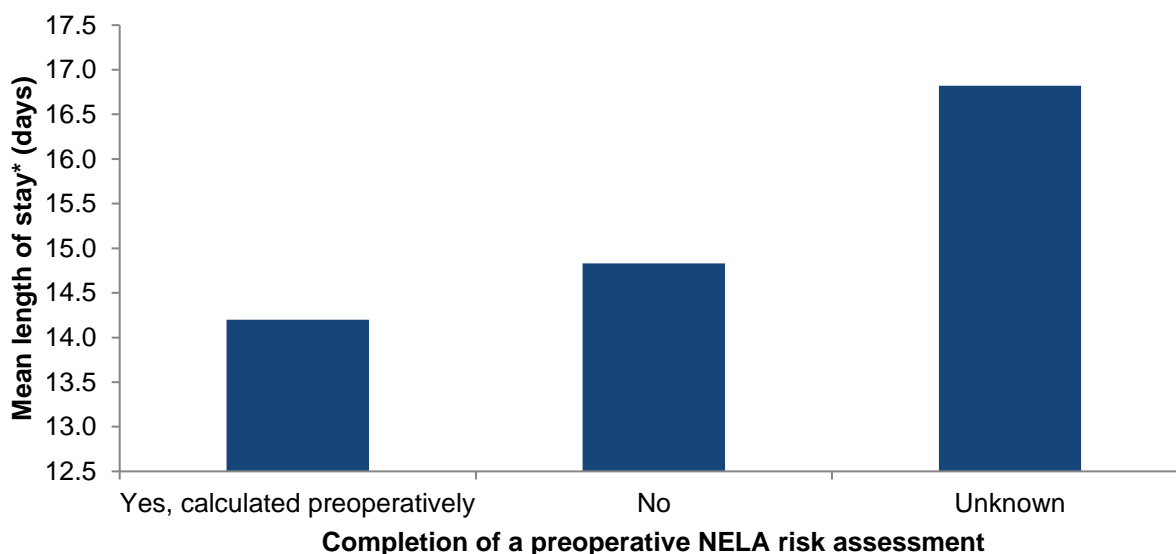
**Figure 14: Mean length of stay over time in patients surviving to hospital discharge**



Notes:

Mean length of stay data excludes 196 patients who died during their admission and 446 patients who were still admitted after 60 days in hospital or had not had their discharge data completed.

**Figure 15: Mean length of stay in hospital, by NELA risk assessment completion**



Note:

Mean length of stay data excludes 196 patients who died during their admission and 446 patients who were still admitted after 60 days in hospital or had not had their discharge data completed.

## Clinical commentary and recommendations

A short length of stay is a surrogate marker for efficient care that is not associated with complications. It also suggests that patients probably returned to their preoperative residence, a very important quality of life consideration for patients. Length of stay is also the major determinant of overall cost.

### 3.3.3 Discharge destination

Postoperative quality of life is a critical outcome for patients, with many giving this greater priority than survival. For many, the single most important factor in determining postoperative quality of life is returning to their preoperative place of residence. ANZELA-QI was only able to determine their destination on discharge, and for the 2,228 for whom there were data, 391 (14.2%) were not discharged to their preoperative place of residence (Table 9). This data may be misleading as it will be determined by local facilities. It would be more valuable to know their place of residence three months after surgery and/or three months after discharge from surgical care. Amendments to how this data is collected is a future consideration for ANZELA-QI.

**Table 9: Discharge destination of patients who did not return to prehospital residence**

| Did the patient return to their prehospital residence?                   | Patients, n (%) <sup>a</sup> |
|--|------------------------------|
| Yes  | 1,837 (66.7)                 |
| No   | 391 (14.2)                   |
| Missing or unknown   | 527 (19.1)                   |
| Discharge destination if patient did not return to prehospital residence | Patients, n (%)              |
| Residential care   | 8 (2.1)                      |
| Nursing home   | 14 (3.6)                     |
| Rehabilitation facility (any)  | 209 (53.5)                   |
| Other public hospital for ongoing acute care                             | 111 (28.4)                   |
| Private hospital for ongoing acute care                                  | 14 (3.6)                     |
| Other destination  | 30 (7.7)                     |
| Missing or unknown   | 5 (1.3)                      |

Notes:

<sup>a</sup> No data reported for n=131 cases who had more than one case recorded during their admission. Unknown: answer that can be selected in the dataset. The questions are answered, but often due to retrospectively entering the data the answer cannot be recalled. Missing: responses where numerous fields contribute to the answer; however, one or more of these fields are blank.

### 3.3.4 Return to theatre

Return to theatre was evaluated to see if there was an association with type of admission (emergency or elective).

A total of 193 patients had an emergency laparotomy following an elective admission. Of these, 2.1% (4/193) had a further return to theatre after the initial emergency laparotomy, compared to 0.9% (23/2,666) of patients who had a return to theatre after the initial emergency laparotomy following an emergency admission (Table 10).

**Table 10: Patients who had a return to theatre, by admission type**

| Admission type | Patients (N=2,886) | Patients with returns to theatre, n (%) |
|----------------|--------------------|---|
| Emergency      | 2,666              | 23 (0.9)                                |
| Elective       | 193                | 4 (2.1)                                 |
| Unknown        | 27                 | 1 (3.7)                                 |

Notes:

n (%): number (percentage) of patients with returns to theatre

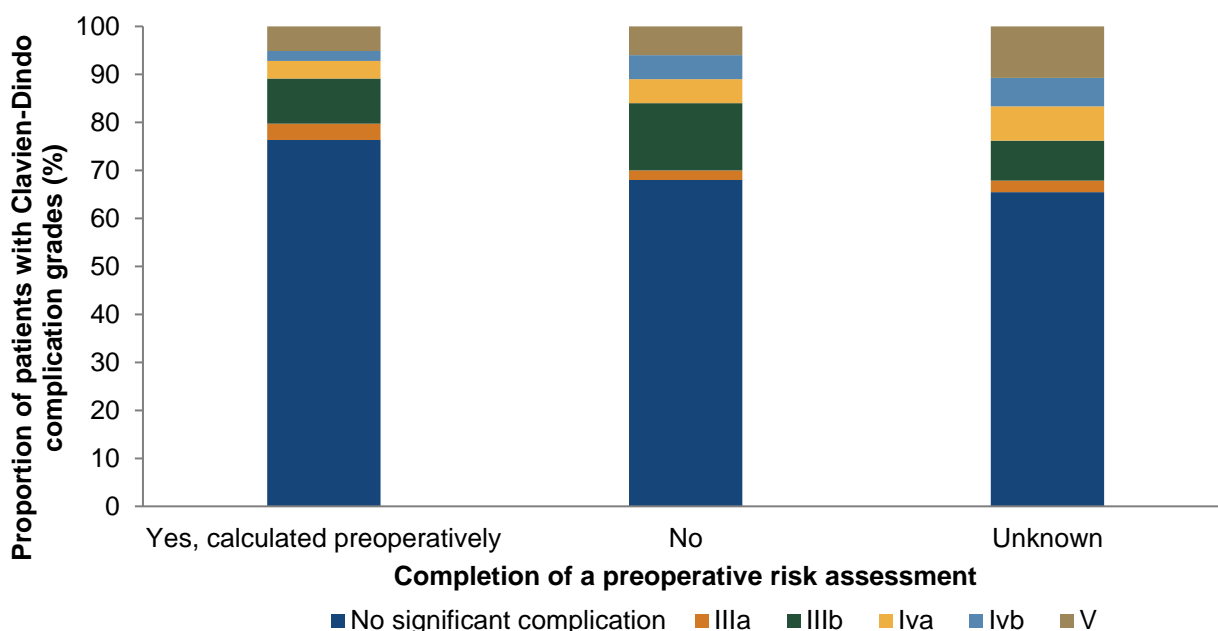
### 3.3.5 Clavien-Dindo complication grade

The Clavien-Dindo scoring system is used by clinicians to allocate a grade to complications (or adverse events) that a patient may experience during their hospital admission (see Appendix C for Clavien-Dindo complication grade; Dindo 2004). The grading is given postoperatively. Increasing grade indicates increasing severity of clinical complication, and a grade of IIIa or higher is considered clinically significant. Analysis was performed to determine whether Clavien-Dindo score was associated with type of admission (emergency or elective), preoperative NELA risk score and documented urgency to surgery.

Patients who were elective admissions had much lower rates of clinically significant Clavien-Dindo complications than patients who were emergency admissions (data not shown).

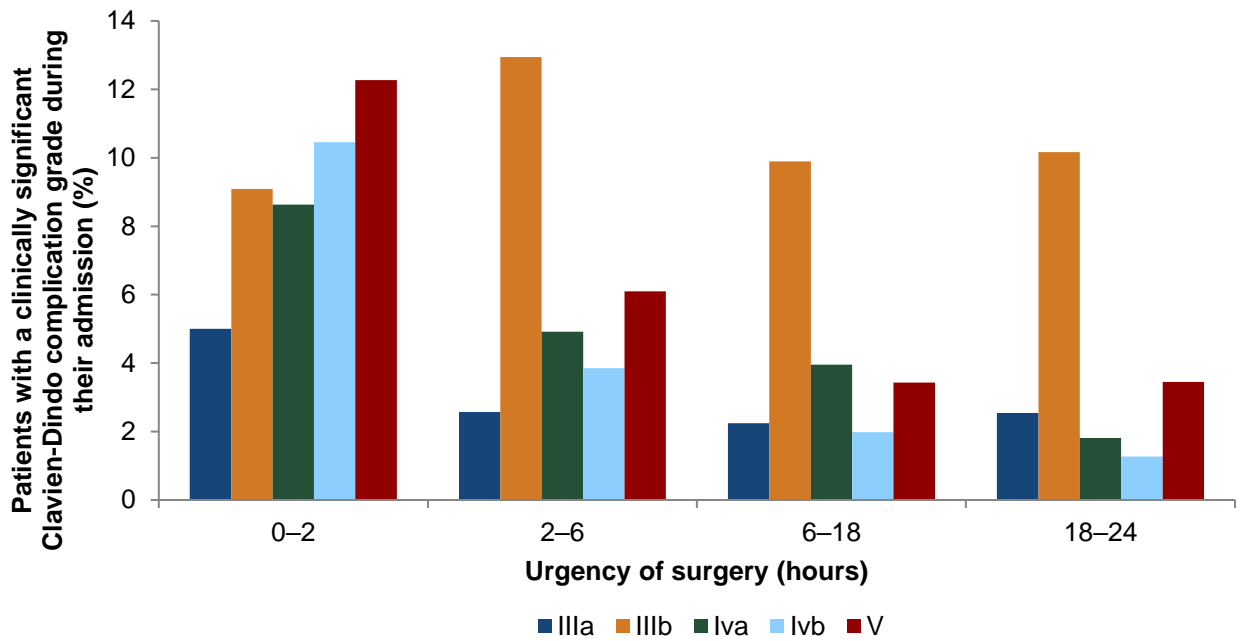
The completion of a preoperative risk assessment had minimal impact on the incidence of significant Clavien-Dindo grades, except for patients where the completion of a risk assessment was unknown. Patients where it is unknown if they had a preoperative risk assessment completed were twice as likely to have a Clavien-Dindo grade of V (Figure 16). Patients who had a NELA preoperative risk assessment that was  $\geq 10\%$  had higher complication rates in each recorded Clavien-Dindo grade (data not shown).

**Figure 16: Risk assessment completion, by clinically significant Clavien-Dindo complication grade**



Patients with an urgency of surgery of less than two hours had the highest proportion of grade IV and V Clavien-Dindo complications. The proportion of patients experiencing grade IV and V complications decreased with decreasing urgency of surgery (Figure 17). Patients with an urgency between 2 and 6 hours were the most likely to have a complication of grade IIIb (Figure 17).

**Figure 17: Documented urgency of surgery for patients who had a clinically significant Clavien-Dindo complication grade**



#### Clinical commentary and recommendations

The patients least likely to arrive in theatre within the specified time were those who need to be in theatre in less than 2 hours, and these will also be the most unwell patients. The data shows that these patients had the greatest severity of complications (Figure 17) and were least likely to arrive in theatre in an appropriate timeframe (Figure 5). Emergency laparotomy is a time-critical operation and delays may contribute to an increased number of significant complications.

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## Appendix A: Reports provided to participating hospitals

ANZELA-QI provides the following reports to participating hospitals:

1. RAGG chart reporting the eight currently agreed KPIs over a defined period (example in Figure A1)
2. Individual hospital mini-report that includes run charts (example in Figure A2)
3. Patient-level summary (example in Figure A3)

### Representative report: KPI results categorised by RAGG

Figure A1 (below) shows the eight primary KPIs (columns) selected by ANZELA-QI and the 24 hospitals contributing to the pilot study (rows). In this example all hospital names have been removed. However, when reports are sent to individual hospitals, those contributing more than 50 cases are identified by name. This allows hospitals not achieving the standard to identify hospitals that are and to approach them for assistance in understanding how they might improve practices.

**Figure A1:** RAGG chart reporting the eight currently agreed KPIs over a defined period



## ANZ Emergency Laparotomy Audit Quality Improvement

### Monthly Hospital KPI Report

for  
admissions from July 2019 to June 2020

Published: 6 July 2020  
Version: 1.0





## Acknowledgement

This report has been prepared by the ANZELA-QI Audit Team at the Royal Australasian College of Surgeons.

The ANZELA-QI team wishes to acknowledge the invaluable contribution of Dr Tom Poulton who assisted us to design these reports, in particular for his explanatory text accompanying the KPIs.

This report has been based on those produced by the National Emergency Laparotomy Audit (NELA) in the UK.

## Introduction

One of the main aims of the ANZELA-QI is to provide frequent and contemporaneous feedback of hospital and national level data. This allows hospital staff to make the most use of their data in an effort to bring about improvements in standards of care.

Aggregate performance within a particular time-period is presented on a dashboard. Once sufficient data have been collected, run charts will also be used to present time-series data, allowing hospitals to monitor the change in their performance over time.

## Performance dashboard

The results for each metric in a particular time-period are displayed on a dashboard, with the percentage of cases for each KPI together with the numerator (n) and incomplete cases (no data).

The dashboard shows each hospital's performance relative to Red-Amber-Green-Grey (RAGG) ratings. The boundaries between the RAGG ratings are set at 50% and 80%.

- In general, hospitals in the Green area ( $\geq 80\%$ ) are performing well and are likely to have reliable systems in place to consistently achieve the standard of care.
- Hospitals in the Amber area ( $\geq 50\%$  but  $< 80\%$ ) may be performing well for some patients, but should aim to improve the consistency of this good performance.
- Those in the Red area ( $< 50\%$ ) should examine their systems and processes to see what steps can be taken locally to improve both performance and consistency.
- Those in the Grey area have no data recorded.

## Guide to interpretation

The performance should be interpreted with caution in metrics where the denominator is small (e.g. less than 10 patients). Results will become more reliable as more data is collected.

It is possible that not every eligible case was entered into the database. Analysis is performed only on available data, which may alter results.

## Feedback

Feedback is encouraged. Please email [anzela-qi@surgeons.org](mailto:anzela-qi@surgeons.org).

## Explanatory Notes

### KPI 1: CT scan performed and reported by a consultant radiologist before surgery

A preoperative CT scan can help to inform surgeons about the surgical diagnosis and extent of likely pathology. While it is recognised that not all patients require a CT scan and the decision to operate can be made on clinical findings only, CT scans can help to reduce the number of non-therapeutic (open-close) laparotomies. Where a scan has been performed, it is reasonable that it should have been reported by a consultant radiologist before surgery, such that the treating surgical team have the opportunity to discuss the findings.

### KPI 2: Risk of death documented preoperatively

NELA data has shown that recognising when patients are high risk improves the attainment of subsequent standards of care. Documentation of risk is important, not just for ensuring other standards of care are met, but also to aid the process of shared decision making. It should be stressed that since a predicted risk score is based on population data, interpreting the score for an individual patient can be difficult. Risk scores should be used to aid, but not replace, clinical judgement and decision making. A high-risk score in isolation should not deny a patient surgical intervention.

### KPI 3: Arrival in theatre within a timescale appropriate to urgency

Each emergency laparotomy will have its own degree of urgency specific to the clinical circumstances. However, once a decision to operate has been made, theatre capacity and staffing should allow patients to arrive in theatre within an appropriate timescale. This can be particularly challenging for the most urgent cases since delays can be caused by any number of factors in the patient's care.

### KPI 4: Consultant presence in theatre for patients with a preoperative NELA risk score $\geq 5\%$

High risk patients should have consultant directed care. Depending on the specific circumstances it may not be necessary for the consultant to be directly managing the case, but if not they should be supervising in theatre. While the aim should be that a consultant surgeon and consultant anaesthetist are both present in theatre, the results are also reported for each speciality separately.

### KPI 5: Consultant surgeon presence in theatre for patients with a preoperative NELA risk score $\geq 5\%$

### KPI 6: Consultant anaesthetist presence in theatre for patients with a preoperative NELA risk score $\geq 5\%$

### KPI 7: Direct admission to critical care after surgery for patients with a preoperative NELA risk score $\geq 10\%$

Considering the high-risk nature of most emergency laparotomies, patients with a postoperative predicted risk  $\geq 10\%$  should be admitted directly to a critical care unit after surgery. Although Post-Anaesthesia Care Units and other enhanced care wards are becoming more common, because there is no standard definition for these areas, 'critical care' continues to refer to High Dependency (level 2) or Intensive Care (level 3) units.

### KPI 8: Postoperative assessment by a specialist in elderly medicine for patients aged 65 years and over

Elderly patients are more likely to be frail or have multiple comorbidities that makes their perioperative care more complex. These patients are likely to benefit from multidisciplinary input, including care from a specialist in elderly medicine.

**ANZELA-QI**  
**KEY PERFORMANCE INDICATOR RESULT FOR JULY 2019 TO JUNE 2020**

| Hospital                | KPI 1<br>CT scan reported by a<br>Consultant pre-surgery | KPI 2<br>Pre-operative<br>documentation of risk | KPI 3<br>Arrival in theatre within<br>timescale appropriate to<br>urgency <=18 hrs | KPI 4<br>Consultant surgeon and<br>anaesthetist in theatre<br>when risk of death >=5% | KPI 5<br>Consultant surgeon in<br>theatre when risk of<br>death >=5% | KPI 6<br>Consultant anaesthetist<br>in theatre when risk of<br>death >=5% | KPI 7<br>Direct critical care<br>admission when risk of<br>death >=10% | KPI 8<br>Post-op review by Elderly<br>Medicine team where age<br>>=65 |
|-------------------------|--|---|--|---|--|---|--|---|
| Hospital A<br>42 cases  | 29/38 (76%)<br>Incomplete = 8                            | 21/41 (51%)<br>Incomplete = 1                   | 22/35 (63%)<br>Incomplete =6   | 7/7 (100%)<br>Incomplete = 0  | 7/7 (100%)<br>Incomplete = 0   | 7/7 (100%)<br>Incomplete = 0  | 4/4 (100%)<br>Incomplete = 0   | 0/18 (0%)<br>Incomplete = 1   |
| Hospital B<br>5 cases   | 0/1 (0%)<br>Incomplete = 0                               | 2/2 (100%)<br>Incomplete = 0                    | 2/2 (100%)<br>Incomplete =0  | 1/2 (50%)<br>Incomplete = 0   | 1/2 (50%)<br>Incomplete = 0  | 2/2 (100%)<br>Incomplete = 0  | 2/2 (100%)<br>Incomplete = 0   | 0/2 (0%)<br>Incomplete = 0  |
| Hospital C<br>44 cases  | 26/37 (70%)<br>Incomplete = 11                           | 19/44 (43%)<br>Incomplete = 24                  | 23/44 (52%)<br>Incomplete =7   | 0/13 (0%)<br>Incomplete = 12  | 10/13 (77%)<br>Incomplete = 2  | 0/13 (0%)<br>Incomplete = 13  | 8/9 (89%)<br>Incomplete = 1  | 0/22 (0%)<br>Incomplete = 21  |
| Hospital D<br>195 cases | 143/165 (87%)<br>Incomplete = 17                         | 38/189 (20%)<br>Incomplete = 5                  | 117/159 (74%)<br>Incomplete =9   | 13/26 (50%)<br>Incomplete = 0   | 13/26 (50%)<br>Incomplete = 0  | 24/26 (92%)<br>Incomplete = 0   | 14/19 (74%)<br>Incomplete = 0  | 3/111 (3%)<br>Incomplete = 6  |
| Hospital E<br>223 cases | 85/189 (45%)<br>Incomplete = 86                          | 145/200 (73%)<br>Incomplete = 10                | 98/162 (60%)<br>Incomplete =42   | 49/73 (67%)<br>Incomplete = 5   | 53/73 (73%)<br>Incomplete = 5  | 60/73 (82%)<br>Incomplete = 5   | 30/43 (70%)<br>Incomplete = 1  | 23/105 (22%)<br>Incomplete = 19                                       |
| Hospital F<br>147 cases | 19/120 (16%)<br>Incomplete = 100                         | 113/132 (86%)<br>Incomplete = 1                 | 50/81 (62%)<br>Incomplete =4   | 16/36 (44%)<br>Incomplete = 0   | 27/36 (75%)<br>Incomplete = 0  | 23/36 (64%)<br>Incomplete = 0   | 15/27 (56%)<br>Incomplete = 0  | 2/67 (3%)<br>Incomplete = 0   |
| Hospital G<br>30 cases  | 22/25 (88%)<br>Incomplete = 3                            | 17/26 (65%)<br>Incomplete = 0                   | 18/23 (78%)<br>Incomplete = 1  | 6/6 (100%)<br>Incomplete = 0  | 6/6 (100%)<br>Incomplete = 0   | 6/6 (100%)<br>Incomplete = 0  | 2/4 (50%)<br>Incomplete = 0  | 7/9 (78%)<br>Incomplete = 0   |
| Hospital H<br>26 cases  | 19/19 (100%)<br>Incomplete = 0                           | 17/26 (65%)<br>Incomplete = 1                   | 15/25 (60%)<br>Incomplete =4   | 4/4 (100%)<br>Incomplete = 0  | 4/4 (100%)<br>Incomplete = 0   | 4/4 (100%)<br>Incomplete = 0  | 2/2 (100%)<br>Incomplete = 0   | 0/12 (0%)<br>Incomplete = 0   |
| Hospital I<br>81 cases  | 35/76 (46%)<br>Incomplete = 26                           | 54/81 (67%)<br>Incomplete = 6                   | 40/58 (69%)<br>Incomplete =5   | 20/27 (74%)<br>Incomplete = 0   | 21/27 (78%)<br>Incomplete = 0  | 24/27 (89%)<br>Incomplete = 0   | 8/14 (57%)<br>Incomplete = 0   | 19/45 (42%)<br>Incomplete = 7   |
| Hospital J<br>3 cases   | 0/2 (0%)<br>Incomplete = 2                               | 0/3 (0%)<br>Incomplete = 0                      | 2/3 (67%)<br>Incomplete =0   | 0/0 (%)<br>Incomplete = 0   | 0/0 (%)<br>Incomplete = 0  | 0/0 (%)<br>Incomplete = 0   | 0/0 (%)<br>Incomplete = 0  | 0/2 (0%)<br>Incomplete = 1  |
| Hospital K<br>13 cases  | 11/13 (85%)<br>Incomplete = 0                            | 8/13 (62%)<br>Incomplete = 1                    | 5/12 (42%)<br>Incomplete =0  | 7/7 (100%)<br>Incomplete = 0  | 7/7 (100%)<br>Incomplete = 0   | 7/7 (100%)<br>Incomplete = 0  | 3/6 (50%)<br>Incomplete = 0  | 0/10 (0%)<br>Incomplete = 0   |
| Hospital L<br>183 cases | 102/145 (70%)<br>Incomplete = 20                         | 60/170 (35%)<br>Incomplete = 33                 | 72/155 (46%)<br>Incomplete =15   | 27/36 (75%)<br>Incomplete = 2   | 28/36 (78%)<br>Incomplete = 1  | 30/36 (83%)<br>Incomplete = 2   | 17/25 (68%)<br>Incomplete = 1  | 6/88 (7%)<br>Incomplete = 10  |
| Hospital M<br>88 cases  | 62/71 (87%)<br>Incomplete = 4                            | 10/82 (12%)<br>Incomplete = 10                  | 40/63 (63%)<br>Incomplete =1   | 4/7 (57%)<br>Incomplete = 0   | 5/7 (71%)<br>Incomplete = 0  | 6/7 (86%)<br>Incomplete = 0   | 5/6 (83%)<br>Incomplete = 0  | 7/45 (16%)<br>Incomplete = 0  |
| Hospital N<br>257 cases | 127/200 (64%)<br>Incomplete = 28                         | 198/230 (86%)<br>Incomplete = 2                 | 110/172 (64%)<br>Incomplete =7   | 71/89 (80%)<br>Incomplete = 1   | 75/89 (84%)<br>Incomplete = 1  | 81/89 (91%)<br>Incomplete = 1   | 34/58 (59%)<br>Incomplete = 3  | 33/120 (28%)<br>Incomplete = 15                                       |
| Hospital O<br>41 cases  | 22/37 (59%)<br>Incomplete = 15                           | 26/37 (70%)<br>Incomplete = 2                   | 27/36 (75%)<br>Incomplete =3   | 8/8 (100%)<br>Incomplete = 0  | 8/8 (100%)<br>Incomplete = 0   | 8/8 (100%)<br>Incomplete = 0  | 3/3 (100%)<br>Incomplete = 0   | 5/23 (22%)<br>Incomplete = 4  |
| Hospital P<br>138 cases | 74/117 (63%)<br>Incomplete = 7                           | 5/128 (4%)<br>Incomplete = 2                    | 67/118 (57%)<br>Incomplete =11   | 2/4 (50%)<br>Incomplete = 0   | 3/4 (75%)<br>Incomplete = 0  | 3/4 (75%)<br>Incomplete = 0   | 3/4 (75%)<br>Incomplete = 0  | 20/57 (35%)<br>Incomplete = 4   |

Notes: Data refers to Admission Dates from July 2019 to June 2020, for cases entered up to 6 July 2020. Data extracted 6/07/20 10:49AM ACST

The dashboard shows each hospital's performance relative to Red-Amber-Green-Grey (RAGG) ratings. The boundaries between the RAGG ratings are set at 50% and 80%. Green area (≥80%) Amber area (≥50% but <80%) Red area (<50%) Grey area (no records). n = numerator, incomplete = no. of cases with incomplete data that could not be taken into account for this KPI.

Important: Performance results should be interpreted with caution, especially where the denominator is small (e.g. less than 10 patients). Results will become more reliable as more data is collected.

It is possible that not every eligible case was entered into the database. Analysis is performed only on available data, which may alter results.

## Representative report: ANZELA-QI monthly summary

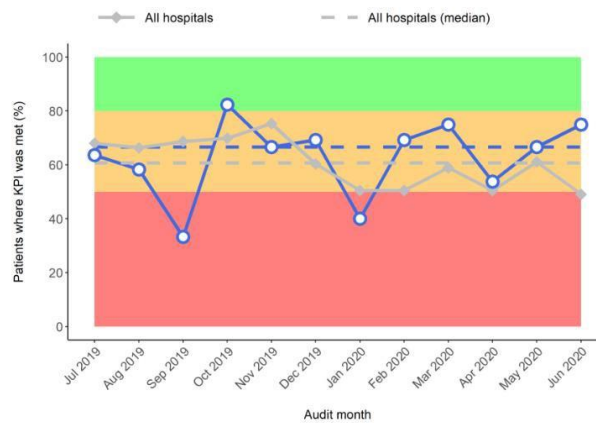
Each month, participating sites are provided with a report comparing the hospital's compliance with the KPIs set by the audit and the hospital's performance compared to other hospitals participating in ANZELA-QI. Each hospital receives its own mini-report in the second week of each month. Figure A2 shows a representative example of the monthly KPI run charts for one contributing hospital.

**Figure A2:** Representative monthly KPI run chart for one contributing hospital



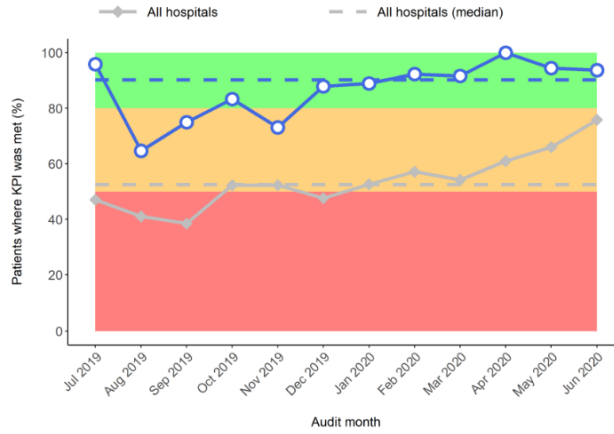
For reporting period 01 July 2019 to 30 June 2020.

KPI 1: CT reported before surgery (where performed)



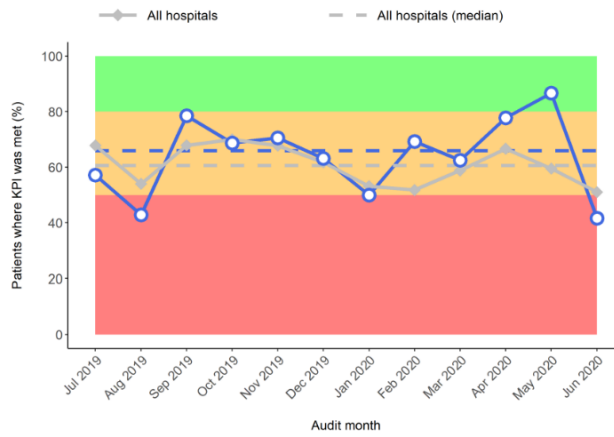
75.0% of the cases met KPI 1 this month; 12 of the 16 patients meeting the criteria for this KPI received recommended care.

**KPI 2: Risk of death documented before surgery**



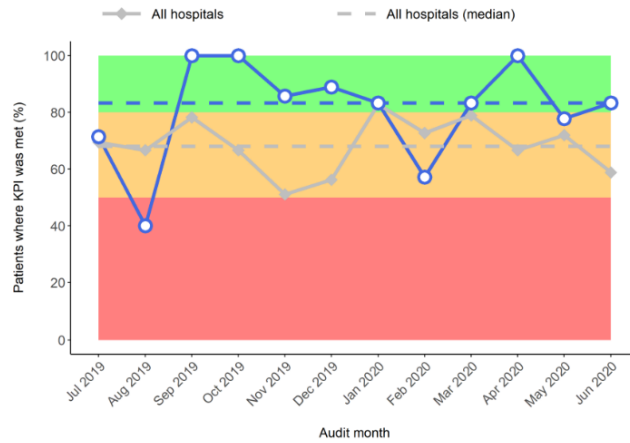
93.8% of the cases met KPI 2 this month; 15 of the 16 patients meeting the criteria for this KPI received recommended care.

**KPI 3: Arrival in theatre within a timescale appropriate to urgency (where documented urgency was 18 hours or less)**



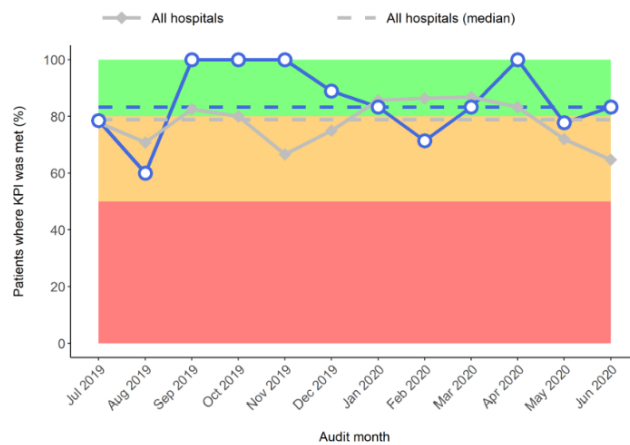
41.7% of the cases met KPI 3 this month; 5 of the 12 patients meeting the criteria for this KPI received recommended care.

**KPI 4: Consultant presence in theatre for patients with a preoperative risk score  $\geq 5\%$**



83.3% of the cases met KPI 4 this month; 5 of the 6 patients meeting the criteria for this KPI received recommended care.

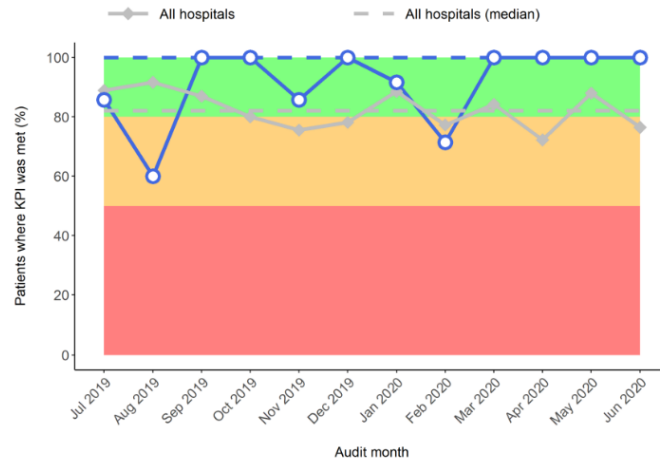
**KPI 5: Consultant surgeon presence in theatre for patients with a preoperative risk score  $\geq 5\%$**



83.3% of the cases met KPI 5 this month; 5 of the 6 patients meeting the criteria for this KPI received recommended care.

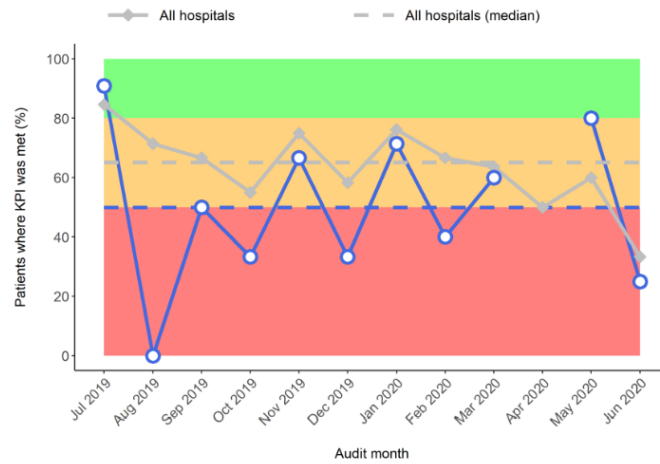


**KPI 6: Consultant anaesthetist presence in theatre for patients with a preoperative risk score  $\geq 5\%$**



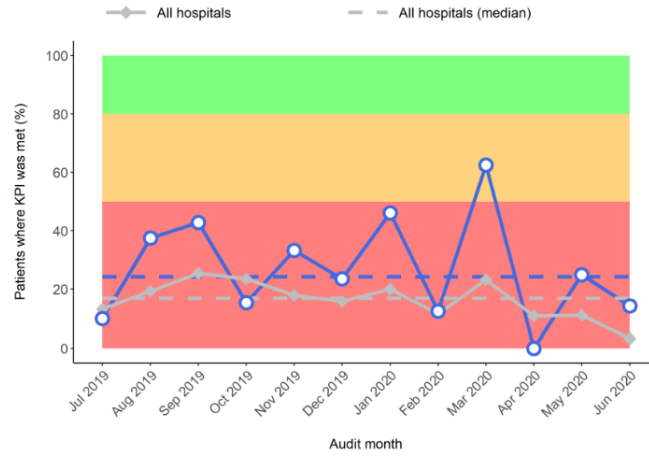
100.0% of the cases met KPI 6 this month; 6 of the 6 patients meeting the criteria for this KPI received recommended care.

**KPI 7: Direct admission to critical care after surgery for patients with a preoperative risk score  $\geq 10\%$**



25.0% of the cases met KPI 7 this month; 1 of the 4 patients meeting the criteria for this KPI received recommended care.

KPI 8: Postoperative assessment by a specialist in elderly medicine for patients aged 65 years and over



14.3% of the cases met KPI 8 this month; 1 of the 7 patients meeting the criteria for this KPI received recommended care.

## Representative report: ANZELA-QI patient-level summary

The patient-level summary generated for each individual hospital shows every patient and whether the relevant KPIs were achieved. It is then possible to identify any KPI not met by an individual patient and to undertake a review of care to determine the cause. Patterns within a hospital will also emerge. These reports will be generated monthly and hospitals will use them to improve care: for example, at monthly morbidity and mortality meetings while the care of a patient can still be recalled.

**Figure A3:** Representative patient summary chart for one contributing hospital



### ANZELA-QI Patient-level Summary June 2020

For reporting period 01 April 2020 to 30 June 2020

| Admission date | Age (years) | NELA risk score (%) | Discharge status* | KPI 1 | KPI 2 | KPI 3 | KPI 4 | KPI 5 | KPI 6 | KPI 7 | KPI 8 |
|----------------|-------------|---------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 02/04/2020     | 44          | 0.9                 | Home              | No    | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 05/04/2020     | 67          | 7.3                 | Home              | No    | Yes   | No    | Yes   | Yes   | Yes   | N/A   | No    |
| 06/04/2020     | 66          | 4                   | Home              | No    | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | No    |
| 05/04/2020     | 67          | 2.7                 | Home              | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   | No    |
| 09/04/2020     | 50          | 0.6                 | Home              | No    | Yes   | No    | N/A   | N/A   | N/A   | N/A   | N/A   |
| 03/04/2020     | 61          | 0.7                 |                   | Yes   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 17/04/2020     | 40          | 0.5                 |                   | No    | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 18/04/2020     | 83          | 4.5                 | Home              | Yes   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | No    |
| 07/04/2020     | 79          | 2.4                 | Home              | Yes   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | No    |
| 17/04/2020     | 55          | 7.6                 | Home              | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | N/A   | N/A   |
| 17/04/2020     | 62          | 0.7                 |                   | Yes   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 17/04/2020     | 40          | 0.5                 |                   | No    | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 12/04/2020     | 57          | 8.1                 | Home              | Yes   | Yes   | N/A   | Yes   | Yes   | Yes   | N/A   | N/A   |
| 01/05/2020     | 55          | 9.7                 | Home              | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | N/A   | N/A   |
| 02/05/2020     | 78          | 3.1                 | Home              | Yes   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | No    |
| 05/05/2020     | 78          | 4.1                 | Home              | Yes   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | No    |
| 01/05/2020     | 55          | 2.4                 |                   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 05/05/2020     | 82          | 7.5                 |                   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | N/A   | Yes   |
| 04/05/2020     | 68          |                     |                   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 08/05/2020     | 53          | 28                  | Deceased          | No    | Yes   | Yes   | Yes   | Yes   | Yes   | No    | N/A   |



| Admission date | Age (years) | NELA risk score (%) | Discharge status* | KPI 1 | KPI 2 | KPI 3 | KPI 4 | KPI 5 | KPI 6 | KPI 7 | KPI 8 |
|----------------|-------------|---------------------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 17/06/2020     | 50          | 7.7                 |                   | Yes   | Yes   | No    | Yes   | Yes   | Yes   | N/A   | N/A   |
| 19/06/2020     | 67          | 2.1                 |                   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   | No    |
| 06/06/2020     | 63          |                     |                   | No    | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 13/06/2020     | 58          | 0.9                 |                   | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 08/06/2020     | 56          | 1.5                 |                   | Yes   | Yes   | No    | N/A   | N/A   | N/A   | N/A   | N/A   |
| 02/05/2020     | 73          | 5                   | Home              | No    | Yes   | Yes   | No    | No    | Yes   | N/A   | Yes   |
| 29/05/2020     | 73          | 3.5                 | Home              | No    | Yes   | Yes   | N/A   | N/A   | N/A   | N/A   | Yes   |
| 29/05/2020     | 91          | 5.7                 | Home              | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 29/06/2020     | 53          |                     |                   | No    | No    | Yes   | N/A   | N/A   | N/A   | N/A   | N/A   |
| 30/06/2020     | 64          | 8.7                 |                   | No    | Yes   | No    | No    | No    | Yes   | N/A   | N/A   |
| 22/06/2020     | 73          |                     |                   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   | N/A   |

\* ANZELA-QI patient-level summary: Explanation of discharge status abbreviations

| Discharge status | Description of discharge destination         |
|------------------|--|
| Home             | Returned to pre-hospital residence           |
| Deceased         | Patient was deceased on discharge            |
| Adm >60          | Still in hospital at 60 days after admission |
| RC               | Residential care                             |
| NH               | Nursing home                                 |
| Rehab            | Rehabilitation facility (any)                |
| Public           | Other Public hospital for ongoing acute care |
| Private          | Private hospital for ongoing acute care      |
| New dest         | New destination                              |
| Unknown          | Unknown                                      |

Blank fields in this report are due to missing data points during data entry. If there are blank fields in this report please open the applicable case in REDCap and ensure all applicable questions have been answered.

## Appendix B: Participating hospitals

**Table B1:** Participating hospitals

| Hospital or health service                                      | State or territory           |
|---|------------------------------|
| Albury Wodonga Health, Albury Campus (Hospital)                 | New South Wales              |
| Albury Wodonga Health, Wodonga Campus (Hospital)                | Victoria                     |
| Armidale Rural Referral Hospital                                | New South Wales              |
| Ballarat Base Hospital  | Victoria                     |
| Canberra Hospital   | Australian Capital Territory |
| Fiona Stanley Hospital  | Western Australia            |
| Footscray Hospital (Western Health)                             | Victoria                     |
| Gold Coast University Hospital                                  | Queensland                   |
| Latrobe Regional Hospital                                       | Victoria                     |
| Logan Hospital  | Queensland                   |
| Mackay Base Hospital  | Queensland                   |
| Mount Gambier and Districts Health Service (Hospital)           | South Australia              |
| Nepean Hospital   | New South Wales              |
| Port Macquarie Base Hospital                                    | New South Wales              |
| Rockhampton Base Hospital                                       | Queensland                   |
| Royal Adelaide Hospital   | South Australia              |
| Royal Darwin Hospital   | Northern Territory           |
| Royal Hobart Hospital   | Tasmania                     |
| Sir Charles Gairdner Hospital                                   | Western Australia            |
| St John of God Midland Public and Private Hospital <sup>a</sup> | Western Australia            |
| St Vincent's Hospital Sydney                                    | New South Wales              |
| Sunshine Hospital (Western Health)                              | Victoria                     |
| The Alfred Hospital   | Victoria                     |
| University Hospital Geelong (Barwon Health)                     | Victoria                     |

Notes:

<sup>a</sup> This is one hospital with ~66% of beds allocated to public patients and ~33% allocated to private patients.

## Appendix C: Clavien-Dindo scoring system

Clavien-Dindo complication grade is a scoring system which allocates a grade of severity to various types of complications a patient can have during their hospital admission.

| GRADE     | DEFINITION   |
|-----------|--|
| Grade I   | Any deviation from the normal postoperative course not requiring surgical, endoscopic or radiological intervention. This includes the need for certain drugs (e.g. antiemetics, antipyretics, analgesics, diuretics and electrolytes), treatment with physiotherapy and wound infections that are opened at the bedside.               |
| Grade II  | Complications requiring drug treatments other than those allowed for grade I complications; this includes blood transfusion and total parenteral nutrition.  |
| Grade III | Complications requiring surgical, endoscopic or radiological intervention.<br>Grade IIIa – intervention not under general anaesthetic.<br>Grade IIIb – intervention under general anaesthetic.   |
| Grade IV  | Life-threatening complications; this includes central nervous systems complications (e.g. brain haemorrhage, ischaemic stroke, subarachnoid haemorrhage) which require intensive care, but excludes transient ischaemic attacks.<br>Grade IVa – single-organ dysfunction (including dialysis).<br>Grade IVb – multi-organ dysfunction. |
| Grade V   | Death of the patient.  |

(The British Association of Urological Surgeons, 2019)