4 Emergency anaesthesia

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4.1 Risk assessment and preparation for emergency surgery

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Why do this quality improvement project?

Preoperative assessment of risk is an essential component of high-quality perioperative care, informing discussions of treatment options and identifying patients who may benefit from augmented care pathways. Delivery of multidisciplinary care using protocols is associated with improved survival after emergency laparotomy. Preoperative risk assessment is reported by national clinical audits and is required for English NHS trusts to receive best-practice tariff remuneration after emergency laparotomy.[1,2]

Background

Likelihood of adverse outcomes (including death, morbidity, reduced quality of life and increased dependency) may be estimated before surgery. Individualised estimates draw on population-level research. These assessments of 'risk' may not be routinely performed and are often poorly communicated both with patients and between healthcare professionals. By categorising risk, it may be possible to pre-emptively identify the minority of 'high-risk' patients in whom the majority of adverse events occur. The specifics of what clinicians do with this information are contested, but there is evidence that consistent delivery of emergency surgical care using protocols is associated with improved survival.[3,4]

A wide variety of methods exist for assessing perioperative risk. Prediction models (most based on logistic regression) are usually the most appropriate in the context of emergency surgery. Bespoke models calibrated for contemporary populations are often the most accurate.[5]

Death is often preceded by the development of morbidity after emergency surgery. Morbidity may also be associated with excess mortality for several years after surgery. Unfortunately, non-mortality outcomes appear to be harder to accurately predict.

The National Emergency Laparotomy Network (NELA) has reported a steady improvement in risk documentation before emergency laparotomy, but marked variation persists between and within hospitals.[1]

Best practice

Risk of death (and substantial morbidity) should be assessed using the most accurate and clinically appropriate method. Estimates should be clearly recorded and if risk varies by the available treatment options, competing estimates should be recorded.

Estimate(s) should be communicated to the patient and family in appropriate terms. Categories of risk may be more appropriate than quoting percentage predictions! Risk estimates should inform discussions of treatment decisions and consent for surgery. The Choosing Wisely campaign 'Benefits Risks Alternatives, and what happens if we do Nothing (BRAN)' framework may be useful.[6]

'High-risk' individuals should be clearly identified in team briefs, multidisciplinary communication and planning of perioperative pathways of care. Risk factors may persist over the days after emergency surgery, so these practices should be continued for high-risk patients until they recover from their acute illness.

Patients must be actively involved in shared decision making and supported by clear information from healthcare professionals to make fully informed choices about treatment and continuing care that reflects what is important to them, in line with the ten standards of NHS 7 Day Services.[7]

Suggested data to collect

Teams should not be overburdened with data collection; a distinct advantage of this project is that most, if not all, of the data for the management of emergency laparotomies are already collected as part of NELA. In addition, the data are readily downloaded and analysed, in particular a section on the proportion of cases for whom risk of death was documented before surgery. Lessons learned from NELA may be able to be extrapolated to management of other major emergency surgeries:

- type of emergency surgery performed
- whether or not an assessment of risk has been documented on consent form
- the nature of the adverse event identified
- whether or not risk was discussed with the patient (or their relatives if appropriate).

Quality improvement methodology

There are helpful resources particular to NELA on the website, including a link to quality improvement videos.

Quality improvement is best undertaken as a team, whereby all the relevant stakeholders, including patients, are represented. This assists in incorporating views and issues at an early stage and also in feeding back the results of change projects.

NELA data analysis should be able to reveal deficiencies in risk assessment for emergency laparotomy against national standards and comparison with peers. Understanding the local system is vital to identify where improvements can be made. A process map can be helpful in putting information about the system into diagrammatic form, incorporating the perspectives from the stakeholders.

Use a driver diagram to define the specific outcome, the what, by how much and by when aims, which should (in this context: reduction in mortality, complications and cost), identify the primary (pre-, intra- and postoperative care) and secondary drivers, which are often processes that lead to the desired outcome (eg in preoperative care, secondary drivers are frailty, nutrition and cognition assessment).

The Model for Improvement is useful to provide a structure to the change projects and the change ideas that are generated from the driver diagram can be incorporated into the plan-do-study-act (PDSA) cycle. Change projects should be focused and short, with rapid audit of the relevant data to assess the success or otherwise of an idea.

Collected data either for a single process (eg risk assessment) or as a care bundle displayed as 'run charts' and or statistical process control charts to assess implementation and improvement using PDSA methods.

Case example

Since starting to collect patient-level data in 2013, NELA has asked participants to indicate whether risk of death was documented before surgery and, if it was, to categorise risk and identify which method was used to estimate risk.

In the first year, only 56% of patients had risk of death documented before surgery and, at hospital level, risk was consistently (over 80% of patients) documented at only 14% of hospitals. Analysis revealed that, of those patients for whom risk had not been documented, more than half were at greater than 5% risk of 30-day mortality. Over subsequent years, NELA has provided clinicians with a host of quality improvement tools and hospital-level reports and has targeted recommendations to improve risk documentation. By the fourth year, risk had been documented in 74% of all patients and, of these patients, with probability of 30-day mortality being formally calculated in 61%. Mortality over the same time period has reduced.

Mapping

ACSA standards: 4.2.2.2, 4.2.3.1, 4.2.3.2, 1.5.1.1, 1.5.1.2, 1.5.1.3

Curriculum competences: GU IK 11, GU IK12, GU IS 02, GU IS 05, GU IS 06, GU HK 01, GU HK03, GU HS 01, GU HS02, GU HS03, GU HS 05

CPD matrix code: 3A03

GPAS 2020: 2.1.1-2.9.15, 3.1.1-3.9.5, 4.1.1-4.9.3, 5.1.1-5.9.18

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4.2 Theatre provision for emergency surgery

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Why do this improvement project?

Emergency surgery should not be delayed for operational reasons. Each hospital should have at least one emergency theatre with appropriate staffing, on standby for emergency cases at all times. Some hospitals may have more than one emergency theatre, as determined by their case-mix and caseload. Provision and staffing of emergency theatres should be in line with RCoA guidelines.[1] Anaesthetists play a key role in the management and running of the emergency operating list, whether through being in a direct managerial role, or by virtue of being the senior consultant on-call tasked with making the best use of an often limited resource.

Background

Whereas there is a wealth of literature concerning the optimal use of the elective operating room (OR), the literature[2] on management of emergency ORs is sparse. It is reasonable to maximise utilisation of an elective OR, and failure to do so implies mis-management of resources. However, a hospital needs to staff and fund an emergency OR even if there are few, or no emergencies. Indeed, the more 'empty' an emergency OR is, the more rapidly will an urgent case receive care. So, a different metric is required best related to the delay in access to emergency OR once a case is booked.

Furthermore, some operations need to be done immediately (eg unstable ruptured aortic aneurysm) whereas others might reasonably wait longer (eg small abscess in a non-septic patient). Any concept of 'delay' needs to take into account the delay that is appropriate to the urgency of the case.

Best Practice

- Overall demand on emergency OR should be <85% of its capacity.
- Actual utilisation of emergency OR should be <85% of its capacity.

Data should be collected to assess if emergency demand is so great that more than one emergency OR is required. If the OR is utilised >85%, then established demand-capacity analyses show that this indicates saturation of the system and a risk of delayed access[5].

- Emergency patients should be assigned an outer limit of time before the surgeon regards it as delayed care. The time listed for each case by which it should be done should correlate with the actual time for that case to access OR. NCEPOD provides a category cases by urgency[3] and individual centres have further refined this to provide more discrete times by which cases should be done[4].
- Outcomes should be within published national reference norms, and be unaffected by delay.
- Consider unused time on elective lists for emergency cases, for example after cancellation of elective cases. This will depend on casemix, equipment availability and skills of staff in those elective ORs.

Suggested data to collect

1. Assess demand for emergency surgery in each 24 h period by estimating the time for each operation booked. If measured demand measured is greater than 85% of the time available, (ie cases fill more than 20 h) then capacity may be inadequate.
2. Assess actual utilisation of the emergency OR in each 24 h period. If utilisation is consistently >85% (ie >20 h) this implies inadequate capacity. Record the number of cases (and the time they took) if allocated to unused capacity on elective lists.
3. Measure the waiting time for each case, against the maximum waiting time according to its urgency. If the former consistently exceeds the latter, this implies inadequate capacity.
4. Assess outcomes (eg death before surgery, 30 day and 1 year mortality, or other markers of outcome such as return to OR) against actual delay.
5. For all data, both the mean/median and the variance (standard deviations or interquartile ranges) must be given.
6. Subsidiary audits may include: demand on emergency OR by specialty; or extent to which the time estimates by which cases should be done are accurate.
7. Audit staffing of emergency ORs. Note root causes of delayed access, such as rostering of surgeons so that they are available, or scheduling of pre-operative diagnostic tests, etc. Finding delayed access when capacity is adequate should trigger further investigation.

Some of the data may already be collected through the use of other audit tools (eg NELA, National Hip Fracture Database), which simplifies analysis and presentation, especially when comparing the data within a Trust or with peers.

QI methodology

- Process mapping is helpful to indicate steps causing significant delays, or unreliable steps.
- A Pareto chart is useful to indicate which cause of delays will be the best target for improvement.

There are other issues unexplored which may be amenable to different methodologies, exemplified by the following examples:

Case #1:

2 cases are booked, one can be done within 6 h; the other must be done within 1 h. The former is booked first, but generally, a joint decision would be that the second takes priority. This is fine unless of course this second case will take > 6 h. This will cause a breach of the first case.

Case #2:

3 urgent cases (need to be done, each within 1 h) turn up almost at once. Each takes 6 h. Overall utilisation is 18/24 h = 75%, superficially indicating plenty of capacity but in fact 2 cases greatly breach their times, one by 6 h and the other by 12 h. If this is a frequent occurrence, does this warrant permanently staffing a 2nd emergency OR.

Case #3:

A hospital has an emergency OR that is generally utilised to its capacity. It is proposed to introduce a new service that would impact on this with infrequent but very long cases (eg bowel transplants). This would mean that, x times per year, emergency OR would be devoted only to that single case for periods of >12 h, causing breaches of all other cases. Short of cancelling elective lists on those days, how is this service to be best managed?

Mapping

ACSA standards: 1.1.18, 4.2.3.1, 4.2.3.2

GPAS 2020: 5.1.1; 5.1.3; 5.1.4; 5.1.5; 5.2.6; 5.5.1; 5.5.2; 5.5.3; 5.5.4; 5.5.15; 5.5.16; 5.5.17; 5.5.18; 5.5.19; 5.5.21; 5.5.22; 5.5.35; 5.5.45; 5.7.3; 5.7.4

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4.3 Emergency laparotomy

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Why do this quality improvement project?

Improving the care of patients undergoing emergency laparotomy will ensure better patient outcomes for this very high risk patient group through assessment of risk, senior clinician input, defined perioperative care pathways and streamlining of resources.

Background

Emergency laparotomy is one of the highest risk emergency surgical procedures undertaken in most hospitals.[1] Patients can present acutely unwell with significant physiological derangement with sepsis, complications of previous surgery, haemorrhage, cancer or a range of other pathologies.[2] Patients on their perioperative journey may require services from the emergency department, diagnostic radiology, pathology, operating theatres, critical care unit or surgical ward, often within hours of arrival at hospital.[3]

Best practice

The National Emergency Laparotomy Audit (NELA) and the Emergency Laparoscopic and Laparotomy Scottish Audit (ELLSA) measure against standards set by NCEPOD, the Royal College of Surgeons (RCS) and the National Institute for Health and Care Excellence.[4]

Suggested data to collect

Standards	Measures
Hospitals that admit patients as emergencies must have access to both conventional radiology and computed tomography (CT) 24 hours a day, with immediate reporting.	■ Proportion of all emergency laparotomy patients who received a preoperative CT report by an in-house consultant radiologist. ■ Discrepancy rates between CT report and operative findings.
An assessment of mortality risk using a validated risk score in conjunction with clinical assessment should be made explicit to the patient and family and recorded clearly.	■ Percentage of patients with a documented risk assessment prior to theatre.
Each high-risk cases should have active input of a consultant surgeon and anaesthetist in decision making and in the operating theatre.	■ Percentage of patients who have consultant (anaesthetists or surgeon) presence in decision making and in theatres.
Trusts should ensure that emergency theatre access matches need and should ensure that prioritisation of access is given to emergency surgical patients ahead of elective patients whenever necessary, as significant delays are common and affect outcomes.	■ Proportion of patients arriving in theatre within a time appropriate for the urgency of surgery: immediate surgery for bleeding, surgery underway <3 hours for septic shock, <6 hours in sepsis source control or <18 hours in other cases.
Each patient aged >70 years should have multidisciplinary input that includes medicine for the care of older people. At-risk patients should be screened for frailty.	■ Percentage of patients >70 years referred to medicine for the care of older people. ■ Percentage of patients >70 years screened for frailty.

Some patients having emergency laparotomy may also fall under standards set by the Surviving Sepsis Campaign.[5] All patients should be considered at risk for sepsis and should have sepsis screening performed at admission.

- Percentage of patients with suspicion of sepsis at admission or time of decision to operate and timing of antibiotic administration.
- Percentage of patients having lactate measurement and goal directed fluid therapy in theatres.

Quality improvement methodology

Risk assessment

Draw out a process map from the time between assessing and booking an emergency laparotomy case:

- Where is it most helpful to remind staff to undertake a calculation of risk of death?
- Does the risk score prompt activation of appropriate high risk care pathways?
- Which members of staff are most reliable at calculating risk? Do they have any lessons to share with their peers?

Timely access to theatres

Look at the process map of a patient undergoing emergency laparotomy from admission to accessing theatre:

- Look for places where the process is unreliable or where it could be made simpler or quicker.
- Look at cases which fail the required standard by a long way (you can look at this with a SPC chart if you have this capability), where there any common features in these cases?

Hold a multidisciplinary meeting to 'walk through' the emergency laparotomy patient pathway and to discuss the process map.

- Where are delays likely to occur, what are the barriers to delivering optimal care?[6] Work with colleagues to prioritise projects for action.

Consider using a 'care bundle' such as that used in emergency laparotomy quality improvement programmes.[7,8] Monitor implementation of each component of the care bundle with run charts to show progress and demonstrate areas where more improvement is needed.

Mapping

ACSA standards: 4.2.2.2, 4.2.3.1, 4.2.3.2, 1.5.1.1, 1.5.1.2

Curriculum competences: GU IK 11, GU IK12, GU IS 02, GU IS 05, GU IS 06, GU HK 01, GU HK03, GU HS 01, GU HS02, GU HS03, GU HS 05

CPD matrix code: 3A03

GPAS 2020: 5.1.1, 5.1.2, 5.1.3, 5.2.6, 5.2.8, 5.2.9, 5.2.10, 5.2.11, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.9, 5.3.19, 5.3.20, 5.3.21, 5.3.22, 5.5.2, 5.5.3, 5.5.8, 5.5.21, 5.5.24, 5.5.25, 5.5.26, 5.5.27, 5.5.28, 5.5.29, 5.5.30, 5.5.32, 5.5.61, 5.5.62, 5.5.67, 5.7.1, 5.7.3, 5.7.4

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4.4 Emergency anaesthesia for the elderly patient

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Why do this quality improvement project?

National reports have repeatedly demonstrated that the perioperative care of the older patient undergoing emergency surgery is poor compared with younger patients and when the same procedure is performed electively.[1–3] Although, not unsurprisingly, older patients with limited physiological reserve and multiple comorbidities have higher postoperative morbidity and mortality, what is unacceptable is the several-fold variation found in the standard of care and mortality of these vulnerable patients.

Improving the perioperative care of these patients through a multidisciplinary approach, starting with enhanced preoperative risk assessment, intraoperative strategies and collaboration with medicine for the care of older people postoperatively will ensure the best possible outcome.[1–3]

Background

Much emergency surgery is performed in the elderly, with the most common procedures being fractured neck of femur, laparotomy and vascular procedures. As an example, almost half of the patients presenting for emergency laparotomies are over 70 years old and almost 10% are frail. These patients have, in addition to multiple comorbidities, age-related physiological decline and geriatric syndromes (frailty and cognitive dysfunction) which complicate their care. Thus, to provide the best quality care, a multidisciplinary approach is needed, involving emergency medicine, geriatricians, anaesthetists, intensivists and surgeons,[2] and the establishment of a dedicated emergency older patient care pathway with processes to improve areas highlighted by the NCEPOD audits (1999 and 2010).[1,3] Areas highlighted include frailty and nutritional assessment, delirium and dementia management, good pain management and increased involvement of medicine for the care of older people postoperatively.

Best practice

The Association of Anaesthetists guidelines on perioperative care of the elderly (2014) and perioperative care of the patient with dementia (2019).[4,5]

Suggested data to collect

Frailty

Frailty is now recognised as an independent risk factor for poor outcomes. An assessment of frailty should be made in addition to assessment of comorbidities. Preoperative frailty should be assessed using a suitable frailty tool even in the emergency setting (eg the Clinical Frailty Scale).[6]

Measures

- Percentage of frail patients identified and operated on.
- Percentage highlighted pre- or postoperatively to medicine for the care of older people team for input.

Nutrition

Malnutrition is identified as a marker for increased postoperative complications and mortality. Low albumin is predictive of poor outcome.

Measures

- Percentage of patients who have malnutrition.
- Time to restarting of oral nutrition and other nutritional interventions postoperatively.

Cognition

Poor baseline cognitive function is a risk factor for postoperative delirium and postoperative cognitive dysfunction. Delirium complicates the recovery process with increased risk of falls, chest infections and prolonged cognitive impairment.

Measures

- Preoperative cognitive screen (eg using a validated tool such as the Mini-Cog or the 4AT,[7,8] which incorporates delirium assessment with quick tests of cognitive function).[9]
- Intraoperative avoidance of deleriogenic medications (eg benzodiazepines and anticholinergics).
- Recovery room delirium testing (eg using nursing delirium screening scale or the confusion assessment method).[10,11]
- Screened positive patients referred to medicine for the care of older people for management.[12,13]

Intraoperative

Avoidance of hypotension as mean arterial pressure less than 65 mmHg even for five minutes duration increases risk of cardiac and renal impairment.[14] Minimised by using age-adjusted MAC (minimum alveolar concentration at 1 atm) values for volatile agents and/or the use of depth of anaesthesia monitors (eg bispectral index).[15]

Measures

- Percentage of time that patients have mean arterial pressure less than 65 mmHg.
- Use of age-adjusted MAC and depth of anaesthesia monitors.
- Postoperative complication rates for cardiac and renal function.

WHO Surgical Safety Checklist

Amendments to World Health Organization Surgical Safety Checklist for patients over 75 years as recommended by the Association of Anaesthetists' perioperative care of the elderly guidelines (see section 2.1).[4]

Measures

- Amendments at sign in, time out and sign out.
- Percentage of older patients following the amended checklist.

Additional notes

Some of these data may already be collected through the use of other audit tools (eg the National Emergency Laparotomy Audit, National Hip Fracture Database). One advantage of these systems is that analysis and presentation is easy, especially when comparing the data within a hospital or with peers. It is important not to overwhelm staff and the system with onerous data collection just for the sake of it. Indeed, oversight of the data collection should ensure that only useful data that can be used for change projects should be collected.

Ideally, the data collection should be incorporated with the hospital's existing electronic systems and fed into an online dashboard system that can be easily extracted and analysed when being used for quality improvement.

Quality improvement methodology

Quality improvement is best undertaken as a team whereby all the relevant stakeholders, including patients, are represented. This assists in incorporating views and issues at an early stage and also in feeding back the results of change projects.

The care of elderly patients is complex, and the temptation should be resisted to rush into implementing changes without first determining those most likely to be successful. Once broad areas for improvement have been identified, there are various quality improvement tools available to assist in identifying the underlying reasons for a problem and optimising the chances that a change will be successful.

Use a driver diagram to define the specific outcome: the 'what, by how much and by when' aims (in this context, reduction in mortality, complications and cost), identification of the primary (pre-, intra- and postoperative care) and secondary drivers, which are often processes that lead to the desired outcome (eg in preoperative care the secondary drivers are frailty, nutrition and cognition assessment).[16]

The model for improvement is useful to provide a structure to the change projects, and the change ideas that are generated from the driver diagram can be incorporated into the plan-do-study-act (PDSA) cycle. Change projects should be focused and short with rapid audit of the relevant data to assess the success or otherwise of an idea.

Collect the data either using single focus (eg cognition) or as bundles displayed as 'run charts' and/or statistical process control charts to assess implementation and improvement using PDSA methods.

4.4 Emergency anaesthesia for the elderly patient

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Mapping

ACSA standards: 1.2.1.4, 1.1.3.1, 1.1.3.2, 3.1.2.4, 4.2.3.1

Curriculum competences: GU BK 13, POM BK 10, POM BK 13, POM BK 16, POM BK 18, POM BS 06, POM BK 25, GU IK 11, GU IS 06, POM IS 07, POM IS 21, POM HS 10, POM HS 19

CPD matrix codes: 2A03, 3A03

GPAS 2020: 5.3.1-10, 5.3.19-22, 5.3.34, 5.3.35, 5.5.24-29, 5.5.61-67, 5.7.1-4, 16.1.13-15, 6.3.14-19, 6.5.22, 6.7.2, 6.7.3

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4.5 Anaesthesia for fractured neck of femur surgery

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Why do this quality improvement project?

Improve perioperative quality of care and outcomes in patients undergoing emergency fractured neck of femur surgery through multidisciplinary initiatives. Strive to standardise perioperative anaesthetic care.[1]

Background

In 2017, around 66,000 patients were admitted to hospitals across England, Wales and Northern Ireland with fractured neck of femur.[2] It is estimated that the NHS spends 1% of its budget on caring for these patients in the perioperative period. The National Hip Fracture Database (NHFD) reported 30-day mortality as 6.9% in 2017.[2] Although there is a downward trend in mortality, there remains great variation in outcomes between different regions and hospitals.

Patients undergoing surgery are often frail with multiple comorbidities contributing significantly to their perioperative risk. Complications occurring secondary to anaesthesia are more likely to present in the first five postoperative days.[1] Anaesthetists with a specialist interest in elderly care can therefore play a major role in improving survival and outcomes, not just by delivering effective anaesthesia but also by acting as the lead perioperative physician during the whole perioperative journey.[1] The key outcome goals include minimising the incidence of postoperative delirium, early mobilisation and re-enablement.[1]

Best practice

- The NHFD outlines key performance indicators produced against National Institute for Health and Care Excellence guidelines and clinical standards.[2–4]
- Association of Anaesthetists guidelines.[5]
- International Fragility Fracture Network.[1]

Suggested data to collect

Prompt surgery

Surgery should be performed within 36 hours of admission,[2] and anaesthetists should facilitate this objective.[1] Ensure that surgery is not delayed due to inadequate preoptimisation of 'correctable comorbidities'[3] and/or management of theatre lists (see Part A Quality improvement in anaesthesia).

Measures

- Percentage of patients having their surgery delayed or cancelled.
- Proportion of delayed or cancelled cases due to medical and/or organisational reasons.

Experienced anaesthetist

Anaesthesia should be administrated by a clinician who delivers anaesthesia regularly to patients undergoing hip fracture surgery.[1,4]

Measure

- Grade of most senior anaesthetist.

Type of anaesthesia

Patients should be offered a choice between spinal and general anaesthesia.[3] The anaesthetic should be administered carefully and age-appropriately to maintain physiological stability.[1] Spinal in combination with general anaesthesia (or sedation so heavy that the patient is unresponsive) should be avoided, as this combination increases the risk of hypotension with its associated risks.[4,6]

Measure

- Record of consideration and discussion of mode of anaesthesia.

Intraoperative nerve blocks

Consider nerve blocks for all patients undergoing surgery.[4]

Measures

- Percentage of patients receiving nerve blocks.
- Percentage of blocks performed under ultrasound guidance.

Perioperative pain management

Anaesthetists should implement an analgesia protocol covering admission to discharge.[1] It should include regular paracetamol, peripheral nerve blocks and immediate-release oxycodone as rescue analgesia. Non-steroidal anti-inflammatory drugs, tramadol and codeine should be avoided.

Measures

- Preoperative and postoperative pain scores.
- Analgesia modalities.
- Time to first analgesic input.

Hypotension

Intraoperative hypotension should be avoided,[4] aiming to maintain a mean arterial pressure of 65 mmHg or greater. Consider the use of invasive monitoring in high-risk patients.[1]

Postoperative mobilisation

The patient should receive physiotherapy input and should be mobilised out of bed (standing or hoisted) on the day after surgery unless contraindicated.[2]

Measures

- Percentage of patients who have received physiotherapy assessment.
- Proportion of patients being mobilised on the day after surgery.
- Proportion of patients being mobilised at least once a day.

Postoperative delirium

Patients should be tested for delirium, especially on the first postoperative day,[2] but risk may continue for some days afterwards.

Measures

- Preoperative and postoperative cognitive assessment.[1]
- Percentage of patients who are not delirious when screened postoperatively.

Quality improvement methodology

- Map out the process stages from admission to time to theatre. Seek out a pattern for delays/cancellations. Process mapping is ideally performed as a team-based exercise, often using sticky notes on a large board or wall. Once the first and last steps are agreed (eg patient admitted to hospital with fractured of femur until day after surgery), the gaps are filled with the various task and decision points.
- Identification of the causes of problems in the pathway can be assisted with root cause analysis or cause and effect diagrams.
- Driver diagrams should be used to map out an improvement goal by first agreeing an improvement aim (what, by how much, by when) that is line with national best practice. Spending time on the driver diagram helps to identify outcome and process measures for improvement work so that teams can tell whether their efforts are leading to improvement. In addition, change ideas can be generated, which can be implemented on a small scale, with contemporaneous audit of data to determine which are successful.
- Data can be presented on a run chart and or statistical process chart that is annotated with the change projects. These allow identification of patterns or trends in processes and also increase confidence in the change ideas.
- Is there a local formal hip fracture neck of femur pathway that includes guidelines on preoptimisation and orthogeriatric input, as well as early anaesthetic input?
- Is there an allocated trauma theatre and an appropriately trained anaesthetist for each list? What is the attendance at multidisciplinary/trauma meetings – what tools are used for the identification of very high risk patients (high frailty score, elderly, sick)? Is there any scope to improve the prioritisation of such patients?

Mapping

ACSA standards: 1.1.3.1, 1.1.3.2, 4.2.3.1, 4.2.3.2
Curriculum competences: OR BK 09, OR BK 11, OR BS 01, OR BS 03, OR IK 03, OR IS 01, OR IS 02, OR HK 01, OR HS 01, OR HS 04, OR HS 05
CPD matrix codes: 2A03, 2G03, 3A08
GPAS 2020: 2.3.16, 2.3.17, 2.3.18, 2.3.19, 2.3.20, 2.5.24, 3.2.24, 3.2.32, 3.3.2, 4.3.20, 4.3.21, 5.2.31, 5.2.32, 5.3.2, 5.3.6, 5.3.7, 5.3.8, 5.3.9, 5.5.26, 5.5.28, 5.9.13, 16.1.14, 16.1.15, 16.3.14, 16.3.15, 16.3.16, 16.3.18, 16.3.19, 16.5.22, 16.5.23, 16.5.24, 16.5.25

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4.6 Major lower limb amputation

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Why do this quality improvement project?

Patients undergoing major lower limb amputation are often frail, acutely unwell and with underlying overt or covert comorbidities. As a result, this surgery carries significant risks, including a perioperative mortality of 12.4–22%.[1] This project aims to compare local processes, pathways and clinical outcomes against best-practice national guidance, to identify areas requiring improvement leading to an ultimate goal of reduced perioperative morbidity and mortality.

Background

In the UK, approximately 6,000 major lower limb amputations are performed annually.[2] The average readmission rate for this procedure is 16.5% (Getting It Right First Time, GIRFT)[3] and up to 70% of these patients die within five years of surgery.[1] Data from the 2014 NCEPOD and 2018 nationwide GIRFT reports revealed significant variation in unit outcomes and considerable delays from decision to operate to definitive surgery.[1,3] Following these reports, the Vascular Society revised its 2012 best practice pathway for major amputation to incorporate the recommendations of the NCEPOD report.[2] The aim of the pathway is to standardise practice, and to reduce and maintain the national 90-day mortality to less than 10%.

Best practice

- NCEPOD lower limb amputation report.[1]
- Vascular Society guidance on major amputation surgery.[2]
- GIRFT Programme National Specialty report on vascular surgery.[3]
- RCoA Guidelines for the Provision of Anaesthesia Services for Vascular Procedures 2019.[4]

Suggested data to collect

Standards	Measures
Involvement of a multidisciplinary team pre- and postoperatively.	■ Proportion (percentage) of patients undergoing a major lower limb amputation who have a documented multidisciplinary team discussion. ■ As appropriate the proportion (percentage) of patients seen by associated medical specialties (eg diabetic teams, comprehensive geriatric assessments).
Timely review and surgery of elective lists with surgeons and anaesthetists with a regular practice in vascular surgery.	■ Proportion (percentage) of patients who were reviewed within 12 hours of admission by a consultant vascular surgeon. ■ Proportion (percentage) of patients whose surgery was carried out on a dedicated elective vascular operating list within a prescribed time frame. ■ Proportion (percentage) of patients who were assessed preoperatively by a vascular consultant anaesthetist, consultant anaesthetist or post-fellowship trainee. ■ Time taken from decision to amputate to definitive surgery.

Specialist vascular anaesthetic care and acute pain management.[4]	■ Percentage of patients anaesthetised by consultant vascular anaesthetist or post-fellowship trainee.
Good acute postoperative pain management.[5] Is there a major lower limb amputation perioperative pain management protocol? If not, one should be created.	■ Percentage of patients who received regional technique as part of anaesthetic plan. ■ Percentage of patients who had peripheral nerve catheter inserted for postoperative pain management. ■ Percentage of patients reviewed by the acute pain team within 12 hours of surgery or on the first postoperative day.
Rehabilitation and discharge planning should start before surgery.	■ Percentage of patients with a documented discharge plan prior to their surgery. This should involve medical, nursing, physiotherapist and occupational health staff.
Vascular major lower limb amputation should be performed in a vascular centre with agreed transfer pathways in place from spoke to hub centres.	■ Percentage of patients who had their major lower limb amputation in a regional centre. Look for the presence of a transfer pathway and whether it works in a timely manner.
Data on procedures should be submitted to the National Vascular Registry.	■ Cross-check to review the percentage of patients who underwent major lower limb amputation recorded in the Registry.
The ratio of below-knee to above-knee amputations should be less than one.	■ Measure the ratio of below-knee amputations compared with above-knee amputations.
Recognition of patients who are at the end of life, minimise futile surgery and refer appropriately for palliative care.	■ Measure the proportion of patients with unsalvageable limb ischaemia who do not come to major lower limb amputation and who have had a formal referral to palliative care.

Quality improvement methodology

- Use a driver diagram to provide an overview of the aims of the project. Use it to help to analyse where you might be able to make quick and easy improvements in the management of major lower limb amputation in your hospital.
- Define the key aims for improvement and link these to the desired (aspirational) outcomes. Remember to engage the full support of colleagues in the surgical department and allied healthcare professionals; this is vital to the project success.
- This topic lends itself to the development of a number of 'care bundles'. Choose a combination of interventions that you think are easy to implement and achievable (ideally choose three to five in total). Once agreed with the relevant stakeholders, pilot your care bundle to exclude any barriers to implementation that were not anticipated. Agree a date for implementation. When you start, you should consider using run charts for each individual component of the care bundle. This will demonstrate the areas where more work needs to be done. Only when the individual components are reliably implemented should a whole-bundle compliance run chart be used. Assess whether the care bundle, when

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well implemented, brings about your desired outcomes (eg reduction in length of stay or mortality). When developing and implementing the bundle it is vital to take a team-based approach, incorporating all the stakeholders, including patients if possible.

- Sustaining the change is challenging but is assisted by continued data audit and use of run charts to illustrate the effect of any quality improvement intervention on process and outcomes and to encourage continued engagement.

Mapping

ACSA standards: 4.2.2.2, 4.2.3.1, 1.1.3.1, 1.5.1.2, 1.5.1.3, 1.4.5.3

Curriculum competences: VS HK 01, VS HK 02, VS HK 03, VS HK 05, VS HK 06, VS HS 01, VS HS 02, VS HS 06

CPD matrix codes: 2E01, 3A05

GPAS 2020: 15.1.1-1.9, 15.7.1-1.4, 11.1.1-1.8, 11.2.1, 11.5.6-5.10, 11.7.1-7.3, 5.1.1-1.4, 5.2.6, 5.2.7, 5.2.13-16, 5.3.1-9; 5.3.21, 5.3.22, 5.3.26, 5.5.11, 5.5.21, 5.5.24, 5.5.27-30

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Emergency anaesthesia

4.7 Transfer of the critically ill patient

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Why do this improvement project?

It is well documented that the transport of critically ill patients is associated with a significant risk of physiological deterioration and adverse events.[1] The incidence of such events is proportional to the pre-transfer severity of illness or injury and to the inexperience of medical escorts.[2] Clear local guidelines, as well as governance structure and education in line with national recommendations, will help to improve the quality of critically ill patient transfers by mitigating some of the associated risk factors.

Background

A survey of intensive care units in 1994 estimated that over 11,000 critically ill patients were transferred between hospitals in the UK each year,[3] although the current incidence is unknown due to the lack of a national reporting system.

Growing demand for critical care beds in conjunction with the regionalisation of specialist services is expected to contribute to increasing interhospital transfers of critically ill patients.[4] Intrahospital transfers are also thought to be increasing owing to dependence on new imaging modalities and therapeutic interventions that cannot be performed bedside.

A 2019 Healthcare Safety Investigation Branch report recognised that there is considerable inconsistency in standards and processes governing the transfer of critically ill patients despite a multitude of published guidelines.[5] Failure to implement recommendations is likely to increase the occurrence of adverse events.[5,6]

Best practice

Although it is recognised that critically unwell adults transferred by specialist retrieval teams probably have better outcomes, there is currently a paucity of definitive evidence and resources to support this fact.[2] The responsibility of ensuring a safe transfer most commonly lies with ad-hoc, in-house anaesthetic and critical care teams overseen by local critical care networks. In the absence of a national framework, we should aspire to the standardisation of local transfer guidelines, education, equipment and documentation supported by a rigorous audit and governance process for investigating incidents and sharing learning points across the network.

The Guidelines for the Provision of Anaesthetic Services 2019 state that transport of the emergency patient should occur in accordance with multiple other established guidelines from the Intensive Care Society and the Association of Anaesthetists.[7–11]

Standards

Staffing and risk assessment

- All staff should receive appropriate formal training in transfer medicine (including aeromedical if required) and should be offered the opportunity to gain experience in a supernumerary capacity.
- The makeup of the team transferring the patient should be determined by how sick the patient is and how much support they require.
- Staffing needs to be provided at such a level that the emergency theatre and high dependency/intensive patient care is not compromised when an intra/interhospital transfer is undertaken.
- Before the transfer of any critically ill patient, a risk assessment must be undertaken and documented by a consultant or other suitably experienced member of medical staff to determine the level of anticipated risk during transfer.
- Staff should have adequate insurance (personal and medical indemnity) and be aware of terms and limitations of these.

Equipment and monitoring

- Minimum standards of monitoring should be applied in every case and should be continuous throughout transfer.
- Staff must be trained, competent and familiar with the equipment.
- All hospitals must have equipment immediately available to facilitate safe transport of the patient including; CEN-compliant transfer trolley and equipment and monitoring suitable for use in the transfer environment and mounted on the trolley in such a way to be CEN compliant.

Organisation and process

- Transport of patients within and between hospitals should be undertaken in a timely manner, without unnecessary delays and in accordance with nationally and locally established guidelines and standards (including paediatrics).
- Reasons for transfer should be documented. Transfers for capacity reasons alone should only occur as a last resort.

- A written record of observations and events should be maintained throughout the transfer and handover. This should ideally be standardised throughout the critical care network and be scrutinised within a robust audit system.

Suggested data to collect

We suggest that data should be collected to ensure that the standards above are being met, and to find areas for improvement where standards fall short.

Quality improvement methodology

- Most of the standards highlighted above could be easily assessed using a simple, locally designed prospective questionnaire completed by the transferring team. In regions where standardised transfer documentation exists, it may be possible to analyse patient records retrospectively.
- Competency of the team members and their ability to deal with unexpected deterioration during transfer as a qualitative standard is harder to measure. Competency could be assessed using two different methods:
  - self-assessment: a scale of transfer team 'level of confidence' in managing the patient they are transporting
  - proof of competency: using the RCoA or Faculty of Intensive Care Medicine competencies to determine appropriate level of experience (eg undertaking an unstable neurosurgical patient transfer should require competence in neuroanaesthesia or a workplace-based assessment in traumatic brain injury management).
- Hospital equipment availability would lend itself to a standalone audit.
- A distinction should be made between the auditing of the provision of care for the purposes of assurance and the collection and use of data to drive quality improvement. Where standards are unclear, it may be of use to develop local guidelines with an understanding of the local system.
- Data that have been collected on incidents or where care has fallen short of the prescribed standard can be used for quality improvement. A Pareto chart can be a useful tool to ascertain where the most gain will come for improvement activity using the 'Pareto principle' that only a small number of factors account the majority of the effect.[12]
- Developing an aim (what, by how much, by when) and identification of change projects is commonly done through the use of driver diagrams. These are best developed by the improvement team that includes all relevant stakeholders, including patients if necessary.

Mapping

ACSA standards: 1.1.1.4, 1.5.1.4, 1.6.3.3, 2.1.1.12

Curriculum competences: 7.4.2, 7.4.3, 11.6.2, 11.7.1, 11.7.2, 12.9.1, 12.9.2, 14.4.1, 14.4.2, 16.4.1, 16.4.2, 18.6.1, 21.4.1 2, 5, 6, 7, 10, 11, 13, 6, 9, 1.5.0.5, 1.5.0.9, 2.1.1.10, 2.6.4.1

GPAS 2020: 5.2.13, 5.2.14, 5.2.15, 5.2.16, 5.2.20, 5.2.35, 5.2.37, 5.3.14, 5.3.22, 5.4.2, 5.4.3, 5.4.4, 5.4.5, 5.5.42, 5.5.43, 5.5.56, 5.5.57, 5.5.58, 5.5.59, 5.5.60, 5.5.61, 5.5.62, 5.5.63, 5.5.64, 5.5.67, 5.7.3, 5.7.4, 16.1.1, 16.1.11, 16.1.12

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4.8 Initial management of the adult patient with major trauma

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Why do this quality improvement project?

Data from 2018/19 show that approximately 16,000 people per year die after injury and many, many more survive with significant personal and economic cost.[1] Ensuring that the basics of initial care are carried out in a timely and comprehensive fashion has a significant impact on improving patient outcomes.

Background

Major trauma remains the leading cause of death in those under 40 years of age,[1,2] and prior to the organisation of the trauma networks was thought to account for an annual loss of economic output totalling more than £3 billion.[3] Care in the UK has now been developed into the current system of 27 major trauma centres providing specialist services (11 adult only, 5 paediatric only and 11 mixed).[4] This system configuration was made as a consequence of US experience in the 1990s and the 2007 NCEPOD report Trauma: Who Cares?[2] Recent research has shown that this change in structure has significantly increased the odds of survival following major trauma, equating to over 500 additional lives saved per year.[4]

Management by specialist multidisciplinary trauma teams improves time to definitive care. The role of diagnostic imaging in the form of computed tomography (CT) has become the benchmark for assessment of the head, neck and trunk.[5]

Best practice

- National Institute for Health and Care Excellence guidance on major trauma.[6]
- RCoA Guidelines for the Provision of Anaesthesia Services for Trauma and Orthopaedic Surgery 2019.[7]
- British Orthopaedic Association Standards for Trauma and Orthopaedics.[8]

Suggested data to collect

Airway management

- All those with a Glasgow Coma Scale score of less than 8 should be intubated and ventilated, unless there is a clear contraindication (eg end of life care).[6–8]
- Where indicated, rapid sequence induction should occur within 45 minutes of initial injury; preferably at scene by a competent pre-hospital emergency medicine doctor.[6]
- All those intubated should have their arterial blood gas checked.
- All areas receiving major trauma patients should have a difficult airway trolley immediately available.[7]
- Consider also looking into the choice of induction agents for rapid sequence induction, the availability of drugs in the emergency department and the availability of a difficult airway kit.

Management of major haemorrhage

- All units managing major haemorrhage should have a major haemorrhage protocol for trauma.[5–8]
- Initial transfusion should be based on a fixed ratio of red cells to plasma. This should be tailored for each individual patient using laboratory and point of care testing as soon as possible.[5–8]
- Crystalloids should not be used for patients with active bleeding.[5–8]
- Tranexamic acid should ideally be given within one hour of injury,[5] and definitely within three hours.[8]
- All patients should have a minimum of haemoglobin and lactate concentration measured on initial blood tests.
- All patients with high-energy mechanism and suspicion of pelvic injury should have a pelvic binder applied pre-hospital.[5,8]
- Consider also looking into the use of vasopressor infusions in this context.

Analgesia

- Morphine should be the first-line analgesic in the acute phase. Ketamine can be considered as a second-line agent.[6]
- Additional work could investigate the management of pain, especially focusing on the elderly and the use of regional anaesthesia.

Temperature management

- Warming should be instituted as soon as possible to minimise continuing heat loss.[6]

Use of imaging modalities

- All patients with abnormal physiology and/or symptoms or clinical signs of significant injuries should undergo whole-body CT. This should occur within 30 minutes of arrival, with facilities available for immediate preliminary reporting.[6,8]
- Formal reports on CT scans should be available within 60 minutes of imaging.[6]
- CT can still be used in those with suspected continuing bleeding but who are responding to resuscitation.[6]

Damage control surgery

- Damage control surgery is indicated in those with haemodynamic instability not responding to initial resuscitation.
- Damage control surgery should last less than 60 minutes; this includes anaesthetic time. If it progresses to definitive surgery, procedures should be complete within four hours.[6]

Composition of the trauma team

- The minimum staffing should consist of an anaesthetist, an orthopaedic surgeon and a general surgeon, all of whom should be specialty trainee year three or above.[6–8]
- The trauma team leader should be a consultant and be available within five minutes of arrival of the patient.[6–8]

Quality improvement methodology

- Quality improvement activity should be undertaken by a team consisting of representatives from all relevant stakeholders, including patients. This ensures that issues pertaining to each group can be fed into the change projects and results fed back in a timely fashion.
- There is a large amount of data that is collected already, for example using TARN (the Trauma Audit and Research Network),[1] which should be used to avoid onerous data collection for team members. Feeding these data into dashboards and reviewing those dashboards can focus activity on those audit standards that are not being adequately met.
- There are various tools available to define the aim of the quality improvement project. For example:
  - driver diagrams (with a what, by how much and by when aim)
  - root cause analysis
  - Pareto charts.
- Many of the data pertain to processes within a system. Process mapping allows definition of the pathway and is ideally developed by the whole team. The process map starts off with agreement over the first and last steps (eg trauma call activated to patient arrives in the operating theatre). The team then works to identify the various task and decision points to fill in the gaps.

Service improvement projects could focus on:

- the use of briefing and debriefing after major trauma cases
- the availability and attendance at multidisciplinary morbidity and mortality meetings
- triage and destination of major trauma patients, with availability of critical care beds when indicated.

Mapping

ACSA standards: 1.5.1.2, 1.5.1.4
Curriculum competences: MT_BK_01, MT_BK_08, MT_BK_13, MT_IK_11, AT_D3_08, AR_BS_10, AR_HS05, AR_HS_07
CPD matrix codes: 1I02, 1I05, 2F01, 2F02, 2F03, 3A10
GPAS 2020: 16.1.1, 16.1.5, 16.1.7, 16.2.4, 16.2.9, 16.2.15, 16.2.19, 16.2.21, 16.5.6, 16.5.27, 16.5.28, 16.5.29

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4.9 Rib fracture analgesia pathway

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Why do this quality improvement project?

Rib fractures are a frequent injury following blunt chest wall trauma; 55% of patients with chest trauma will fracture a rib, with 10% suffering multiple rib fractures.[1] A 2017 trauma report highlighted thoracic injury as the second leading cause of mortality due to trauma.[2] Thoracic injury was predominantly associated with road traffic collisions in younger patients and with simple falls in older patients. Older patients have twice the morbidity and mortality of younger patients; with every subsequent rib fractured, mortality increases by 19% and morbidity by 27%.[3] Rib fractures can also frequently result from cardiopulmonary resuscitation, bone tumours or metastases. Managing pain, particularly in high-risk patients, is paramount in preventing respiratory failure. Consequently, in addition to multimodal analgesia, access to epidural analgesia or other nerve blocks is essential.

Background

Rib fractures cause respiratory compromise by a number of different mechanisms:

- Direct lung injury from trauma can cause pneumothoraces in 14–37% of rib fractures, haemopneumothoraces in 20–27% and pulmonary contusions in 17% of patients.[4] This leads to increased shunt.
- Decreased ventilation due to pain can lead to atelectasis, decreased oxygenation and pneumonia.
- Altered breathing mechanics caused by paradoxical movement decreases tidal volume and oxygenation.

Improving analgesia for patients with rib fractures is vital in improving tidal volumes, clearing secretions and preventing atelectasis. An individualised analgesic approach is recommended for each patient, depending on their age and injuries sustained. This normally includes initial treatment with titrated intravenous morphine followed by a multimodal analgesia regimen. This regimen could include paracetamol, non-steroidal anti-inflammatory drugs, oral opiates or intravenous patient-controlled analgesia.[5] Access to neuraxial analgesia or regional analgesia is highly recommended.[6]

Best practice

- British Orthopaedic Association blunt chest wall trauma guidelines.[6]
- RCoA Guidelines for the Provision of Anaesthesia Services for Trauma and Orthopaedic Surgery 2019.[7]

Suggested data to collect

Patient data

- Analgesia prescription.
- Pain scores recorded regularly, in addition to calculation of National Early Warning Score 2.
- Analgesia administration, including any delays in administration.
- Referral for epidural anaesthesia or nerve block.
- Timing and efficacy of epidural or regional nerve block.
- Complications of rib fracture: pneumonia, referral to critical care for ventilatory support.
- Complications of epidural or regional nerve block.

Departmental data

- Is there an analgesia guideline for the management of rib fractures in your hospital?
- Is there a system in place for referral for consideration of epidural or regional analgesia?
- What proportion of referred patients received epidural or regional analgesia and at what stage in their treatment?
- Do ward staff have appropriate training on managing epidural or nerve block local anaesthetic infusions?

Service improvements

- Work with stakeholders in your emergency department, trauma unit and pain team to establish an agreed rib fracture analgesia guideline for your hospital or review your local guideline, if one does not already exist. Can you work with patients to ensure the guideline and any accompanying patient information is patient centred?
- Establish an agreed referral pathway for epidural or regional analgesia. Survey staff and patients about the barriers to patients receiving epidural or regional analgesia. You can display these barriers in a Pareto chart to highlight the most important factors in improvement.

- Does your referral pathway have clear contact details for referral or advice? Does this work in, and out of hours?
- Do you need to undertake some training or awareness session for staff on the importance of good analgesia for rib fractures?

Mapping

ACSA standards: 1.2.2.1, 1.4.1.2
Curriculum competences: AT_D2_01, AT_D3_01, AT_D3_03, AT_D3_08, AT_D4_01, AT_D5_04, AT_D6_05
CPD matrix codes: 1D01, 1D02, 1L05, 2A02, 2A08, 2E02, 2G01, 2G02, 3A09, 3A10
GPAS 2020: 2.9.1, 2.9.4, 2.9.6, 4.2.18, 11.5.6, 11.5.9, 11.5.10

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4.10 Prevention of unexpected cardiac arrest

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Why do this quality improvement project?

Unexpected in-hospital cardiac arrest should be a rare event and many hospitals have adopted a policy of reviewing all in-hospital cardiac arrests and deaths following in-hospital cardiopulmonary resuscitation (CPR).[1] This enables learning and identifying those cardiac arrests that that may have been preventable. In the perioperative setting the concept of failure to rescue is well established.[2] Patient death is not necessarily related to complications occurring after surgery, but the failure of the organisation to effectively rescue the patient when complications and deterioration occur.

Background

The introduction of rapid response systems using track and trigger processes such the National Early Warning Score (NEWS2)[2,3] combined with critical care outreach teams and the wide implementation of treatment escalation plans (including do not attempt cardiopulmonary resuscitation decisions) have reduced the incidence of unexpected in-hospital cardiac arrest.[4]

Unlike out-of-hospital cardiac arrest, in-hospital cardiac arrest is rarely a sudden event – it usually follows a period of deterioration in a patient's clinical condition accompanied by changes in vital signs. Most English hospitals contribute data to the National Cardiac Arrest Audit (NCAA).[5] The inclusion criteria are patients in cardiac arrest receiving chest compressions and/or defibrillation and for whom there is a resuscitation team response (2222 calls). The Resuscitation Council (UK) publishes Quality Standards for CPR Practice and Training, which include a section on prevention of cardiac arrest.[6]

Best practice

The five-ringed chain of prevention' can provide a structure for hospitals to design care processes to prevent and detect patient deterioration and cardiac arrest, and can provide a basis for audit and research.[7] There are currently no specific national standards for perioperative cardiac arrest, but many of the existing standards could be adapted for the perioperative setting (eg the recovery area).

Suggested data to collect

Standards	Measures
Hospitals should have a specific education programme for the recognition and management of the acutely ill patients in hospital for staff and responding clinical personnel. The Royal College of Physicians recommends that education, training and demonstrable competency in the use of the NEWS2 should be a mandatory training requirement for all healthcare staff engaged in the assessment and monitoring of acutely ill patients across the NHS.[3]	■ Percentage of staff successfully completing such a training programme.
An early warning scoring system must be in place to identify patients who are critically ill and therefore at risk of cardiorespiratory arrest. The use of the NEWS2 or a paediatric early warning score for children is recommended.[2]	■ Percentage of cardiac arrest patients with documented NEWS2 score before cardiac arrest.
The organisation must have a clear, universally known and understood, mandated, unambiguous, graded, activation protocol for escalating monitoring or summoning a response to a deteriorating patient. This should be standardised across the organisation.[3]	■ Percentage of patients with cardiac arrest receiving the appropriate frequency of monitoring and clinical response based on their NEWS2 score before cardiac arrest.

Admission to hospital with an acute illness should trigger discussion of an emergency care plan (eg treatment escalation plan) including CPR status.	■ Percentage of patients with cardiac arrest with a completed treatment escalation plan before their cardiac arrest.
No patient with a documented do not attempt resuscitation decision should receive CPR.	■ Percentage of patients receiving CPR who have an existing do not attempt resuscitation decision.
Staff should have immediate access to resuscitation equipment and drugs when required to care for the deteriorating patient, or patient with cardiorespiratory arrest. The precise equipment and drugs should be determined locally and should be standardised and checked regularly.	■ Percentage of equipment checks completed correctly.

Quality improvement methodology

NCAA data review:

- Identify the person responsible for NCAA data. From the NCAA data, identify patients with cardiac arrest and request their records. For each patient, determine whether the above standards were achieved. Identifying those patients who do not meet NCAA inclusion criteria may be more challenging (eg in operating theatre or intensive care unit). In addition, NEWS2 is not used in all perioperative care settings and other markers for deterioration or an inadequate response should be identified.
- Based on the findings of this analysis, create an improvement plan. Work on common failures. Involve the multidisciplinary team to understand all aspects of the failure and develop potential solutions.

Training records:

- Locate hospital or department mandatory training data by location and determine measure for the specific education programme for the recognition and management of the acutely ill patients in hospital. Identify challenges and barriers to meeting training requirements.

Equipment audit:

- Review contents lists and check lists for resuscitation trolleys. Are the contents optimised? Do they meet current requirements for the specific clinical area? Are they in date?
- If there are failings, create a plan to ensure reliable checking. Who is responsible? What are the backups if the first line of checks fails?

Mapping

ACSA standards: 1.1.1.5, 2.1.1.5, 2.5.1.2, 3.1.2.3, 4.3.3.3
Curriculum competences: CC_D11_02, RC_BK_01–25, RC_BS_01–11, CI_BK_34, CI_IS_01–02, RC_IK_01–14, RC_IS_01–07, RC_HK_01–02, RC_HS_01–04
CPD matrix codes: 1B03, 1B04, 2C06
GPAS 2020: 5.1.12, 5.1.18, 5.2.8, 5.2.9, 5.2.10, 5.2.12, 5.2.17, 5.2.16, 5.3.4, 5.3.21, 5.4.4, 5.5.5, 5.5.24, 5.5.31, 5.5.61, 5.5.63, 5.5.64, 5.7.1-7.4

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4.11 Admission to high dependency and intensive care after emergency surgery

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Why do this quality improvement project?

Admission directly to critical care postoperatively after emergency surgery is associated with improved outcomes for patients including lower mortality rates and shorter lengths of hospital stay. Ensuring that high-risk patients benefit from timely, direct admission to critical care after emergency surgery is important to help improve outcomes and experience.

Background

Nineteen per cent of admissions to critical care units are after emergency (unplanned) surgery.[1] The National Emergency Laparotomy Audit reported that 88% of patients with a predicted 30 day mortality greater than 10% were admitted directly to critical care.[2] However, studies have shown that there is significant variation in the availability and use of critical care beds, but it is known that improved use is associated with better outcomes.[3–5] Minimising delays in admission is associated with better outcomes as a result of early identification of deterioration and timely management of complications.

Best practice

- Emergency surgical patients should have their risk of in-hospital mortality assessed and documented using risk prediction tools and clinical judgement before surgery.
- Emergency surgical patients with an end-of-operation predicted hospital mortality of 5% or greater by any measure should be transferred from theatre directly to critical care. Admission to the intensive care unit (ICU) must occur within four hours of the decision to admit. Consultant to consultant referral should occur for high-risk patients (greater than 10% mortality risk).
- National Emergency Laparotomy Audit (NELA) measures against standards set by NCEPOD, Royal College of Surgeons and the National Institute for Health and Care Excellence.
- In response to the pressures on higher acuity beds, some hospitals have developed 'workarounds' such as level 1.5 areas, post-anaesthesia care units or extended recovery units. These solutions, while not necessarily meeting national documented standards, may still be acceptable on review locally, to provide the highest quality of care possible at times of significant constraint. Local teams should collect data and use them to understand their own systems and processes and to identify crucial opportunities for investment.

Suggested data to collect

There are opportunities to use both the ICNARC (Intensive Care National Audit and Research Centre) database and the NELA dataset to facilitate data collection (places where data can be sourced easily is shown in brackets).

- Proportion of patients admitted to ICU after emergency surgery (ICNARC).
- Number of emergency laparotomy patients admitted directly to critical care postoperatively (NELA).
- Proportion of high-risk patients with an estimated risk of death of greater than 5% and more than 10% admitted to a critical care location (NELA). We suggest collecting these two categories to understand the local ability to accommodate the more stringent standard of all patients with a risk greater than 5% being admitted.
- Local trends in time of day or night of admissions/discharges to the ward (ICNARC).
- Proportion of high-risk patients post-emergency surgery who are not admitted directly to critical care and who subsequently require an unplanned admission to critical care (NELA).
- Proportion of high-risk patients with an unplanned readmission to critical care after discharge to the ward from the ICU (NELA).
- Delays in admission to critical care (ICNARC).
- Proportion of emergency patients who are held in the recovery area because of lack of appropriate facilities elsewhere; nursing and staffing provision when this occurs (ICNARC).
- What care is provided if the initial care is on post-anaesthetic care unit/recovery for patients due to be admitted to level 2/3 units (organisational questionnaire)?
- Handover processes between teams of emergency patients admitted to intensive care.
- Protocols in place for admission postoperatively to the ICU for emergency surgical patients.

Quality improvement methodology

Quality improvement activity should ideally be undertaken by a team consisting of representatives from all relevant stakeholders, including patients. This ensures that issues pertaining to each group can be fed into the change projects and results can be fed back in a timely fashion.

- Stage 1: driver diagram (Figure 4.11.1). As a team describes the aim of the project (in this case – ensure that all high-risk emergency surgical patients are admitted directly to critical care without delays) and identify the key drivers needed to achieve this aim. The diagram can be used to help to engage key members of the team required to ensure that the aim is achieved.
- Stage 2: process map the pathway of referral of emergency surgical patients to critical care. Identify the opportunities to make alterations to the pathway and to formalise it to ensure that all patients who should go to critical care do go to critical care without any avoidable delays (Figure 4.11.2).
- Stage 3: identify from the driver diagram and the process map specific areas that require change and develop plan–do–study–act cycles.
- Stage 4: use the suggested dataset to measure the effects of these changes. The data should be represented graphically; this is most commonly done using a simple run chart and/or statistical process chart. Changes are annotated on the chart to help determine which changes are or are not effective in achieving the desired changes in process or outcomes.

Figure 4.11.1: Driver diagram to ensure that all high-risk emergency surgical patients are admitted directly to critical care without delays.

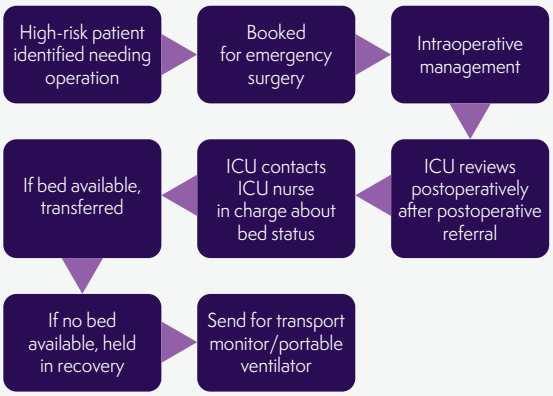

Figure 4.11.2: Process map of referral to critical care for emergency surgical patients.

Mapping

ACSA standards: 1.2.1.3, 2.5.1.1, 4.1.1.1
CPD matrix codes: 1I02, 2C01, 2C07, 3C00
GPAS 2020: 4.1.13, 4.2.8, 4.2.9, 4.2.10, 4.2.11

4.11 Admission to high dependency and intensive care after emergency surgery

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Further Reading

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Emergency anaesthesia

4.12 Structured morbidity and mortality reviews

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Why do this quality improvement project?

Morbidity and mortality reviews are a valuable opportunity to learn and reflect on adverse outcomes and to use the learning to enhance safety locally. They can also be used to feed data into national reporting systems. Effective morbidity and mortality review meetings can help to reduce mortality and are effective in identifying and engaging clinicians in system-wide improvements.[1] The use of a systematic approach to review all deaths to inform improvement work is now promoted for all UK hospitals as part of the National Mortality Case Record Review Programme (NMCRR).[2]

Background

Anaesthesia is often cited as a model for excellence in patient safety, given the improvements in outcomes over recent decades.[3] However, anaesthetic and perioperative morbidity and mortality still present a burden to patients despite continuing safety improvements. Review of untoward events is embedded in the RCoA curriculum and is part of revalidation and clinical governance. For morbidity and mortality meetings to facilitate improvement and to be more than a forum for peer review, they need to be structured and systematic in reviewing and discussing deaths, and to address system and process variations.[4] Morbidity and mortality meetings should be multidisciplinary and should not focus on the actions of any individual, but rather on education and quality improvement. Meetings should have an agenda, a structured presentation format (ie situation, background, assessment, recommendation, SBAR), an analysis of error processes and conclude with actions to be performed. There should also be a pathway through which learning is passed up through the organisation so relevant learning can be disseminated more widely and ensure accountability.[4] Actions should be followed up at the beginning of subsequent meetings.[1] There is more on this topic in section A8.

Best practice

There is limited evidence exploring patient-centred outcomes following the morbidity and mortality review process.[1] However, it is clear that using a structured mortality review tool facilitates professional learning and allows focus on system and process failures rather than individual error.[2,3] The available literature recommends:

- that cases reviewed with a structured tool (ie SBAR, the Safe Anaesthesia Liaison Group, SALG, toolkit, the London protocol).[4,5] Advantages include:[2]
  - improved structure of meetings
  - thorough case review
  - improved records and organisational memory
  - improved governance processes
- thematic analysis of causative factors to guide local quality improvement initiatives
- identifying and acknowledging excellence in clinical practice[6]
- promoting a safe, supportive blame free forum to facilitate improvement and accountability[1–3]
- multidisciplinary participation[1–4]
- meetings chaired by leaders with skills in the area of case analysis and supporting colleagues[1]
- outcomes and actions feeding into clinical governance structures[1–4]
- clearly defined criteria for investigation
- cases, learning and action points disseminated widely and available for future learning
- cases reported to local (ie Datix) and national reporting mechanisms (SALG, National Reporting and Learning System reporting).

Suggested data to collect

Attendance and access to morbidity and mortality meetings:

- Using NAP2 methodology describe meeting frequency, attendance, perceived usefulness and efficacy.[7]

Quality:

- Are cases analysed with a structured tool?

Outcomes:

- Morbidity and mortality meeting action points outstanding at 6 and 12 months.
- Proportion of suitable cases referred to local and national reporting mechanisms.
- Learning which has produced change that has been implemented.

Case example

Nottingham University Hospitals adapted the London Protocol to create a structured tool (Appendix) for case analysis for their multidisciplinary review group.[4] Standard criteria triggered multidisciplinary team case review with technical and non-technical contributory factors identified and weighted. Thematic analysis enabled recurring problems to be identified and quality improvement initiatives targeted for maximal yield. Communication between specialties and theatre prioritisation frequently identified as contributory factors, to mitigate this a supernumerary 'lead' consultant role was instituted to coordinate emergency theatre work which improved communication, productivity and timely access to theatres.

Mapping

ACSA standards: 4.2.1.1, 4.2.1.3, 4.2.2.1, 4.2.2.2

Curriculum competences: CC D8 04, CC D8 08, CI BK 32, CI BK 35, TF IK 25, PR IS 02, AR BS 13, AR IS 05, AR AK 05

CPD matrix codes: 1I01, 1I03, 1I04, 1I05

GPAS 2020: 2.7.2, 3.5.7, 3.5.8, 3.5.10, 3.5.11, 3.5.24, 3.5.26, 3.7.1, 3.7.3, 3.7.4, 4.7.1-5, 5.2.11, 5.3.20, 5.3.22, 5.5.5, 5.5.6, 5.5.61-67, 5.7.1-4

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4.12 Appendix

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Structured tool for case analysis developed by Nottingham University Hospitals, adapted from the London Protocol for the hospital's multidisciplinary review group.

Factor	Severity -5 0 +5	Preventability 1-5	Comments
Patient factors:			
■ Complexity and seriousness			
Organisational factors:			
■ Appropriate priority			
■ Logistical constraints			
■ Safety culture			
Work Environment:			
■ Staff levels, skill mix, shift patterns			
■ Theatre availability or excessive workload			
■ Lack of equipment or failure			
■ Out of hours inertia			
Task factors:			
■ Availability or use of protocols			
■ Availability of records, imaging or test results			
■ Effective use of NEWS			
Team factors:			
■ Communication between specialties			
■ Communication within teams			
■ Communication to theatre team			
■ Appropriately seeking senior support			
■ Appropriate senior response/availability			
■ Clearly defined responsibility and leadership			
■ Clear management plan and record keeping			
■ Theatre coordination			
Individual factors:			
■ Knowledge and skills			
■ Mistake: action/cognitive			
■ Violation			

Surgical event:

- Delay in decision to operate
- Wrong site or wrong procedure
- Bleeding/perforation/poor technique

Anaesthetic event:

- Anaphylaxis/aspiration/respiratory

Other

Transfusion related

Drug error

Preventability:

1: Probably within current resource.

2: Probably with reasonable extra resource.

3: Possibility within current resource.

4: Possibly with reasonable extra resource.

5: Not obviously by any change of practice.