

Quality improvement and emergency laparotomy care: what have we learnt from recent major QI efforts?

Authors: Tim Stephens,^A Carolyn Johnston^B and Sarah Hare^C

ABSTRACT

More than 1.53 million adults undergo inpatient surgery in the UK NHS. Patients undergoing emergency abdominal surgery have a much greater risk of death than patients admitted for elective surgery. Widespread variations in key standards of care between hospitals exist and are associated with differences in mortality rates.

Recently there have been three large-scale initiatives to improve quality of care for emergency laparotomy patients: the National Emergency Laparotomy Audit, the enhanced perioperative care for high-risk patients trial and the Emergency Laparotomy Collaborative. Here we provide a critical review of what we currently know about the use of structured methods for improving the quality of healthcare services, with reference to the three initiatives. We find that using structured methods to improve care is the hallmark of quality improvement but attention must too be paid to the context in which these methods are used.

KEYWORDS: Postoperative care/methods, quality improvement, surgical procedures, operative mortality

Introduction

More than 1.53 million adults undergo inpatient surgery in the UK NHS each year with a 30-day mortality of 1.5%.¹ However, patients undergoing emergency abdominal surgery have a much greater risk of death.^{2,3} Latest figures show around 25,000 patients undergo these procedures in NHS hospitals each year, with 30-day mortality rates of 9.6%.² Widespread variations in key standards of care between hospitals exist, including the involvement of senior surgeons and anaesthetists and postoperative admission to critical care. These variations have been associated with differences in mortality rates.^{2–4}

There have been significant efforts focused on addressing these issues, both within the UK and internationally.^{2,5–8} In the UK, there have been three large scale initiatives to improve quality of care for emergency laparotomy patients: the National Emergency Laparotomy Audit (NELA), the enhanced perioperative care for high-risk patients (EPOCH) trial and the Emergency Laparotomy Collaborative (ELC). Although different in many aspects, at their hearts all three projects focus on using quality improvement (QI) methods to improve key care processes and, ultimately, patient outcomes. QI involves systematic efforts to reduce unwarranted variation in healthcare, using structured methods to make the changes that will lead to better system performance and better patient outcomes.⁹ There are good examples where discrete QI interventions have been associated with improved patient outcomes but others have yielded disappointing results, especially for complex interventions requiring coordinated change across complex hospital systems.^{10–14} There are now growing calls for a more critical appraisal of QI initiatives, so that the science of improvement can be more robustly developed.¹⁵ At a national level, during the lifetime of these projects the 30-day mortality associated with emergency laparotomy has decreased from a historical figure of 14.9% to 11.8% by the end of the first year of NELA, and to 9.5% in 2018.^{2,3,16} This is an important and positive development for this patient group. However, the specific contribution of QI methodology to this reduction in mortality is challenging to ascertain due to the multiple different project designs, with overlapping time periods and differing results obtained from the two intervention studies (EPOCH and the ELC). This is a common challenge in current improvement science research.^{17,18}

The objective of this paper is to provide a critical review of what we currently know about the use of structured methods for improving the quality of healthcare services, with reference to the three aforementioned UK initiatives focused on emergency laparotomy care.

Three major initiatives to improve emergency general surgery

NELA is an ongoing major national audit commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England and the Welsh government.^{2,19} NELA is one of the first national audits to provide real-time data to inform clinicians about the process of patient care and subsequent outcomes at both the local (hospital) and national (NHS) level. Facilities to

Authors: ^Aresearch fellow, Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, UK; ^Banaesthetist, St Georges University Hospital NHS Trust, London, UK and quality improvement lead, National Emergency Laparotomy Audit, Royal College of Anaesthetists, London, UK; ^Canaesthetist, Medway Maritime Hospital, Kent, UK and clinical lead, National Emergency Laparotomy Audit, Royal College of Anaesthetists, London, UK

access data instantly, rather than waiting for annual reports, allowed a data driven QI approach to be used in both the EPOCH trial and ELC project. The EPOCH trial was a large stepped-wedge, cluster randomised trial of a national QI programme to implement a care pathway of 37 elements for patients undergoing emergency laparotomy, which was funded by the National Institute for Health Research.⁶ EPOCH used NELA data to study outcomes for almost 16,000 patients in 93 NHS hospitals throughout the UK. While the QI intervention did not impact upon patient survival, EPOCH provided vital learning about how we can and cannot improve patient care using large-scale QI programmes.^{20,21} ELC was a large QI project funded by the Health Foundation, adopting implementation science to improve patient care.⁷ The project was led by the Kent Surrey Sussex Academic Health Science Network (www.kssahsn.net) in 28 NHS hospitals, and used a quality improvement collaborative model to help teams to implement a laparotomy care bundle. Using statistical process control chart analysis, the ELC demonstrated an improvement in care-bundle compliance with a concurrent association with decreased 30-day mortality (to 8.3%) during the course of the ELC project.⁶ However, the ELC was designed as a QI project rather than a clinical trial and the observational nature of the study and lack of control group mean a causal relationship between the intervention and improved outcomes cannot be confirmed.

The main QI methods and their usage to improve emergency laparotomy care

Audit and feedback

In an audit and feedback (A&F) process, an individual's or team's performance is measured and then compared with agreed professional standards or targets. The results of this comparison are then fed back to the individual or team with the aim of encouraging greater adherence to the desired professional standards.^{22,23} Most A&F has been focused at the individual clinician level and the most recent Cochrane systematic review of the evidence found this methodology can lead to small but potentially important improvements in professional practice.²² Effectiveness seems to depend on baseline performance, with poor baseline performance more amenable to change, and also on how the feedback is provided. Studies of team-based A&F were absent from the 2012 Cochrane Review but there is a small but emerging body of research suggesting that a team-based approach can be effective, although the mechanisms of effect may be different from individual-level feedback.^{24–26}

In the efforts to improve emergency laparotomy care, A&F has been facilitated by the data presentation tools provided by the NELA team, and team-based A&F has been promoted by all three improvement projects as a key strategy to motivate teams to improve local care processes. However, challenges exist in delivering effective A&F, including difficulties in data collection and a lack of formal opportunities for feedback resulting in data feedback that is not contemporaneous; healthcare teams are generally considered pseudo-teams and so team members receiving the feedback may or may not have been those involved in the performance under review;²⁷ and some performance feedback may be regarding key standards that are outwith of the team's ability to influence, eg access to emergency theatres limited by capacity issues. All the consequences of these challenges are likely to weaken the potential impact of A&F on process improvement.^{22,26}

Model for Improvement and plan, do, study, act cycles

The Model for Improvement focuses on using data to understand current performance, setting clear, measurable goals and then developing potential solutions to achieve these goals.²⁸ The plan, do, study, act (PDSA) cycle promotes rapid cycle testing of these potential solutions, re-evaluating performance on a regular basis and adjusting solutions iteratively based on that review. The four stages mirror the scientific experimental method of formulating a hypothesis, collecting data to test this hypothesis, analysing and interpreting the results and making inferences to iterate the hypothesis.²⁹ Unlike A&F, which has been extensively researched, there has been little empirical evaluation of this approach. The research that does exist, on the PDSA cycle specifically, suggests clinical staff often find PDSAs difficult to carry out in the methodical fashion intended, often with consequently disappointing results.^{29,30}

Use of NELA data can facilitate situational awareness and support tracking of progress with improvement solutions (the 'How will we know a change is an improvement?' question in the Model for Improvement). In all three projects, the clinical standards or target care processes were prescribed eg patients should enter the operating theatre within their target National Confidential Enquiry into Patient Outcome and Death time-frame or patients should be admitted to a critical care unit postoperatively. The challenge for those clinicians leading change locally was therefore not 'what to improve' in order to reduce mortality for these patients, but 'how to improve' care locally in line with these standards. Time constraints inherent in clinician-led QI, plus, in the case of the EPOCH trial, the complexity of the care pathway meant that the experience of the EPOCH/ELC teams mirrored that of the extant research. Frontline teams did not receive sufficient training to use the approach and/or did not have sufficient time in their working week to methodically develop, test and refine potential solutions that would lead to improved care. This was a major theme of the evaluation of the EPOCH trial in particular (explored further below).²⁰ Another recent controlled evaluation in another aspect of emergency surgery (the CholeQuIC project) found that the time spent on deliberation upfront made for better solutions that needed fewer rounds of testing, but that an openness within the team to testing and iterative adaptation was also vital.³¹ Thus acting 'scientifically and pragmatically' through a trial-and-error-based approach may be more palatable to busy frontline clinicians than the PDSA cycle approach.³²

QI collaborative approach

A QI collaborative (QIC) is an organised, multifaceted approach that includes teams from multiple healthcare sites coming together to learn, apply and share improvement methods, ideas and data on service performance for a given healthcare topic.³³ Although sites may use methods such as A&F or the Model for Improvement to effect change locally, the added value of the collaborative approach is thought to be the creation of a new cooperative space for clinicians to share and learn together outside their normal working environment.³⁴ A recent systematic review found that 53 of the 64 studies (83%) that met the Effective Practice and Organisation of Care study design standards for inclusion found measured improvements in at least one target process. Collaboratives reporting success generally

addressed relatively straightforward aspects of care, had a strong evidence base and noted a clear evidence–practice gap in an accepted clinical pathway or guideline.³⁴ Notably, only one of the collaboratives focused on perioperative care.³⁵

The ELC was based on a QIC approach with multiple collaborative meetings, both cohort-wide and regional meetings within the cohort, and webinars/calls over the 2-year project period. Conversely, the EPOCH trial followed a more ‘light touch’ QI campaign approach, with the focus on awareness-raising and basic QI skills training. Face-to-face contact was relatively limited, with additional support and resources available online. The QI campaign is a successful approach to QI, but it is likely, based on the results of the EPOCH trial, that it is not suited to complex quality problems, even in the presence of accepted evidence-based guidelines as the hard core of the intervention.^{20,36}

Other QI approaches, such as Lean and Six Sigma are used in the NHS but were not used in any of the three emergency surgery projects so are not included in this review.³⁷

Beyond QI methods: the influence of context on QI in emergency surgery

Context characterises the overall environment in which QI activities take place and includes prevailing national policies, local organisational structure, the culture of an organisation overall and of the specific departments within an organisation.³⁸ Contextual factors are distinct from the clinical and QI interventions within an improvement project but are highly influential on the success or otherwise of such projects.³⁹

Recent work by the NELA group has identified that a substantial amount of the observed variation in mortality nationally was explained by differences in hospital structures and characteristics, such as the number of operating theatres available or the existence of an emergency surgical unit.⁴ The work of Donabedian on the relationship between structure, process and outcome remains highly relevant and QI methods are best suited to tackling process, rather than structural quality problems.⁴⁰ For example, improving the process by which emergency patients flow through theatres could be amenable to QI methods, but increasing the number of theatres available (with commensurate staffing and equipment) is an organisational management issue, requiring additional funding, recruitment and procurement. It is perhaps notable that across all three initiatives, improving the time for getting emergency laparotomy patients into theatre has remained the most stubbornly challenging aspect of care to improve, suggesting that it may not be amenable to improvement by QI methods alone.^{2,6,7}

Consideration of context goes beyond the structural aspects of an organisation. In the EPOCH trial, limited resources, both human and financial, and organisational upheaval were cited as key challenges by many interviewed in the process evaluation, as was lack of engagement of colleagues and hospital executives.²⁰ One significant consequence of this may have been a lack of organisational support for NELA data collection in around half of the EPOCH trial sites. A non-supportive context meant that the burden of data collection fell to a few clinicians leading the local improvement projects. While data is central to any QI project, it is the use of this data through feedback, combined with other improvement strategies, that is likely to achieve more robust results.^{22,41–43} If future QI programmes are to capitalise on concurrent national audits or other ongoing data collection, contextual factors need to be addressed to allow embedding of

data collection processes well before the start of any improvement work. This may take considerably longer than anticipated.⁴¹

Interpretation and discussion

This review, particularly in the context of these three initiatives, demonstrates the challenge of QI in healthcare. Using structured approaches to improvement is the hallmark of QI but attention must too be paid to the context – at the system/policy, hospital and team levels. Due to the time and effort required to effectively apply such methods, and the need for colleagues to change behaviours or practice as a result, an unsupportive context may stymie even the most rigorously applied QI methods. The impact of time and resources also needs to be recognised. Resource is required not only at the national or regional improvement project level, to focus attention and support change, but at the individual hospital level to unblock contextual barriers to improvement. While ostensibly the ELC did not provide hospitals with any more resources than the EPOCH trial QI programme, the impact of NELA (and indeed the EPOCH trial itself) was likely to have generated a more receptive context for improvement in emergency general surgery, with a greater awareness of the problem, not least among senior and middle management in hospitals, and regional and national policymakers. The ELC, with a 2-year project period, also provided more time for change to occur than the EPOCH trial. To that end, improvement-focused national audits such as NELA may prove to be the most effective centrally organised approach to the improvement of complex quality issues due to the open ended time period (rather than a time-constrained ‘project’), and also due to the potential impact on structural issues in the medium to longer term, such as the number of operating theatres, through national reporting and benchmarking. However, data needs to be used locally to effect change and that means time to focus on improvement must be included in job plans for clinical staff and frontline managers, allied with appropriate training in QI skills. QI is not a quick and easy fix for complex quality problems. As such, using QI to improve emergency surgical care, indeed any complex system issue in healthcare, requires not only the right QI ‘method’ but also time, commitment and resource from healthcare organisations if efforts are to lead to actual improvements in patient outcomes. ■

Conflicts of interests

Carolyn Johnston and Sarah Hare both receive salary support for their roles within the National Emergency Laparotomy Audit. Tim Stephens received salary support for his roles in the EPOCH trial and Emergency Laparotomy Collaborative.

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Address for correspondence: Tim Stephens, Critical Care and Perioperative Medicine Research Group, William Harvey Research Institute, Queen Mary University of London, c/o ACCU Research Team, Royal London Hospital, London E1 1BB, UK.
Email: t.t.stephens@qmul.ac.uk