The time has come for New Zealand to improve outcomes after emergency laparotomy

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The time has come for New Zealand healthcare to focus on emergency laparotomies (ELs) and enhancing outcomes through data collection, real-time clinician feedback and quality improvement in the processes of care. Adult patients with acute abdominal conditions present throughout the country and many of them will need an emergency laparotomy. European evidence has shown that those requiring surgery are some of our highest risk patients, with a 30-day mortality in excess of 10%.1–3 To offer some perspective, this is 10 times the mortality following first-time coronary artery bypass graft.4 Yet, unlike patients with acute coronary syndrome,5 there is no national dataset looking into specific measures of care delivery and outcomes for this high risk group of patients. Without evidence, there can be no recommendations or guidelines, especially those applying specifically to patients within New Zealand. Therefore, unlike the management of acute coronary syndromes5,6 there is no standardised care pathway.

Summary of evidence

An EL typically refers to patients who undergo an unscheduled operation for an acute abdomen via a midline abdominal incision, although many EL audits5–8 include laparoscopic approaches when traditionally the same procedure would be performed by open means, such as a perforated peptic ulcer.

Evidence worldwide for improving outcomes following ELs includes a standardised process of care pathway, including undertaking an objective risk assessment, early identification and treatment of sepsis, consultant-led care, reaching the operating theatre in a timely manner and post-operative critical care admission.5 Despite the high-risk nature of this operation and considerable inter-hospital variation, prospective audit alone has been shown to improve outcomes.12–14 The National Emergency Laparotomy Audit (NELA) in England and Wales has demonstrated steadily improved outcomes and care processes for patients undergoing ELs.7–9 Over three years for example, NELA has shown a reduction in 30-day mortality (11.8% to 10.6%), average length of hospital stays (from 19.2 to 16.6 days) and unplanned returns to theatre (10.2% to 9.0%).7–9

The Copenhagen and EPQuIC studies, conducted since NELA, demonstrated a reduction in mortality by standardising the perioperative care pathway.2,11 Most recently the UK's Emergency Laparotomy Collaborative (ELC) has used quality improvement methodology to increase compliance with key standards of care. Preliminary results demonstrating crude mortality for the last four months was 7.5%, a reduction from 9.7%. There has also been a two-day reduction in length of hospital stay (unpublished data, Nial Quiney, Principal Investigator of ELC) as compliance with their care bundle improved.

In Australia, the first multi-hospital prospective EL audit, the Perth Emergency Laparotomy Audit (PELA), was published last year. It showed lower 30-day mortality than in the UK, despite poor compliance with process of care targets.10 While there are differences in resource allocation, privatisation of the health system, referral
patterns and case mix, a likely significant contributor to this lower mortality is avoiding surgery on very high-risk patients whose chances of long-term survival are extremely low and where a return to an acceptable quality of life is unlikely.

Unfortunately, it was beyond the scope of NELA to capture patients who did not undergo surgery, which makes direct comparison difficult. However, NELA’s patient group did have a higher pre-operative mortality risk than those in Western Australia (WA).

Furthermore, 1% of patients in NELA (approximately 700 patients) had surgery with an operative diagnosis of ‘not amenable to surgery’. Such open/close laparotomies, while not completely avoidable, are unusual in WA with the advent of mandatory reporting to the Australian and New Zealand Audit of Surgical Mortality (ANZASM). Better selection of those patients who will not survive despite surgery, or have an unacceptable quality of life following surgery, will clearly reduce operative mortality rates. While it would not reduce overall mortality, avoidance of futile surgery offers an important opportunity to improve end-of-life care.

Despite the overseas evidence showing high mortality following ELs and the benefits that a standardisation of care approach can impart, we lack baseline multi-hospital data in New Zealand on outcomes and process of care compliance. A retrospective review at Auckland City Hospital showed a 30-day mortality of 8% over two years. If we extrapolate such generalised data from all surgical procedures, we are unlikely to be outliers in outcomes compared to other Western nations. We know from the Perioperative Mortality Review Committee, as a surrogate to allow international comparisons, crude 30-day mortality after colorectal resections in New Zealand between 2010 and 2015 was 3.69%. Not unexpectedly, acute/emergency colectomy carried an almost four-fold increase in mortality than elective (8.09% compared with 1.87%) without adjusting for risk factors such as age, comorbidities and colonic obstruction. This compares with international studies including the NHS’s English data with an overall 6.7% 30-day mortality, including both acute and elective resections.

Problems with existing evidence

Direct adoption of a UK model of care will expose the differences between the two health systems and the problems of not modifying the model to fit within the New Zealand healthcare environment. In New Zealand there are hospitals undertaking emergency laparotomies without level 3 critical care units, a requirement for such a hospital in the UK. The remoteness of some patients and therefore the transfer times to tertiary hospitals is also a significant difference.

Furthermore, while many countries have shifted towards acute general surgery being undertaken by subspeciality upper and lower GI surgeons, there are still a significant proportion of generalists or breast surgeons undertaking emergency laparotomies throughout New Zealand. Overseas evidence has shown improved outcomes when emergency laparotomies are undertaken by GI surgeons, and especially where colorectal emergencies are treated by specialist colorectal surgeons. The feasibility of this in New Zealand is questionable, as it is only in the larger district health boards where there may be sufficient numbers of colorectal surgeons to run a sub-specialist on-call roster. In the New Zealand context, removing general and breast surgeons from on-call rosters may substantially increase the burden of out of hours work for GI surgeons.

The specialist general surgical training program in New Zealand and Australia has a stated aim of training specialist general surgeons to a level where they could confidently perform a weekend on call as a consultant general surgeon at a regional hospital. The length of the specialist general surgical training program is likely to be increased from four years to five years, to ensure that trainees have adequate exposure in the setting of reducing working hours for resident medical officers. Trainees enter the training program with a greater level of experience than their US equivalents, and sub-specialisation occurs later than in UK training programmes. The difference in performance between our ‘generalist’ general surgeons and our sub-specialist colorectal surgeons in performing emergency colorectal surgery may not be as significant as witnessed overseas.
Why we need a similar project in New Zealand

While there are obvious differences between our healthcare system and that in the UK, the current situation in New Zealand is far from defined. We have some data that demonstrates overall, our mortality post emergency laparotomy is similar to comparable countries internationally, but there are significant socioeconomic and ethnic differences in perioperative mortality\textsuperscript{15,16,23} and we need to explore this in more depth.

In addition, we have limited data at a national level regarding:

- The characteristics of these patients; level of frailty, sepsis, age groups and primary pathology
- The current standard; rate of operative versus non-operative management, types of operations performed
- Why we are doing what we are doing?

The latter is particularly relevant for our highest risk patients in terms of the broader ethical decisions around surgery. The care of these patients is resource-intensive, but it is unknown what actual resources are being utilised in New Zealand, and the differences in resource provision between hospitals. Furthermore, there has not previously been a prospective EL audit that has collected data on patients who were managed non-operatively.

Lastly, and most importantly, is the assessment of how patients fare in the medium to long term. While mortality is an obvious discrete outcome, and easy to capture at a national level in New Zealand using the National Minimum Dataset, we should also be looking for other outcomes that mean something to our patients—such as post-operative level of function and return to independent living following an emergency laparotomy. Morbidity and complication rates have been notoriously difficult to obtain routinely at national level, however a new outcome measure of days alive and out of hospital can be used as an index of morbidity.\textsuperscript{24} In New Zealand, days alive and out of hospital can be obtained routinely and with relative ease from the National Minimum Dataset.

How we can do this in New Zealand

To draw the kind of meaningful national information on processes and outcomes for our patients undergoing emergency laparotomies we need to enable the electronic recording of everyday clinical information as a matter of routine and in a prospective fashion. In so doing, we can extract accurate project-related data ‘in bulk’, using the existing (or minimally improved) health informatics and business intelligence support structures and collate results at a national level.

Fortunately, within New Zealand there are already some district health boards that are in an excellent position from this perspective.\textsuperscript{25} These information technology platforms are crucial, not only for this project but potentially for hospital quality improvement as we know it. Many DHBs are moving towards more patient records being electronic. Some district health boards have the ability to electronically extract a significant majority of the relevant dataset. Data points such as the time patient arrived in theatre, which surgeon and anaesthetist were present and which operation was performed are already recorded. Some of these data fields are reported to the Ministry of Health for the National Minimal Database (NMD), others form part of the hospital’s own administration records. Additional data such as frailty scoring and mortality risk calculators can be added as part of the electronic record with minimal adjustments to the already present clinical portal software. This data can then be uploaded into REDCap, a free healthcare database and already used internationally for healthcare research and audit projects.\textsuperscript{26,27}

It is possible to combine electronic data collection tools, streamlined to the clinicians’ workflow together with an automatic data-capture system. Key information, in turn, can be fed back to the clinicians, enabling them to make positive changes. In doing so, the data collection burden on clinicians (an issue in the UK in NELA) would be removed. While ultimately there will still be the requirement for some specific clinician-entered data, this would still be significantly less than NELA and similar projects. For example, the extent of support a patient may require at home after hospital discharge is
Introducing the Australia and New Zealand Emergency Laparotomy Audit-Quality Improvement (ANZELA-QI) and its adaptation for New Zealand

The Royal Australasian College of Surgeons (RACS) and the Australia and New Zealand College of Anaesthetists (ANZCA) have committed to supporting a bi-national bi-college Emergency Laparotomy Quality Improvement project (ANZELA-QI). This is the first of its kind and is potentially highly significant for perioperative medicine. The pilot version of this aims to roll out during 2018 and, following funding support, will extend across hospitals in Australia and New Zealand in both public and private sectors. Further information, including governance, inclusion/exclusion criteria, data collection form and the minimal dataset can be found on the RACS website. The pilot will allow assessment of the feasibility of the data collection methods, the end-user experience of clinicians as they enter data into an electronic assessment form (as opposed to handwriting in the clinical notes) and the data collection burden of the small number of remaining ‘manual entry’ data points. Standardised scores and measurements have been chosen for the pilot in both Australia and New Zealand; Rockwood frailty scoring, P-POSSUM and others and will be incorporated into the electronic assessment form.

We are in a unique position in New Zealand in that we have the potential to produce the high-quality process-of-care and outcome data with greater ease than Australia. This allows us to expand our dataset beyond the minimum stipulated by ANZELA-QI. Due to a smaller population size in New Zealand, less variation between health information system platforms, multiple DHBs moving towards electronic clinical record keeping (and therefore already collecting the majority of the data needed for this project), the National Health Index (NHI) and the NMDS (which is inclusive of NHIs, dates of admission and discharge, primary diagnosis and surgery performed (if any) and linked with the date of death), we can expand the project to include all cases of acute surgical abdomen and provide greater certainty of our data completeness. This will ensure that patients who qualify are not missed and the true denominator is captured, for example, to include patients who qualify for an EL but for various reasons do not undergo one.

Furthermore, we can combine this data with outcome measures of 30-day and one-year mortality, as well as days alive and out of hospital at 90 days after diagnosis of an acute abdomen at the national level. Such an extension of the project is not currently achievable in Australia.

Therefore, the New Zealand arm of ANZELA-QI has been designed with an expanded scope, entitled Care DELivery in New Zealand for the Acute Abdomen (CADENZAA). Combining the CADENZAA data with data from Australia will result in a larger dataset and greater statistical precision when interpreting results. Feedback of both New Zealand and combined bi-national results to the institutions will help drive quality improvement at a local level.

In practical terms, CADENZAA Site Lead Investigators at each district health board would need to first identify how much of the required data is already collected electronically. After this, an assessment of the ability to convert currently hand-written clinical notes (lost data) into an electronic format will take place. Once the data source blueprint is established for each DHB, guided by the CADENZAA Steering Group investigators, the project’s long-term sustainability is ensured through more reliable and largely automated data collection. Moreover, other clinical projects in the perioperative domain can be enabled by harnessing the established inter-professional networks both within and between DHBs. An example of such an established and successful network between DHBs is the New Zealand Global Rating Scheme (NZGRS). This was started by the National Endoscopy Quality Improvement Program, (Ministry of Health funded) to improve endoscopy services prior to the roll-out of colorectal cancer screening. It has been implemented across all DHB endoscopy units.
Funding for CADENZAA is currently being applied for. The initial funding, covering several pilot sites, is required to demonstrate that the concept of electronic data collection and extraction is achievable and to enable further funding for a nationwide project. The sustainability of such projects has been illustrated by NELA with a two-day reduction in average length of stay, resulting in a £22 million saving per annum.\textsuperscript{7–9}

We believe the opportunity to measure accurately and continuously (yet unobtrusively) what we are doing nationally, by combining the expertise of clinicians from multiple specialties, together with health informatics specialists and business intelligence professionals is the way forward in healthcare quality improvement. Feeding this information back promptly and continuously will equip clinicians with the knowledge and armamentarium to optimally engage in raising quality and safety of patient care. Success in achieving this ‘proof of concept’ approach will have a far reaching and ultimately positive impact on healthcare in New Zealand and beyond.

\textbf{Competing interests:}
Nil.

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