Royal College of Anaesthetists

Raising the Standards:

RCoA quality improvement compendium

4th edition, September 2020

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ISBN: 978-1-5272-6522-6

Design and layout by the Royal College of Anaesthetists.

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Registered Charity No: 1013887
VAT Registration No: GB 927 2364 18
Registered Charity in Scotland No: SCO37737

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Acknowledgements

We wish to acknowledge a considerable debt of gratitude to all the contributors to the earlier editions, 2000, 2006, 2012. It is testament to the foresight of the editors of the first edition, Dr JA Lack, Dr LA White, Dr GM Thoms and Dr A-M Rollin, that, over 20 years on, their original strapline 'continuous quality improvement in anaesthesia' is now more generally recognised in the application of the emerging science of improvement across all branches of healthcare.

Acknowledgements

Foreword

It is my great pleasure to introduce the latest iteration of the Raising the Standards: RCoA Quality Improvement Compendium.

The 'recipe book', as it is colloquially known, has been a popular and valued resource for anaesthetists in the UK and around the world, providing the basis for many departmental audits for over 20 years in its first three editions. This fourth edition represents the step change in our approach to quality, emphasising further evolution from audit for assurance and measurement to audit as part of an improvement cycle.

Anaesthesia has always been at the forefront of the movement to improve safety by developing safer systems. This Compendium makes effective links between quality standards, training and actions that individuals and departments can take to improve care. Each topic links with the GPAS quality guidelines, ACSA standards and curriculum learning objectives. Departments embarking on audits or improvements based on the topics contained here can be satisfied that in addition to improving care for patients, they are also providing good learning opportunities for trainees and moving their department closer to ACSA accreditation.

The topics reflect the full breadth of anaesthetic practice, spanning perioperative care, pain and intensive care, reminding us of the many ways in which anaesthetists influence the quality of care provided to patients. It contains the key national quality projects with anaesthetic leadership and involvement including PQIP, NELA, NAPs, SNAPs, tracheostomy care, opioid deprescribing and perioperative diabetes care. Each of these reports contains recommendations to change practice and I am pleased to see they are brought together alongside suggested actions to help anaesthetists mobilise this knowledge to provide safer and more effective care.

This Compendium is patient centred, with examples of patient co-design, and prompts to include patients' experiences and perspectives wherever possible. I am grateful to our lay committee for their input and particularly Elspeth Evans for her work alongside the editorial team.

This Compendium also represents a huge amount of teamwork. The College is indebted to the legion of contributors who have submitted recipes. Often experts in their topic, each recipe represent the product of many hours researching and summarising the key audit standards into a digestible summary. The content of each chapter of related topics is coordinated by a chapter editor and a quality improvement editor who has often added points on improvement methodology. The 'section A' of improvement methodology provides an excellent resource for those wishing to learn more about improvement science.

I extend my gratitude to the Compendium editors; Professor Carol Peden and Dr. John Colvin, who have been associated with the book for over 10 years, joined in this edition by Drs Carolyn Johnston and Maria Chereshneva. Dr Chereshneva led the development of the book as a HSRC fellow based at St Georges Hospital.

I strongly encourage all anaesthetists, and in particular those in leadership roles responsible for safety and quality, to adopt the standards and recommendations for action in this Compendium. We continually face pressures of changing demographics and increased complexity, often in an environment with workforce challenges and resource limitations. Using improvement methodology applied to benchmarked standards of care, as listed in this Compendium, we can provide safer and ever more effective care for our patients and more rewarding ways of working for our specialty.

Ravi Mahajan
President of The Royal College of Anaesthetists

Foreword

Previous editions of the Royal College of Anaesthetist's Audit Recipe Book have provided a popular manual of audit topics for anaesthetists since the first edition in 2000, with the third edition in 2012 moving significantly towards recognition of formal improvement methodology in clinical practice. In former editions, the emphasis was on the provision of audits, focused mainly on measurement against defined process standards and, in the last edition, supported by a quality improvement methodology section. This edition strives to provide a much more integrated quality improvement approach across all the topic areas. This continues to be supported by a comprehensive section on quality improvement methodology, now updated to include a wider spectrum of improvement methods, reflecting the significant developments across UK healthcare in the adoption of structured improvement training and practice.

Anaesthesia has a long tradition of improving clinical safety and outcomes by continuous critical examination of our practice.[1–3] However, changing the increasingly complex clinical systems in which we work, and making those changes last, is a very difficult task. We need to combine our professional knowledge of what is the best evidence with knowledge of how to implement improvements, to deliver consistent care for the patients we treat. Improvement science takes into account that context is key in delivering best care; what works for one patient population in one hospital, may not be relevant in another.[4] Knowing what constitutes the best care is not enough: we must ensure that delivery is effective.[5] The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) reports provide ample evidence that delivery of evidenced-based care is at best inconsistent and at worst woefully inadequate.[6]

This new edition of the Compendium further integrates audit and improvement, by providing anaesthetists with an introduction to the science of improvement and demonstrates a range of tools which can be used to drive positive patient-centred change.[4] Many anaesthetists and intensivists throughout the UK have now learned improvement methodology, often from participation in one of the national or regional patient safety programmes,[7–10] and through the inclusion since 2013 of quality improvement training and practice in the anaesthesia postgraduate curriculum.[1] As such, the Royal College of Anaesthetists has been a leader in this field, which is further strengthened across the breadth of medicine by the UK Academy of Medical Royal Colleges' recommendation for quality improvement training in all curricula Quality Improvement: Training for Better Outcomes[12] and by the GMC's explicit recommendations in their generic professional capabilities framework.[13]

The Compendium is still in two sections. The first section includes a comprehensive set of chapters on quality improvement methodology, such as the model for improvement developed by Associates in Improvement[14] and taught by the Institute for Healthcare Improvement.[15] While most of the UK safety and quality programmes use this methodology, we acknowledge that other techniques, such as Lean, are in increasing use. This technique is now included in this edition.

It is the intended place of this Compendium to facilitate and strengthen delivery of comprehensive improvement and safety programmes aligned with RCoA professional standards and accreditation. The second section topics have been chosen to reflect key areas of practice relating to quality of service, covering a range of subject areas that now explicitly aligns the topic chapters with the RCoA Guidelines for Provision for Anaesthetic Services[16] and the Anaesthesia Clinical Services Accreditation standards.[17] This compendium links these key RCoA quality initiatives with the training curriculum, which is also aligned to each recipe.

The Compendium supports anaesthetic departments in a programme of continuous improvement, to take the recipes as a starting point for their own programme of work in a way that provides opportunity for trainees and consultants to participate and learn quality improvement methodology. For trainees in particular, this will link with the quality improvement and safety training requirements in the new anaesthesia curriculum.

What is quality improvement?

Quality improvement is a formal approach to the analysis of performance and then the use of systematic efforts to improve it. Improvement comes from the application of knowledge and a thorough understanding of the system you are trying to improve. Key points to consider when undertaking an improvement project are:

- knowing why or what you need to improve (audit will have provided this information, as well as discussions with patients and your team on what they think the priorities should be)
- having a feedback mechanism to identify if improvement has happened (closing the loop)
- developing a change idea that will lead to improvement
- testing a change before implementation, this may lead to multiple cycles of further change
- knowing when you have an effective change that will lead to an improvement
- understanding how the context in which you are working will influence your improvement work
- using change management techniques for the social aspects of change
- planning for spread and sustainability.

It is important to remember that improvement can result from learning from failure, and so testing what works and learning what does not work, is central to successful improvement.

The process of audit, quality improvement and the role of the Compendium

At its simplest level, audit involves systematic collection and analysis of data to drive change in clinical practice. This may be manifest at several levels from large national audit projects through structured hospital and departmental audit programmes to individuals carrying out single projects. Perhaps the simplest form of cyclical examination of practice and change uses the plan-do-study-act (PDSA) methodology to drive small steps of change in practice at a very local level. While all these approaches are valid, the strengths and weaknesses of each have to be recognised. Large national audits may be comprehensive, well-constructed and authoritative, but locally may suffer from lack of ownership and an understanding of how to drive needed improvement identified by the audit into widespread practice. The use of small stepwise changes in practice via application of PDSA cycles may be seen as a small-scale audit loop. The learning from small PDSA cycles can be accelerated by shared learning in collaborative working, an approach used with success in the national and regional patient safety and improvement projects.[18–20]

Revalidation and quality improvement

Revalidation requires evidence from all doctors about their quality improvement activity, which should be 'robust, systematic and relevant to your work'. Quality improvement activity should contain an element of evaluation and action and, where possible, demonstrate an outcome or change. The GMC suggests that quality improvement activity is wider than clinical audit and includes other measures such as review of clinical outcomes, case review or discussion, audit and monitoring of the effectiveness of teaching programmes and evaluation of the impact and effectiveness of a piece of health policy or management practice.[21] We believe that this new edition of the Compendium provides a tool for all of us undertaking revalidation to be able to link audit to improvement.

Patient and relative participation

Patient experience and patient-centred care[22] should be a cornerstone of the modern NHS and, as such, we would encourage the use and further development of patient and family experience audits. The limitations and pitfalls associated with collection and interpretation of patient satisfaction data are increasingly recognised.[23] Conversely, the high value of specific information relating to patient experience is also recognised and we would encourage the use of such data including patient-reported outcome measures in any service evaluation.
We are grateful to representatives of the RCoA Lay Committee, who provided discussion of these aspects documented in this book. We would expect this to be of use in the execution of many of the included topics and in the future design of new improvement projects.

The future, and how far we have come!

Since the third edition of this book, anaesthetic audit and quality improvement has become embedded in what we do as clinicians. We have achieved real change, such as reducing mortality and improving care for some of the patients at highest risk, those undergoing emergency surgery for laparotomy and hip fracture. In this edition, we further recognise the challenges of dealing with an increasing elderly population with sections on delirium and frailty. As anaesthetists, we have always been a major force in critical incident reporting and we would very much encourage continued reporting as part of audit and risk management. We would also recommend a focus on learning from excellence. Whenever possible this should be done locally (to ensure learning within your own organisation) as well as to the national bodies supported by the RCoA. Developments in information technology and electronic data management should be used to assist audit and improvement especially outcome based audit. We would encourage all anaesthetists to use the methods in this book and the basic template to create their own topics or adapt topics to their own particular needs. If these are of general applicability, we would also encourage you to submit them to us (qualityimprovement@rcoa.ac.uk) for consideration in our next update, and we will publish them on the website. The hip fracture database and National Emergency Laparotomy Audit have demonstrated the power of audit linked to improvement and the use by large numbers of us of standardised data collection. We can now learn from comparisons of practice on a grand scale. We would encourage readers to consider other improvement projects which may be found in this book, which could be used on a large scale to create the same momentum for change in important areas of patient care, if enough data is collected. Our next major step as a specialty with a proven track record in improving care and outcomes will be to further improve the value of the care that we deliver by reducing variation in practice and 'getting it right first time'.

While each of the individual topics are of necessity brief, and our thanks to the rigour and discipline of our many authors for this, we have provided opportunity for authors to reference further material of breadth and depth which is accessible through the College website. We hope the fourth edition of this Quality Improvement Compendium will continue to be a useful reference source to specialist and trainee anaesthetists across the breadth of our specialty.

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Editors, fourth edition

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The patient's perspective

Miss Elspeth Evans, Lay Committee, RCoA

Patients expect to receive high-quality professional care when undergoing any medical procedure and will support any initiative to improve and enhance the way in which they are treated. Of course, all patients want to avoid adverse incidents and bad experiences. An audit or quality improvement project offers an excellent opportunity for collaboration with patients.

Good Medical Practice states that doctors should 'work with colleagues in the ways that best serve patients' interests' and 'must take part in systems of quality assurance and quality improvement to promote patient safety'.[1] The College's own Strategic Plan 2018–20212 includes an aim 'to enhance services and ensure better patient outcomes through collaborative and sustainable work on quality improvement'.[2]

So the prompts are there, but what encourages doctors to carry out an audit or quality improvement project? The public understand that doctors are under pressure in their day jobs and may be too busy or too tired to carry out a project during their working day.[3] However, the benefits of doing so can be enormous: improved patient care and collaboration, cost savings and improved practice. It can also help with career development by learning life skills essential for successful project management. The College now has a network of quality improvement regional leads with suitable experience, who can offer advice and support to those beginning a project. It could also lead to a doctorate or master's degree. In short, these are some of the many strong reasons why quality improvement learning, thinking and practice should be recognised and valued as an integral part of the day job.

It is not necessary to experience anaesthesia personally to be a good anaesthetist, but patients have their own experiences, which they can contribute to a project. The Sprint National Anaesthesia Project (SNAP-1) results showed that 94% of patients surveyed would recommend the service to others: that means there is 6% area for improvement.[4] Undertaking a project will mean managing your time and that of your team, leading change management, dealing with resistance to change and communicating well to win people over. The recipes in this book provide tools and ideas to start the project, collect data, analyse results, decide whether changes are required, implement change and communicating learning to multidisciplinary colleagues. Leading on change may be the most difficult part of a project. Most people are resistant to change due to uncertainty, although most of us at some time, have probably thought that "I wish I'd done that years ago'.

Nudge theory encourages small but significant changes in behaviour. The auto-enrolment pension scheme and the opt-out organ donation scheme set to come in 2020 are good examples of this theory; both assume that most people will not opt out. Another example is a doctor offering a patient a choice of two options for treatment. The Choosing Wisely campaign encourages patients and doctors to make better decisions together about treatments and to avoid unnecessary medical procedures that may not benefit the patient.[5] This is shared decision making to improve patient safety.

The Getting It Right First Time programme is designed to improve the quality of care within the NHS by reducing variation and sharing best practice.[6] The College's own Perioperative Quality Improvement Programme and perioperative medicine initiatives have similar aims.[7,8] The College's report A Teachable Moment: Delivering Perioperative Medicine in Integrated Care Systems offers a number of innovative and award-winning programmes in hospitals across England that are improving patient care before, during and after surgery.[9]

In May 2019, the College launched the Centre for Perioperative Care (CPOC), bringing together a range of healthcare professionals with representatives from a number of medical royal colleges, including surgeons, general practitioners, physicians and nurses.[10] CPOC will be a vehicle to develop and share best practice in perioperative care across the NHS and internationally that contributes to improvements in patient care and safety.

The worldwide need to deliver value in health care through improving quality while considering cost needs more effective ways of working, both for the health service and for patients. Undertaking a QI or audit project could be your legacy to healthcare improvement. I commend the recipes in this book to you.

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Quality improvement in anaesthesia

Edited by Professor Carol Peden, Dr Carolyn Johnston

A1 Getting started on your quality improvement project

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Getting started

We would encourage clinicians to consider the domains of quality: safe, effective, personal, timely, efficient and equitable care,[1] and to choose a balance of audits for assessing the quality of care using structure, process and outcome measures.[2] These audits should sit within a departmental programme or personal portfolio that reflects all the different components of patient care, and should stimulate improvement work when standards are not being met.

How can we make quality improvement as effective as possible?

- Make sure that there is a realistic potential for improvement, and that the end result is likely to justify the investment of time and effort involved.
- Make sure that you have the necessary will, political support and 'muscle' to act upon what you find.
- Examine an area of practice where you have influence (eg the use of nerve stimulators to reverse muscle relaxation) is likely to be easier to influence as an anaesthetist than the quality of consent by the surgical team.
- Make sure that the issue either occurs relatively frequently or is significant when it does occur. This will help to get results that matter.
- Discuss your proposed standards or targets, many of which will be derived from national recommendations and guidelines with your colleagues to ensure that they are relevant and achievable in your local context.

Data collection

- Consider sample size. Effective local quality improvement projects require consideration of what measurement strategy and sample size is really needed to rapidly identify a problem and to begin the improvement process.
- The sample size for audit should be small enough to allow for rapid data acquisition but large enough to be representative. If the data acquisition time is too long, interest will be lost and data completeness will often suffer (eg for an audit of the adequacy of intraoperative fluid documentation consider examining a small sample, such as 10 sets of notes). If a problem is found in the majority of cases and there is clear room for improvement, ensure that energy is directed into changing how fluid recording is done rather than continuing to audit large numbers of case notes, which will take longer and result in the same finding. A structured sampling strategy will help you to gain the information you need without undue time spent on measurement.[3]
- Prepare a method of collection of data that does not require undue additional work from your colleagues. Remember that in an atmosphere of staff shortage and pressure of work, others may not be as interested in your quality improvement project as you are. Any paperwork should be simple and self-explanatory. Wherever possible, aim to take data from existing charts.
- Think about using data that are routinely collected elsewhere. Discussions with clinical coders or hospital business information or analyst teams may help you to find a data source you can use.
- Once under way, monitor the quality of the data frequently and ensure that collection is going smoothly by visiting the wards or the recovery room, or by dropping in on the operating list. Thank everyone involved. Provide feedback often!

Moving towards action

- When you have all your data, analyse it and discuss the results with colleagues. Discuss reasons for failure to meet standards or targets. If targets have been met, consider whether they might be tightened.
- For a major improvement project, invite all interested parties, such as ward, theatre, finance or administrative staff, to a meeting. This is the place to get ideas, make recommendations for improvement and set a timescale for review. A focused structured meeting with time for discussion from a wide range of perspectives is very valuable in gaining buy-in and co-ownership, but this must be balanced against creating inertia or logistic delays in getting ahead with the improvement work.
- Identify the changes required for improvement using the model for improvement:
  - What are we trying to accomplish and by when?
  - How will we know that a change is an improvement?
  - What change can we make that will result in an improvement?

- Think carefully about your aim: you may wish to aim to achieve '100%' as your target, but this may demotivate your team if it seems unachievable. You could split that aim into two – for example aim to reach 85% in three months and 90% at six months. You could also describe the aim as a quantity rather than a percentage, to make it seem more real. For example, aim to 'reduce average fasting times to four hours', rather than 'reduce fasting times by 50%'.
- Consider how best to choose and use the data as effective drivers of improvement. Effective measurement for improvement is described in some detail in subsequent chapters.
- While we are all keen to ensure that the best care is given to all our patients, we would suggest caution on the use of targets of 100%. A 100% completion is great in an ideal world, but there are always exceptions and as such goal can seem unattainable, it can sometimes discourage working towards high reliability.
- Start to make small tests of change and continuously evaluate success or failure until your changes are stable and ready for implementation.
- Ensure that the majority of time in a meeting is not spent on describing the problem; positive patient-centred change requires time for solutions.

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A2 The science and history of improvement

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As anaesthetists, we find ourselves firmly at the centre of the quality and safety agenda. Patient safety is core to all aspects of the College's training, education and standards for anaesthesia. Our strong history of nurturing a safety culture, learning from error, preventing harm and working as part of a multidisciplinary team all contribute to the disciplines of safety and anaesthesia.

Patient safety has made great progress since the Patient Safety First Campaign.[1] However, harm still occurs and the potential remains to save many lives a year, particularly those of older patients.[2] There were five specific interventions in the Patient Safety First Campaign; leadership for safety, reducing harm in perioperative care, reducing harm from high risk medications, reducing harm from deterioration and reducing harm in critical care. The first intervention recognised the importance of strong leadership to foster a safety culture. The next two interventions, have seen major change in the world of perioperative medicine, with implementation of the World Health Organization Checklist,[3] 'Stop Before You Block' campaign,[4] and the introduction of NRFit™ type connections for neuraxial procedures.[5] Other interventions, such as reducing ventilator-associated pneumonia and central venous catheter-related bloodstream infections, as well as implementation of National Early Warning Scores have led to measurable improvements in patient care. Bundles, processes and checklists are all now terms familiar to practising anaesthetists. Many of these concepts arise from improvement science.

The NHS Patient Safety Strategy of 2019 has three aims, designed to improve patient safety culture and a patient safety system:[6]

- Improve understanding of safety by drawing intelligence from multiple sources of patient safety information (insight).
- Equip patients, staff and partners with the skills and opportunities to improve patient safety throughout the whole system (involvement).
- Design and support programmes that deliver effective and sustainable change in the most important areas (improvement).

The latter aim has a specific target that will require anaesthetic involvement, namely, to reduce neonatal and maternal death and neonatal asphyxia brain injury by 50% by 2025. All of the NHS Patient Safety Strategy aims require a system-wide approach and use of the principles of improvement science. Some of us trained in medical research based on testing hypotheses with randomised controlled trials may struggle to understand where translational science fits in and question its scientific basis. However, many of the improvement and measurement techniques now mainstream in healthcare, have been widely used in industry, agriculture and aviation for decades.

The 'father' of improvement science is William Edwards Deming (1900–1993), an American mathematician, statistician and business consultant.[7] He is credited with improving industrial production in the United States during the Second World War, although is perhaps better known for his work in Japan from the 1950s onwards. He was mentored by Walter Shewhart, a statistician who developed the concept of statistical control of processes using control charts and the ideas of special and common cause variation. Deming is regarded as having had more impact upon Japanese industry than any other individual of non-Japanese heritage. Later in his career in the mid 1980s he was credited for transforming the Ford Motor Company from failure to the most profitable American car manufacturer at that time.

Deming's work shows that the processes used in improvement science are not only firmly based on statistical science but have been tested and shown to work successfully in different complex settings. In addition to statistical process control methods, Deming used a technique which he called 'profound knowledge' to examine and diagnose a system This process involved four parts. First, an appreciation of a system as a network of interdependent components with a common aim. Second, a knowledge of variation, a key to understanding measurement including run charts and control charts. Third, a theory of knowledge, what theories drive the system? Lastly, a knowledge of psychology, understanding the human side and motivation of change.

All of these components interact much like a Venn diagram, and a process cannot be improved upon without consideration of each part. For instance, the way individuals in an operating theatre behave, and the culture of that theatre, are integral to understanding how to make that theatre safer. To improve quality we must understand how processes vary under normal (or common cause) circumstances, only then can we clearly identify an abnormal variation or problem. In

general, as anaesthetists, we concentrate on changing technical aspects of care, such as a new drug or piece of equipment, rather than organisational aspects. These same technical innovations often prove frustrating, with the realisation that promising innovations make little or no difference to our patients' outcome or that the evidence is not as robust as first promised.[8] Changing how the operating theatre environment, the work flow and the care pathway function may provide a much greater opportunity for improvement than changing technical aspects, such as which new drug or monitor to use.[9,10]

We cannot improve something until we understand it. To understand how we make care safer, more effective and person centred, we must closely examine our microsystems using Deming's 'lens of profound knowledge'. A system is defined as 'an interdependent group of items, people, or processes working together towards a common purpose. Common purpose aligns the parts of the system, while interdependence considers the relationships and interactions among them. Interaction is amongst people, processes and equipment. Interdependence means that multiple measures are needed to understand the performance of a system'. The first step, therefore, to improving a system is to examine it closely, defining boundaries, temporal components and understanding successes and defects within it. To improve our system we must study and diagnose it, much as we do with patients. The science of improvement is not a threat to evidence-based medicine. To the contrary, it complements it, making it easier to make changes that will result in safer, more effective, efficient, equitable, timely and person-centred care.[11]

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A3 Making improvement happen

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So, you've done your audit, looked at your system and identified problems. How do you now make improvement happen? The traditional method has been through education and hard work. While providing training can be necessary and beneficial, on its own it is not enough to achieve change in the complex systems in which we work.[1] 'Every system is perfectly designed to get the results it gets' (Paul Batalden, Institute for Health Improvement). The only way to get real change is to change the system. To do this, you need 'will, ideas and execution'.[2]

- Build will to make the system better – this may be because you have identified poor performance or outcome through audit or patient experience.
- Generate ideas about how you could change things for the better.
- How to make it happen – execution.

Improvement methods

A structured approach is needed to drive improvement. There are many models available, including Lean and Six Sigma.[3,4] All these methodologies are derived from the work of Shewhart and Deming. We have included a section in this book on Lean and process maps (Part A Section A4) and we also frequently use the Model for Improvement, a foundation tool used in improvement science, developed by the Associates in Process Improvement (API; Figure A3.1).[5]

The API Model for Improvement includes the simple plan-do-study-act (PDSA) cycle (which you may also see referred to as the plan-do-check-act cycle). This model uses small, rapid-cycle changes designed to test, measure impact and test again.[5,6] This method uses small frequent samples to drive change in a much faster and more proactive manner than the traditional audit cycle. Those of us who have participated in one of the UK safety programmes, such the Scottish Patient Safety Programme,[7] have used this technique. There are three questions central to this model:[5,6]

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in an improvement?

The first question, 'what are we trying to accomplish', gives us our aim (eg we wish to improve outcome for patients undergoing joint replacements). An aim statement needs to be ambitious, but not achievable by hard work alone and should stretch us. A good aim should answer the questions 'How much?' and 'By when', and we advise you to make your aim, specific, timebound, aligned with your organisation and numeric. Thus, a better aim would be: 'We aim to reduce the incidence of acute kidney injury (AKI stage 1–3) for patients undergoing elective hip and knee arthroplasty from 10% to less than 2% by 1 December 2020'.

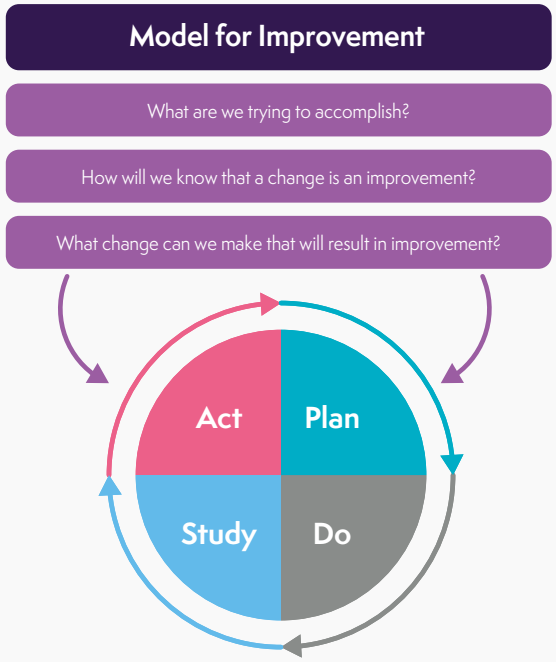

Figure A3.1: Model for Improvement, reproduced from Langley GJ et al, The Improvement Guide with permission of John Wiley & Sons, Inc.

The second question is 'how will we know that a change is an improvement'? For this, we need measures.[8,9] In our example we have a clear outcome measure: a reduction in AKI stage 1–3. To achieve this, we will need some process measures. Process measures measure what we believe we can do to improve outcome, such as screening for high-risk patients (percentage of patients risk screened for AKI) and withholding nephrotoxic agents (percentage of patients in whom antihypertensives are withheld on the day of surgery). Whenever we are changing a system, we must consider how our changes impact other parts of the system. We therefore need balancing measures. For example, if we withhold antihypertensives on the day of surgery, are patients being cancelled because of hypertension?

Once we have our measures, we can start developing our change ideas.[1,5,6] You already have a good idea of what outcome you want to change, but how do you do know where can you make improvements? First, diagnose your system much like you do for your patients. Perhaps you can process map the patient journey and consider where you can most effect change. Do you know of other units that have better outcomes – what do they do differently? What guidelines or research evidence is there that could be done better in your hospital? Have you considered what it feels like to be a patient in this process – what would make their experience better? With ideas generated in this way you can start to develop a change concept. If your audit showed that all patients continued their nonsteroidal anti-inflammatories (NSAIDs) right up until the day of surgery and immediately postoperatively, you may develop a change concept aimed at withholding NSAIDs 1–2 days before surgery. Once you have a theory and/or some ideas, you can start to test them. Remember 'all improvement will require change, but not all change will result in improvement'.[2]

Let us say that part of your change package is to withhold NSAIDs 1–2 days prior to surgery. To achieve this, you plan to inform the preoperative nurse and put up a poster in the preoperative assessment clinic. Obviously, you will need to discuss this with the wider multidisciplinary team and have senior support.

Start the PDSA cycle:

Plan: put a poster in the tearoom and inform the charge nurse.

Do this and study what happens. Start to test on a small scale (eg with Staff Nurse Jones and only in Mr Smith's patients on one day). Start your testing with those who are enthusiastic about your idea. If all the eligible patients get their NSAIDs withheld, start testing on a few days. You may then find that the process becomes less reliable, so study why it is now unreliable. You may find that it does not get done tomorrow because the poster is in the tearoom and Staff Nurse Jones forgot because the clinic was busy.

Study: how do you get round that? What have you learned about your change idea?

Act: develop a new idea to deal with this challenge and test again (eg use the daily safety brief to highlight the change in practice).

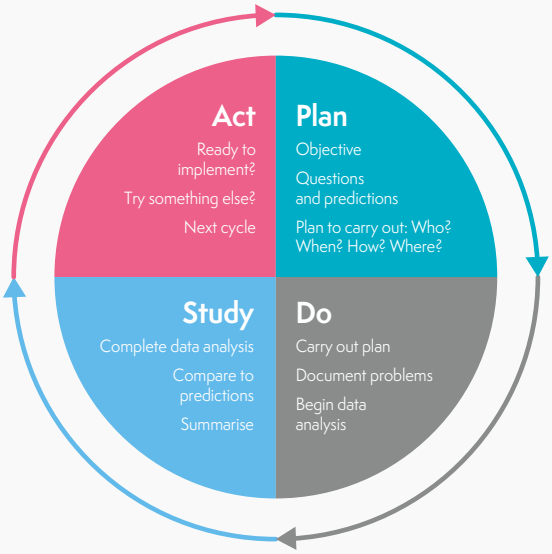

Figure A3.2: Developing and testing a change.

The cycle goes on, testing theories about what works and learning from what does not work (Figure A3.2). If it works during a weekday, does it work on a weekend? Do not assume that your process is reliable until you know it works with different nurses, on different days and with different surgeons. It must work without you being there to drive it.

Finally, while the PDSA cycle may appear to be an apparently new concept, it differs very little from the concept of the differential diagnosis and treatment plan used in medicine. For example, your patient is tachycardic with a normal blood pressure in theatre. Your theory is that the patient has insufficient anaesthesia and analgesia. Your plan is to increase the delivered amount of inhalational anaesthetic and to give a bolus of opiates. Do you increase the depth on inhalational anaesthetic and titrate incremental boluses of opioid? Study: the patient remains tachycardic but is now becoming hypotensive, despite your treatment. Act: you now believe the patient to be inadequately resuscitated and your new theory is to give a fluid challenge. A new PDSA cycle now starts with this new theory from your previous testing.

A3 Making improvement happen

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Quality improvement in anaesthesia

A4 Improvement basics: Lean and process maps

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Lean

Lean is an improvement method developed in Japan's Toyota car factories in the 1980s. For this reason, it is often synonymous with the 'Toyota production system' or the 'Toyota way'. There are multiple versions and terminologies based on the same basic tenets. It was first described in the book The Machine That Changed the World in 1990,[1] and there are now multiple examples of aspects of Lean being used in healthcare. Most notably, Lean tools feature in the NHS Improvement Productive Operating Theatre and Productive Ward titles in the Productive series,[2] as part of the improvement system in Virginia Mason Hospital and now adopted in several NHS hospitals.

Lean consists of an overall philosophy of improvement, focusing on finding value and eliminating waste, by understanding the processes of care, and senior staff supporting 'frontline' staff to solve problems and make improvements. It is associated with several common tools to help staff understand and improve their work.

Seven wastes (or muda in Japanese)

Waste is anything that does not add some value to the patient. An important part of Lean improvement is examining work for sources of waste and then removing them. This concept may include eight wastes, as wasted human potential is often added as an extra source of waste:

- Overproduction: doing unnecessary work, 'just in case' (eg ordering preoperative blood tests on patients with straightforward ASA level 1 outside the National Institute for Health and Care Excellence guidelines or preparing discharge medication packs that are not used).
- Waiting: patients or supplies waiting; there are innumerable examples of this in every operating theatre.
- Transport: any movement of a patient or supplies causes some waste; it is hard to eliminate but you should aim to reduce it (eg patients moving to an inpatient area but being discharged on the same day).
- Unnecessary processing: undertaking a needlessly complex task when a simple one would suffice (eg completing inpatient paperwork for day case surgery).
- Unnecessary motion: this describes staff motion (eg having to visit several storage areas to gather equipment needed for a common task, such as siting an epidural).
- Defects: work that is done with errors; this is a very costly 'waste' as it may ruin the whole process (eg a booking error that results in patient not receiving an admission letter). We could also consider many safety incidents as 'defects' (eg medication errors, wrong site surgery, hospital acquired harm).
- Unnecessary inventory: manufacturers do not store many supplies, instead relying on 'just in time' inventory. In healthcare, excess inventory may result in medications or material that are out of date before use, the need for large storage areas that encroach on clinical space, a cluttered work environment around anaesthetic rooms or hospital beds.

Five Ss

The basic housekeeping discipline of Lean, prominent in the NHS Productive programme, include the five Ss:

- Sort: classify equipment in order of use or importance; remove what is not used (eg resuscitation trolleys).
- Standardise: adopt standard work (eg all anaesthetic rooms/resuscitation rooms sharing a similar layout).
- Simplify: set things in standard locations with labelling (eg shadow boards for rapid sequence induction).
- Shine/scrub: clean and check that everything is working well.
- Sustain: continuing housekeeping audits to ensure that the above steps are followed.

Value stream mapping

Value stream mapping is similar to process mapping.

Gemba

In Japanese, gemba means 'real place' or the frontline of work. Lean thinking emphasises that the solutions to most workplace problems will be found closest to the work; that is, by frontline workers rather than by managerial staff, and so Lean includes 'gemba walks' where leaders or supervisors go to observe frontline work, to 'go see, ask why, show respect'.

Rapid improvement events

As well as promoting continuous improvement, teams may also take time to do 'rapid improvement events' or 'kaizen events' (kaizen meaning improvement). These may take up to a week, where teams set aside time to examine and measure their processes in detail and

rapidly test some improvements. This can be an effective way to make changes when time is short during routine work.

Process mapping

A process map is a graphical representation of a process or patient pathway. It is extremely useful for examining the steps in a process, such as the patient's journey from entering the anaesthetic room to discharge from the recovery room or the steps involved in booking a theatre case. If you are improving a pathway or process, mapping it out can be helpful in a number of ways:

- to look at the overall picture of a process to see where it can be simplified if it is complex
- to see points where the process 'as done' in real life is different from how it was intended in a policy
- to gather team members to talk about the process; this can often be the first time that team members hear about others' perspectives on their shared work
- to look for steps involving any of the seven 'wastes' and try to eliminate them
- to look at the patient's experience of the whole journey.

Process map tips

- Make sure you have all views on the process, including the patient. The more input you have from different roles, the more you will learn about your process
- Define the start and the end of the process you are improving. This can be hard, as most of our processes are interlinked.
- You can list the steps on separate sticky notes and place them in order on a wall or on cards on a table.
- Record how the process actually works, rather than how it is intended to work.
- Go back and examine in detail any steps you are not clear about.
- Add any data you know (eg what percentage of patients complete a certain step, data recording delays between steps).

Variations of process maps

Swimming lanes

This type of process map separates out people or tasks into parallel lanes. This can be useful for complex tasks in which several groups have overlapping or coordinating responsibilities, such as planning an elective caesarean section list. The parallel 'lanes' could list the morning work for the patient, midwife, surgeon, scrub team and anaesthetist.

Value stream mapping

This is a 'Lean' improvement term. It places great emphasis on what steps add 'value' for the patient; for example, eliminating routine follow-up appointments when the patient does not need to attend the hospital.

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A5 Improvement basics: driver diagrams

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Driver diagrams are very useful quality improvement tools. Early in a project the collaborative development of a driver diagram can help to clarify how the aim will be reached through working on different components of the system. Later in the project it can also help to track the various work projects. The creation of a driver diagram should ideally bring a whole team together to brainstorm the things that need to be improved to reach the goal.[1,2] The driver diagram helps to link the changes that you plan to make to the outcomes you want to achieve.[3–5]

If we want to improve care for a particular patient group or condition, then we need to set a clear measurable aim as discussed in section A3: Making improvement happen. What do we want to achieve by when, and how will it be measured? We also need to define the boundaries of the system we are going to work in; for example, are we working in one hospital or across a region? We then need to formulate change concepts and to develop a change package to understand how best to deliver the improvement. A driver diagram can be used to illustrate the aim and to link the primary drivers (also sometimes called key drivers) – the key system components that can be worked on to 'drive' change – to achieve the desired outcomes. The primary drivers are then linked to secondary drivers, the specific change concepts that can be used to create projects that can be worked on to realise the desired outcome. There are lots of examples of healthcare driver diagrams on the internet to give you an idea of how to construct one.

You can develop a driver diagram to assist with your own improvement project. Specify your measurable goals in the left-hand box of the driver. For example, I created a driver diagram to improve care for patients undergoing emergency laparotomy (Figure A5.1).[6] The goals are to decrease mortality, complications and cost. To achieve those goals, we need to work on the primary driver areas: preoperative care, intraoperative care, postoperative care and end of life care. If you were a surgeon working on this project you may want to add another driver, such as reduce incidence of patients presenting for emergency laparotomy with a secondary driver to improve screening for bowel cancer. Remember that it is best to work on areas where you can have most impact. Therefore, as an anaesthetist,

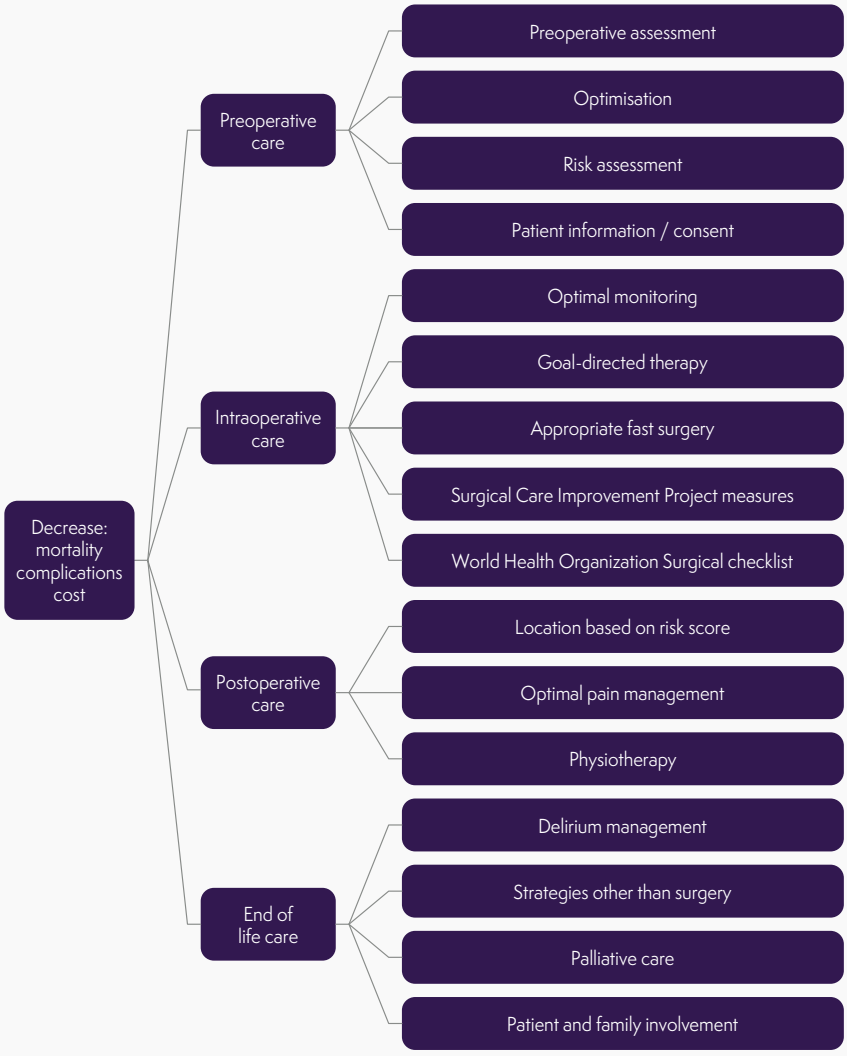

Figure A5.1: Example driver diagram to improve care for patients undergoing emergency laparotomy.[6]

I may want to develop secondary driver components to develop projects to work on the intraoperative care driver. For my diagram, I chose to add the intraoperative projects shown, but you could add others, such as the presence of a senior team for this surgery.

Try developing a driver diagram for a project area you are interested in. This way of thinking can be very helpful to demonstrate the number of areas you can work on to get improvement for your goal. When you have created your driver diagram with your team, pick a secondary component to work on. Remember to pick an area where you can influence change and start working with enthusiasts who will support your change ideas.

If you are developing a theory of change for a more in-depth research project or grant, a driver diagram alone may not be enough to connect changes to outcomes; you may need to develop a programme theory.[7] This requires more clarity about why change will happen. For example, saying that 'our new guideline will reduce postoperative nausea and vomiting' assumes that the guideline will work. Stating that 'our new guideline will reduce postoperative nausea and vomiting because it will provide quick access to an evidence-based protocol that clinicians will find easy to use' articulates much more clearly why the guideline will work. When thinking about your improvement ideas get into the habit of thinking through why this idea will work.

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A6 Improvement basics: bundles to improve reliable delivery of care

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The care of the ventilated patient bundle and the central line bundle are all now very familiar to anaesthetists and intensivists, but how do you create a bundle and what are the principles behind a bundle?

A 'bundle' is a group of interventions for a given disease that, when implemented together, may result in better outcomes than if they were implemented individually. A bundle does not have to include every process related to that area of care; it is designed to improve delivery of related aspects of care to the patient. The use of a small number of evidence-based interventions and the collection of data based on their delivery leads to the recognition that it is really hard to deliver three to five components of care 95% of the time. Most teams, when they start measuring, will find that their performance for bundle delivery is between 20% and 60%. If you deliver each component of a five-element bundle at 90%, then five multiplied by 90% means that you are delivering an overall performance for this bundle of 59%. Use of a bundle promotes awareness that the team must work together to get all the components delivered reliably and to use improvement methods to redesign care processes.[1] Examples include the use of multidisciplinary rounds and daily goals to reinforce bundle compliance (eg planning the sedation hold for a ventilated patient).

The features of bundle design are as follows:[1]

- The bundle ideally has three to five actions agreed upon by clinicians (each further intervention will reduce reliability, as explained above (eg 7 elements × 90% delivery = 48%).
- The steps are all necessary and each step must be performed to achieve success.
- The multidisciplinary team develops the bundle.
- Elements should be descriptive rather than prescriptive (eg thromboprophylaxis on the ventilator bundle does not define what the prophylaxis should be).
- Each step is individually based on level 1 evidence if at all possible.
- Each step should be clearcut and all-or-nothing. The answer to completion of the step can only be 'yes' or 'no' (eg in the ventilator bundle: Was the sedation stopped this morning? The answer has to be yes or no).
- The bundle must take place in the same time and space continuum; for example, the central line bundle takes place during a single episode of line insertion and assessment of the ventilator bundle is made during the ward round.
- There should be no controversy about each step. The bundle is about how to deliver best care, not what the care should be.

As delivery of the bundle components reaches more than 95% reliability, teams can consider what other components would improve care. As delivery of the care bundle improves, teams should see a parallel improvement in related outcomes (eg increased reliable implementation of the central line insertion bundle should correspond with a decrease in central line blood stream infections).

Studies indicate that, by using care bundles as part of a comprehensive improvement strategy, clinical outcomes improve.[1–3] Part of the problem with the adoption of care bundles can be the lack of agreement on which measures to monitor. This does not detract from the value of a bundle if it is accepted that bundles are not the 'answer' to the problem, they are just one tool that can be used in the design of services within an environment of continual improvement. The goal is to ensure that evidence-based care is reliably delivered every time it is needed.

The success of the central line bundle in the United States, after Pronovost and colleagues demonstrated that an intervention including care bundles used in 103 intensive care units decreased infection rates by up to 66%, led to the state-wide implementation of the bundle in Michigan.[2–3] Teamwork and communication were identified as key to the improvements seen.[3]

The Surviving Sepsis bundles have demonstrated an association between improved bundle compliance and decreased mortality.[4] The Surviving Sepsis bundle has evolved over time, as more evidence around efficacy and timing has emerged. The newest version simplifies the old three- and six-hour bundles into a one-hour bundle with increased emphasis on the urgency to start treatment immediately when the patient presents.[5] Bundles should be designed to be updated and evolve as new evidence emerges. The simpler and clearer the timing and actions required for high bundle performance, the more likely that bundle implementation will be high.

When designing your own bundle, consider the following steps:[1]

- Agree on a set of elements to initially test against a small number of records to understand the baseline (if all elements are very low individually, reconsideration may be needed).
- Test with a small sample to identify the barriers to each of the elements in terms of measurement and practicality of implementation.
- When practical elements are identified, move to testing in a single unit or clinical area.
- If clinicians do not choose the individual element about 80% of the time, as you scale up, reconsider or reformat the element.
- Design the bundle with the aim of achieving 95% reliability.

An example of an effective bundle, developed from basics and now being widely implemented, is the emergency laparotomy pathway quality improvement care bundle (ELPQuiC).[6,7] This bundle was developed in one hospital then tested in four, then was scaled up through the Emergency Laparotomy Collaborative programme,[8] and is now being rolled out across England by the Academic Health Science Networks. In both the original ELPQuiC programme and in the Emergency Laparotomy Collaborative, as bundle compliance improved the desired outcome of a reduction in mortality also improved.

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A7 Improvement basics: Pareto charts

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A Pareto chart is used to display data in categories, to demonstrate the most common areas you should aim to improve. Pareto was an Italian economist who was the first to notice what became known as the 'Pareto principle', that 80% of the impact comes from 20% of the causes.

It is a combined histogram (frequency usually displayed on the left-hand vertical axis) and cumulative line chart (usually displayed on the right-hand vertical axis). Using the line chart, you can trace back which categories are responsible for 80% of your impact and so target them for improvement.

As an example, Figure A7.1 shows the reasons for an obstetric list starting late, taken from a daily audit. Looking at the causes that are responsible for 80% of delays, the team should work on blood tests, midwife availability, theatre preparation and patient preparation as key areas for improvement.

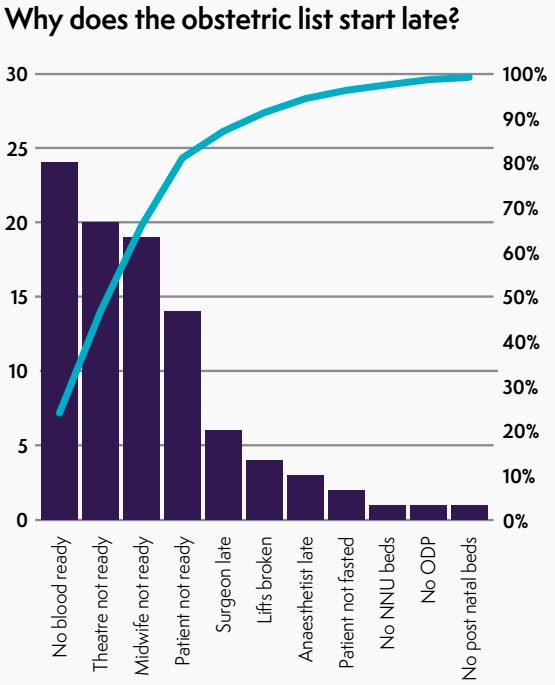

Figure A7.1: Why does the obstetric list start late?

There is a Pareto chart tool on later versions of Microsoft Excel. By entering your frequency data, choosing 'Insert' and then 'Recommended charts', a Pareto chart will be offered as a chart type.

Further reading

NHS Improvement. Pareto chart tool (https://improvement.nhs.uk/resources/pareto-chart-tool).

Quality improvement in anaesthesia

A8 Studying patient harm and death to improve care: structured mortality review, global trigger tool and root cause analysis

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Understanding where harm is occurring in our hospitals is essential to allow us to find the areas for improvement work that will be most effective to increase patient safety. There are a number of tools that can be used to find harm and to help us better understand the underlying causes of harm. These tools include structured mortality reviews, root cause analysis of incidents and trigger tools. It is important to remember that we should proactively look for potential causes of harm, so learning from near misses and using a screening tool such as the global trigger tool should be combined with the learning from mortality reviews and actual harm events.

Mortality review is a standard part of any audit and quality improvement programme. While all departments should be reviewing deaths of patients in their care, and in anaesthesia this is most usefully done in conjunction with surgical specialties, there is also much to be learned from using a structured approach to all hospital deaths. This approach was mandated by the National Quality Board in 2017 in 'Learning from deaths in the NHS' and is supported by the Royal College of Physicians' National Mortality Case Record Review programme using structured judgement review.[1,2]

Structured mortality review helps to identify system issues such as:

- identifying patients where escalation of care should have occurred or been provided in a more timely manner
- to enable sharing and categorisation of harm events and development of themes, such as end of life care
- to allow trends to be seen over time (eg failure to communicate among teams)
- to gain information to improve end of life care.

Mortality reviews offer a means of 'saving lives by studying deaths' and the same themes come up time and again from different hospitals worldwide.[1,3,4] The most common of these are:

- failure to recognise, record and to react to the deteriorating patient
- failure to plan
- failure to communicate
- hospital acquired infection
- renal failure
- postoperative complications.

There is more on structured mortality review in section 4:12 Emergency anaesthesia in this book.

Trigger tools can be used to identify adverse events and areas for improvement by auditing small samples of all patient notes for all inpatient admissions, not just those who died.[5] Triggers such as the use of naloxone are used to detect potential harm, which in the case of naloxone use would be overdose of opioid. Presence of a trigger does not necessarily mean that the patient came to harm. 'Harm' is classed as something you would not wish to happen to you or to a relative. Harm is divided into categories, ranging from temporary harm which required intervention to patient death. This method is again used to classify harm into themes as suggested above and to identify areas for improvement. It can also be used to track reduction in harm associated with improvements in the quality and safety of care. It is important to be aware that the way in which the global trigger tool is preformed varies between organisations and so it is most useful for internal improvement work and not for comparison of one hospital with another.[6] For more detailed information on how to use global trigger tools for audit and quality improvement see the references below.[4–6]

Root cause analysis is a structured process used to understand how and why an incident occurred or as an investigative tool to understand shortfalls in the quality of care.[7] If the root cause or source is identified, then quality improvement resources can be dedicated to improving care. The link between analysis and action is important and to that end the US National Patient Safety Foundation has coined the term 'RCA2' (root cause analysis and action).[8] A root cause analysis should involve all associated stakeholders through relevant multidisciplinary team involvement, with remedial action planning and associated audit and reaudit to prevent adverse event recurrence.[7] If the adverse event has been significant and a patient harmed, consideration should be given to involving the patient or family in the root cause analysis. It is important to have an understanding of the limitations of a root cause analysis, for example using staff who have not been adequately trained in the technique or failing to involve key stakeholders.[9]

A tool often used in root cause analysis is the fishbone diagram (Figure A8.1), also known as a cause and effect diagram or an Ishikawa diagram (after its inventor Professor Ishikawa who designed it in Japan in the late 1960s). It can be used to help creative thinking and brainstorming on possible causes by the analytic team.[10]

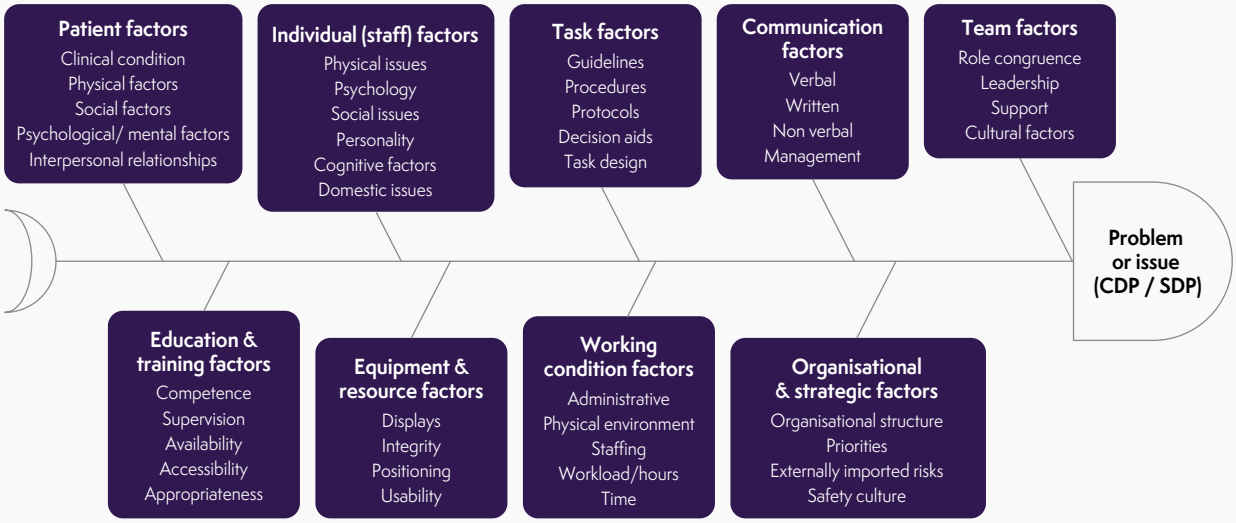

Figure A8.1: Fishbone cause and effect diagram (reproduced from Fereday S. A Guide to Quality Improvement Methods. HQIP; 2015)[7].

Group ideas around themes which can be created by the group or based on the following generic categories:

- patient factors
- individual (staff) factors
- task factors
- communication factors
- team factors
- education and training factors
- equipment and resource factors
- working condition factors
- organisational and strategic factors.

For each category, the team should consider 'Why does/did this happen?' and then go deeper and deeper by asking why at least five times, a technique known as the 'five whys'.[11] As a quality improvement example, consider how you would use this diagram to prompt brainstorming about the reasons why first cases in the operating theatre don't start on time in your organisation. Further reading and practical information is provided in the references below.

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A9 How do you know a change is an improvement? Using run charts

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Data collection is part of all improvement work. Collected data have traditionally been presented in summary format, either as a single numerical figure or as two numbers before and after an event. Whenever two numbers are compared, they are likely to be different. Anything that is measured will be found to vary over time. Summarising data in aggregate blocks removes the vital clues that exist in plotting data on a graph in time series. Plotting each data point over time allows construction of run charts; a simple but powerful tool for examining whether a change has occurred.[1]

How to construct a run chart

Plot time on the x axis and the measurement on the y axis. Enter your data. Once the data are plotted calculate and create a central line using the median (the middle value). Using the median as the centre line has two advantages: it is the point at which half the data points lie above and below the centre line, and it is also resistant to the effects of extreme outliers. All spreadsheet programmes will have a command for this.

How do you know a change is an improvement using a run chart?

Often, when we look at data, we can overreact to the data and apply subjective rules to affirm whether a 'shift' has occurred or whether a 'trend' is present. There are specific

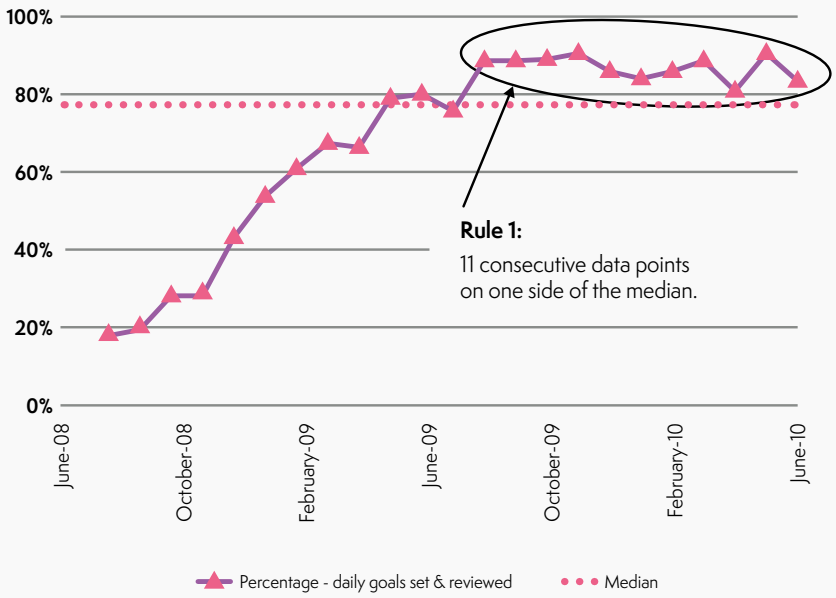

Figure A9.1: Run chart showing that a shift has occurred; that is, when six or more data points lie on the same side of the median.

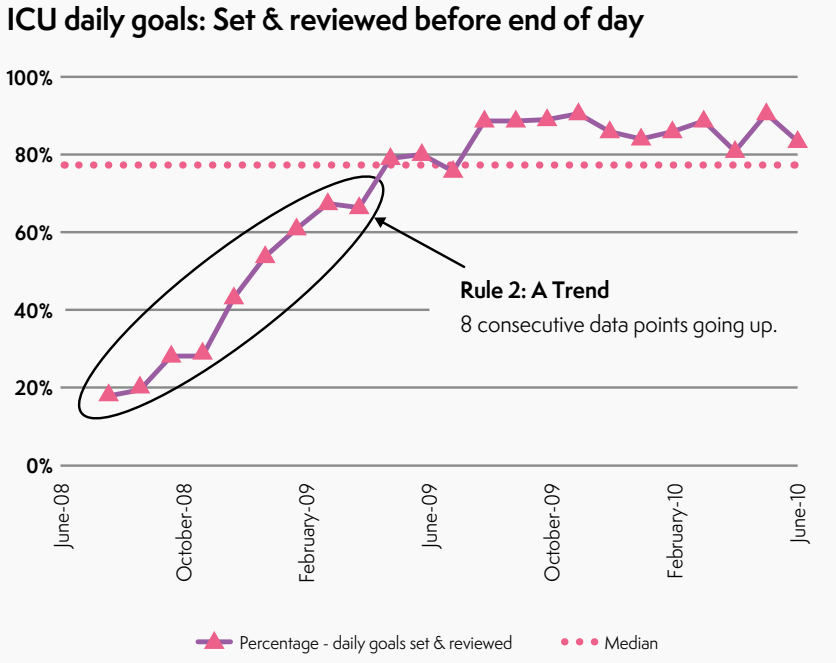

Figure A9.2: Run chart showing a trend. There are five consecutive data points (or more in this case) increasing in sequence.

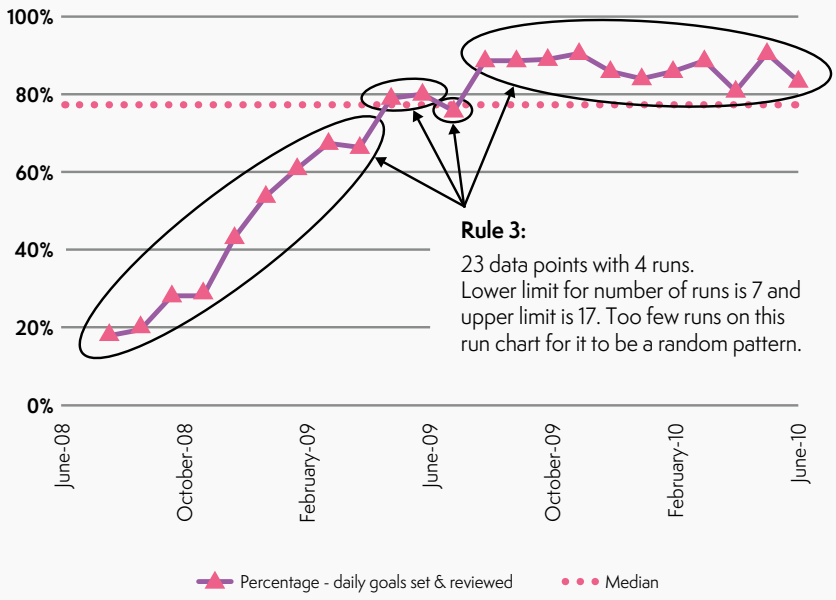

Figure A9.3: Time series data (or a run chart) showing a number of runs.

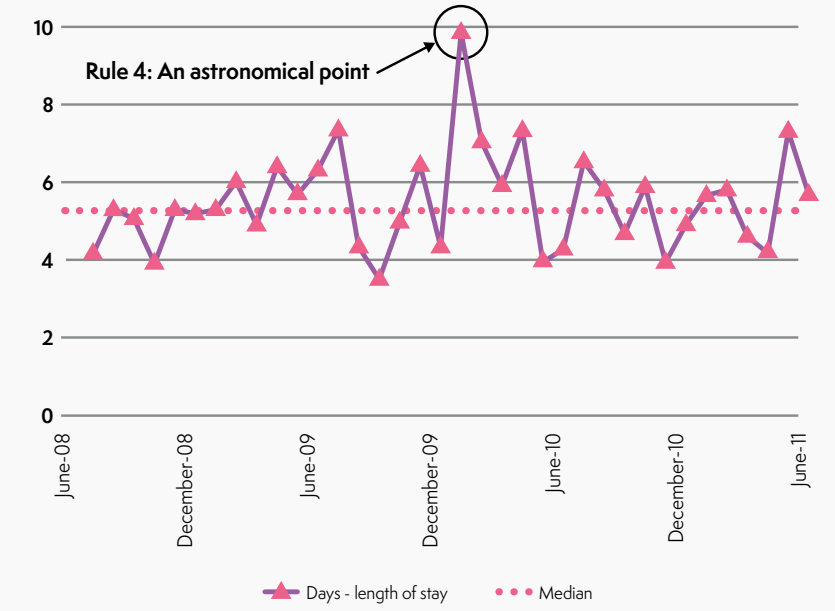

Figure A9.4: Run chart with an astronomical point.

rules that can be applied to a run chart to determine whether a non-random change has occurred. This first three of these are based on the laws of probability.

Rule 1: A shift

A shift has occurred when six or more data points lie on the same side of the median (Figure A9.1). This can be either above or below the median. When counting data points, some may lie on the median. These data points do not contribute to a run; ignore them and continue counting.

Rule 2: A trend

A trend has occurred when there are five consecutive data points either increasing or decreasing in sequence (Figure A9.2). Trends can cross the median. If any consecutive data points are equal, only count the first data point, ignore any repeating values, and continue counting.

Rule 3: Number of runs

A run is a series of data points on one side of the median. A data or point or points that lie on the median do not interrupt a run. The number of runs can be simply calculated be counting the number of times the line connecting those data points crosses the median and add one. If the data in the time series are random, the median should be crossed a certain number of times given the number of observations made (Figure A9.3). A table exists that compares the number of data points and the expected range of how often the median should

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be crossed.[2] This allows us to determine whether there are too few or too many runs.

Rule 4: An astronomical point

This rule aids detection of unusually small or large numbers. All run charts will have a lowest and highest data point. An astronomical point is blatantly different from the rest of the data points and is something that anyone looking at the chart would agree with (Figure A9.4). When an astronomical point is seen, you should question what else was going on at the time, as this is not normal variation. For example, a run chart of hospital mortality during a severe flu epidemic could have an astronomical point.

Using run charts

Run charts can be constructed once there are ten data points. When initial baseline data shows random variation, the median can be calculated and then projected into the future on the chart. Data acquired later in the improvement project will not affect this median, which can be used for comparison. This allows for non-random changes in the data to be detected clearly.

There are three important uses for a run chart. First, a run chart displays measures over time and makes progress visible to those on the team. Second, a central tenet of improvement is that all improvement requires change, but not all changes lead to improvement. A run chart and the rules can be used to determine whether a change has resulted in an improvement. Annotating the run chart with the times at which changes were made makes this an important use for run charts. Third, the run chart has time series data. These data are particularly useful in helping to determine whether the gains are held after a change has been implemented.

Run charts are good for detecting changes, either an increase or decrease in a measure. Run charts cannot be used to determine whether a measure, process or outcome is stable. This requires the construction of a Shewhart, or control, chart and requires additional software or a plug-in for the spreadsheet programme. For almost all hospital improvement projects, a run chart will be sufficient. When more than 50% of measures are either 0% or 100%, a reliable median cannot be drawn. In this case, a run chart using time between events may be more useful.

Run charts are simple to construct.[3–5] The simplicity, together with the probability based run chart rules, provides an easy yet powerful method for assessing the impact of the changes we have made. This provides an objective method to determine whether the changes we have made to the process have led to improvement that has been sustained over time. When improving a process to improve an outcome, a powerful way to present the data is with both these measures plotted on the same run chart using a secondary y axis. This provides a powerful display of the linkage between improving a process and improving an outcome (Figure A9.5).

Acute Pain in Elective Orthopaedics: Primary hip & knee replacement
Process AIM: Bundle reliability > 95% by end of Jan 2010
Outcome AIM: Reduce incidence of even one episode of severe pain by 50%

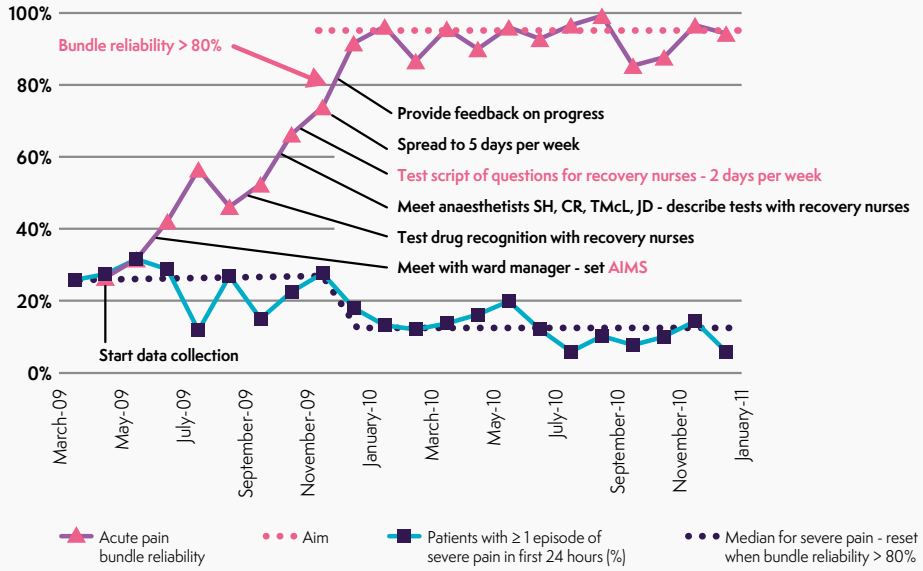

Figure A9.5: Run chart showing both outcome and the process being improved on the same chart. Annotation also helps the reader to understand what effect changes have had.

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A10 Statistical process control charts

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Statistical process control (SPC) charts (or Shewhart charts, after their developer Walter Shewhart), are used to identify and understand variation in a system.

When a biological variable is repeatedly measured, such as a daily blood pressure reading, variation occurs over a period of time This effect is called 'common cause variation'. However, when an intervention occurs (eg a patient forgets to take their antihypertensive medication, or the drugs used to treat their hypertension are altered) then 'special cause variation' will have taken place.

The distinction between 'common cause variation' and 'special cause variation' is important. Common cause variation is inherent in the system and is therefore predictable. To change common cause variation or improve the system, system redesign is needed. Special cause variation requires either investigation of the cause of the variation, or it may provide evidence that changes made to the system are having an effect.

Section A9 of this book discusses run charts. A run chart and an SPC chart have a number of important differences. A run chart can be constructed with fewer data points than an SPC chart and is more than adequate for most improvement projects. However, a run chart does not have the more rigorous statistical approach that SPC charts have and does not show upper and lower confidence limits, which are calculated in relation to the data being plotted. SPC charts are used to provide a greater degree of confidence that the system is stable (ie no points are falling outside of the confidence limits) or that change is really happening (ie data fall outside the confidence limits). SPC charts are more likely to be used when publishing work from a quality improvement project. A major advantage of SPC analysis over more familiar statistical analysis is that SPC charts take into account continuing change over time, rather than aggregating data from two static time points such as 'before' and 'after'.[1,2]

SPC charts have a number of key elements:

- Data points are arranged over time in time sequence.
- The centre line is the calculated mean or median.
- Statistically calculated upper and lower three sigma limits. These are called the 'upper' and 'lower' control limits.
- Between the upper and lower control limits and the central line, two further lines can be shown representing 1 and 2 standard deviations from the central line.
- There are a number of different types of SPC charts such as a P chart for binomial data (eg pass or fail). The type of chart needs to be selected appropriately for the type of data.

To make an SPC chart, it is usual to have 25 or more consecutive points of measurement. Many software programs are available to assist in the construction. However, the first step is to decide which SPC chart is appropriate for the data set and whether the data are continuous or discrete. Flow charts are available to assist in the decision-making process.[1–3]

Once the chart has been chosen and constructed, the question then arises as to whether common cause or special cause variation exists. Any one measurement outside the upper or lower control limit is accepted as a special cause variation and should be investigated. When sequential data points lie between the upper and lower control limits there are further rules for determining whether special cause variation has occurred).[1,2]

As with run charts, SPC charts are particularly helpful when attempting to change a process or pathway. Once a stable baseline has been confirmed with only common cause variation, then attempts to change the pathway can be plotted over time and indicated on the graph. It is especially useful to see how different interventions such as education, meetings or new ways of working can impact on the overall outcome desired.

Are SPC charts inferior to standard research methodology?

Many randomised controlled trials try to exclude the effect of normal variation by collecting large sets of data over prolonged periods. The variable under study is aggregated into a larger group and then compared with another group. The trouble with this type of study is that it may take many months or years to establish the effects of an intervention. SPC charts provide statistical rigour and, by using time sequence charts to study change over time, are able to detect changes at an earlier time than randomised control studies, and to observe whether normal or common cause variation is making a difference[3]. SPC charts actually help us to understand

what happened in our research, not just whether change happened or not. For example, the Emergency Laparotomy Collaborative used SPC charts.[4] The charts showed us that although there was an improvement in processes through implementation of a care bundle, some changes did not occur until the second year of the study.

SPC charts are gaining significant popularity among medical researchers, who find the graphical representation of change and early signals of performance change (often related to specific interventions) very helpful.

Finally, there are many types of SPC chart, as identified above, which can use data from a variety of different types of distributions such as Poisson, binomial or geometric. In addition, charts are available to study rare events such as 'never events' or the acquisition of methicillin-resistant Staphylococcus aureus bacteraemia or mortality. Further references are provided to help readers interested in these areas.[1–5]

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A11 Performance polygons for representing multidimensional data

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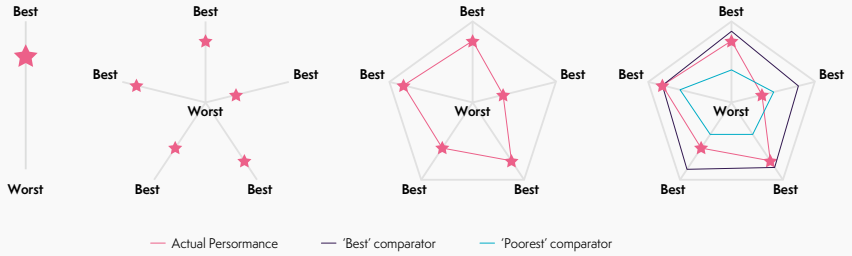

Figure A11.1: Construction of a performance polygon.

Measurement of healthcare outcome is central to assessing quality and quality improvement. Although healthcare performance has often been presented in a single dimension (eg a 'postoperative pain audit') healthcare quality is complex and often involves several related or conflicting outcomes with importance depending on your particular focus; for example for tonsillectomy, the patient's focus (pain and nausea, readmission rate, time off school or work), the anaesthetist's (nausea, pain, daycase rate), the surgeon's (operative time, bleeding, readmission rate), the theatre manager's (theatre time, cost) and the hospital management's (cost, daycase rate), and all outcomes differ.

Relying on single outcome measures encourages 'silo mentality'. Changes in practice intended to improve one outcome (eg pain on waking) may adversely impact others (eg postoperative nausea and vomiting, time in recovery). During practice change, measuring 'balancing measures' may enable unintended consequences to be captured. Performance polygons are a form of data representation, reflecting the complexity of outcome measures. Examples are shown but are not intended to define which outcome measures should be used when measuring perioperative (or other) quality. Performance polygons provide an easily assimilated visual indication of multiple quality measures in one graph.

Performance polygons qualitatively represent multidimensional data, making understanding of overall performance easier. They are derived from star charts.

A performance polygon is constructed as follows (Figure A11.1):

- An outcome measure is plotted on a single line, with better performance indicated by a longer line.
- Additional measures are added as equally spread 'spokes' spreading outwards from same origin (four measures 90 degrees, five measures 72 degrees etc).
- Performance data is plotted and the points are joined, forming a 'performance polygon'.
- Comparator polygons are superimposed as benchmarks, with the reference measure (often the 'optimum outcome') in each domain represented by the same length line, to create an equilateral polygon.

Comparator polygons can be internal (eg temporal changes in an individual's multidimensional performance) or external (eg predefined benchmarks) and may be used to represent the performance of individuals or groups.

Example 1 comparison with departmental performance

Figure A11.2 shows an individual anaesthetist's performance with exemplar outcome measures in recovery. Chosen outcomes are of interest to patients, surgeons, recovery staff, managers and anaesthetists and include measures of anaesthetic skill (regional block

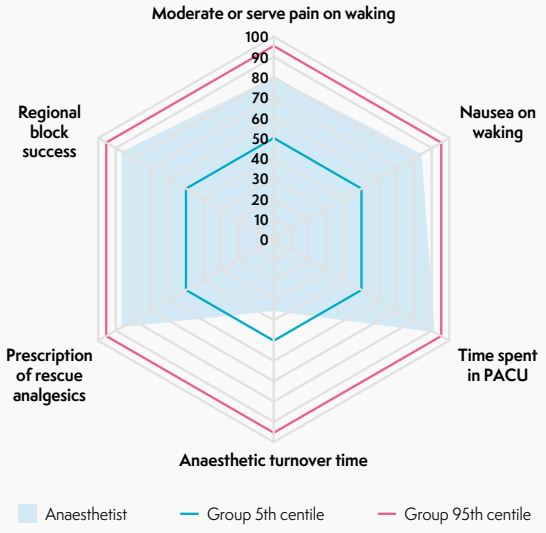

Figure A11.2: Comparison with departmental performance.

success), process variables (good prescription practice), efficiency measures ('turnaround' time) and patient-relevant outcomes (pain, postoperative nausea and vomiting): all measures of anaesthetic performance.

This anaesthetist achieves above average/very good outcomes compared with the reference group but is slow. Criticism about slow service may be deflected by the high-quality patient-centred outcomes. The anaesthetist might focus on improving speed while maintaining outcomes.

Example 2 performance polygon: surgical team performance

Figure A11.3 shows multidisciplinary multidimensional outcomes after knee arthroplasty. All outcome measures are of interest to all team members but individuals may influence some outcomes more than others: the anaesthetist (theatre time, time to mobilise and EuroQoL Quality of Life, EQ-5D, score), surgeon (theatre time, complication rate and Oxford knee score), nursing and physiotherapy care (time to mobilise, EQ-5D score and length of stay). Managers will focus on time in theatre and length of stay. Most importantly, the patient will probably be most interested in EQ-5D score, length of stay and Oxford knee score. Other outcomes of interest could be added or substituted to create a polygon with a different focus. The quality of performance is high, with excellent three-month outcome: the team might address those measures that are closest to the median and turn length of stay from good to excellent.

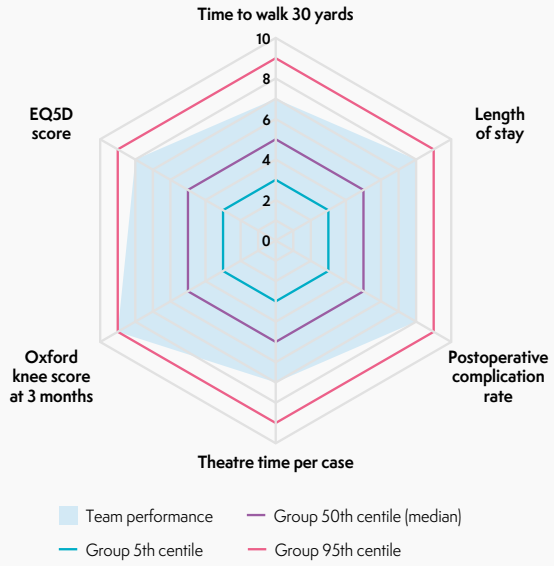

Figure A11.3: Performance polygon: surgical team performance for total knee arthroplasty. The EQ-5D measures global wellbeing in five health-related domains. The comparator polygons are the 95th and 5th centiles and median performance of a reference group, which might be historical data, performance in the neighbouring theatre or trust, or nationally acquired data.

A performance polygon such as this might be used to compare surgical or anaesthesia practices. For instance, during debate about the best surgical or anaesthetic/analgesic method to use for knee arthroplasty, a performance polygon might provide a better balanced assessment of the utility of different techniques than the traditional approach of a pain audit. A performance polygon could compare performance after introduction of an enhanced recovery after surgery programme, illustrating not only on length of stay but also on balancing measures such as pain on discharge and readmission rates.

Comment

Performance polygons have a multitude of potential designs and uses in any specialty. As they provide multidimensional information, they may be especially valuable when balanced measures need to be considered (eg in preparing for training assessment or appraisal or responding to a complaint). Using a large database, performance polygons might be used to examine team or individual performance for specific operations to determine perhaps who performs best (so they may educate others) or to identify individual lower outliers (so they may learn from others). They also usefully represent change such as the introduction of new techniques or procedures or, in research, to show both primary and secondary outcomes. As with many quality measures, large complete datasets and sequential data are likely to be of greatest value.

A final word of caution: the area of the performance polygon may be altered by varying the order in which the outcomes presented, and not all outcomes may have the same importance even if represented with the same 'weight'. Quantitative analysis of performance polygons is likely to be difficult, but the use of z-statistics is one option to develop the tool further.

A11 Performance polygons for representing multidimensional data

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Conclusion

Performance polygons are a simple, powerful way to represent data over several domains. Their visual representation is easily understood. Adding comparator polygons enhances their value and can transform the polygons from simple graphical displays to a potential driver of change and quality improvement.

Further reading

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Quality improvement in anaesthesia

A12 Checklists

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Checklists are ubiquitous in our daily lives and in our healthcare practice. Many of the recipes in this book may propose a checklist or bundle to ensure better compliance with best practice standards. Checklists are often introduced in an effort to reduce complexity and to prompt users 'just in time' to consider certain steps or perform certain actions. Complexity is part of modern clinical practice and checklists have been shown to improve outcomes in clinical care and are standard in surgical practice.[1]

Checklists may be a series of 'read and do' checks, like checking the anaesthetic machine, challenge and response checks to make sure that routine procedures have been completed or they may be a series of prompts that structure a team briefing or debriefing.[2] They may be used to address key safety items that are frequently overlooked, to standardise performance of clinical tasks or to facilitate communication, shared understanding or handover of essential information within or between clinical teams.

The science behind checklist development is complex and many lessons have been learnt from industry.[2] More recently, studies done on the implementation of checklists in healthcare have indicated why some checklists work well and others do not.[3]

A good checklist should:

- Be evidence-based, trialled and tested before introduction, perhaps using simulation.
- Be focused to deal with a particular set of issues or tasks.
- Only contain five to nine items in each section.
- Prompt communication and confirmation of information.
- Be easily accessible when needed and clearly designed, using familiar language.

The World Health Organization (WHO) surgical safety checklist and other surgical checklists have been found to improve surgical morbidity and mortality in a range of settings,[4] but the impact of the WHO checklist is crucially dependent on compliance and the local context.[5,6] The introduction of a checklist to improve central line infections improved safety but these programmes were not solely based on the introduction of a checklist.[7,8] They were accompanied by a rigorous measurement schedule, a training scheme for all staff involved, senior executive support and project coaching. Design and implementation of a checklist is a complex process.

Consider the type of problem

- Consider the type of problem you wish the checklist to address. Some issues are simple, technical issues, such as checking the patient's identity or whether essential imaging is displayed in the operating theatre. These are suitable topics for a simple checklist.
- Complex or socio-adaptive problems require discussion and teamwork, and the answer may change depending on the circumstance (eg discussing critical or unusual steps in an operation or the 'plan B' in a difficult intubation in the emergency department). These are rarely fixed by implementation of a simple checklist, but require improved teamwork, communication, training and other elements as part of the package.[9,10]

Consider your local context

- Variable performance may be improved by a checklist, but it is also likely to be due to different attitudes among members of staff and different environments. We all know theatre teams who perform the WHO checklist well and those who do not, even within one hospital. This kind of variable performance could be better addressed with team training and understanding why performance is different, and perhaps addressing individual performance.[6,9,10]

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A13 From audit to action: the power of trainee networks

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Completing an audit is only the beginning

The Healthcare Quality Improvement Partnership defines clinical audit as 'a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit measures and the implementation of change'.[1] While it can be relatively simple to perform an initial audit, taking the next step and improving the quality of care is much harder.

Identifying the area for improvement

The first step is to identify what you want to change. Trainees often have insight into variations in practice across a region and may have seen examples of practices that work well and could be adopted more widely. Other sources of ideas for quality improvement projects might come from this compendium, National Institute for Health and Care Excellence (NICE) guidance, royal college or professional society guidelines, findings of National Audit Projects (NAP) of the RCoA or NCEPOD reports. As an example, the use of capnography for out-of-theatre intubation was recommended in NAP4 and was endorsed by statements from the Association of Anaesthetists and the Intensive Care Society.[2] Today, capnography is widely accepted as standard practice for any intubation. This was not always the case and implementation was helped in part by audit and quality improvement.

Evidence and expert opinion

Any quality improvement project requires evidence that compliance will improve outcomes. This might come from randomised controlled trials, smaller non-randomised studies or even expert opinion and guidance from bodies such as NICE. In our example, there was strong evidence that using an intubation bundle including capnography reduced the rate of adverse events associated with intubation in the intensive care unit.[3]

Identifying current practice

The next step is an audit of current practice. This key step can highlight any deviations from best practice and can motivate people to change. The majority of audits will be local departmental projects. Coordinating a regional audit became much easier, however, with the emergence of trainee research networks. These networks now cover the vast majority of the UK, with increasing membership and project participation. Many are supported by their local school of anaesthesia and have a resilient governance structure, consultant supervision and nominated trainees in each hospital to lead projects. Since December 2013, they have been overseen and coordinated by an umbrella organisation called the Research and Audit Federation of Trainees, allowing the facilitation of national projects.[4] Anaesthesia and critical care trainee research networks have now delivered many high-impact regional audits of practice, which have been published. Subjects include perioperative diabetes management, ventilation on intensive care units, blood transfusion and central line complications.[5–8]

Whatever the scale of the audit, it is vital to ensure that within each hospital the appropriate audit registration procedures are followed and that each department is aware of the process from the outset. In our example, a prospective audit of out-of-theatre tracheal intubation practice around the West of England region identified wide variation in the use of capnography between sites, and also identified other areas for potential quality improvement. The project was run by one of the first anaesthesia and critical care trainee research networks (Regional Trainees in Intensive Care Severn, RTIC). The nominated trainee at each site was responsible for optimising data capture and quality, although the methods they used were left up to them.[9]

An intervention to improve practice

In general, simply exhorting people to 'do better' is not effective at improving quality. It is more effective to introduce processes with the quality interventions you seek to introduce built in. The development of standardised processes empowers all members of the multidisciplinary team to demand standards of care that they might not otherwise feel they could ask for individually. In the RTIC project, the intubation checklist was written to standardise out-of-theatre tracheal intubation practice and to prompt trainees to request safety equipment, such as capnography, prior to commencing intubation.

Development using PDSA cycles

Once a new process has been designed, it is important that it works in the environment in which it will be used. If staff cannot understand the rationale for new processes, they may feel that changes are being imposed on them for no reason. Using plan–do–study–act (PDSA) cycles allows users to design the process to make their life easier, while retaining the improvement effect. They also then 'own' the process and will be much more likely to use it than a process that has been imposed on them from above. The RTIC intubation checklist went through several iterations in a single centre before reaching a consensus version that was ready for wider trials.

Motivating people to change

Once you have a working process, you can start to spread it out within your region. Again, your network is invaluable here and there are many ways to encourage people to take up your intervention. Presentation of the original audit, revealing differences in practice across a region, together with the evidence supporting your intervention, is a powerful tool. Where capital investment is required then it is important to look at cost-effectiveness data to present a robust business case for investment.

As part of the RTIC project, audit data were presented at both local and regional level and were subsequently published.[9] Trainees from all hospitals in the West of England region were involved in developing the checklist, which was widely used within this region prior to being featured as an appendix to the NAP4 report.[2]

It has now been disseminated internationally, mostly via social media, with adaptations of the original RTIC checklist being used in hospitals from as far afield as the United States and Australia.[10]

Documenting your success

The process of quality improvement is continuing, and it is important to audit practice repeatedly to ensure compliance. The audit should have been registered with the hospital and they will keep a record of it. Where specific quality indicators have been identified, improvements should be documented to encourage continued engagement. Finally, you should to continue to survey practice over time to ensure that standards do not slip and to demonstrate the effectiveness of your intervention.

Acknowledgements

Many thanks to Dr D Freshwater-Turner, Dr T Bowles, Professor C J Peden and the RTIC Severn Group, who wrote the original version of this chapter.

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A14 Co-design and working with patients

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There are many ways that we can include patients' perspectives in improvement work, including surveys, focus groups, listening events, observations, shadowing and more.

'Co-design' refers to staff and patients working in partnership to improve services so that both staff and patients contribute to the design of new improvements.[1] This can be moved one stage further, with 'co-production' referring to staff and patients working together not only to design changes but also to implement them (eg patients writing new information leaflets).[2] Remember that patients may bring unique skills from their own backgrounds and training to help your improvement work.

Co-design is often used when trying to improve the patient's experience of care. This is the basis for experience-based co-design, which has been developed by the Point of Care Foundation charity. The Point of Care Foundation has developed a toolkit available to support those wanting to work more with patients.[3]

Working with patients as active partners in improvement is certainly trickier to set up than working with staff, but has many potential benefits, not least of which is ensuring that whatever changes are made are most likely to work well for patients.

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Quality improvement in anaesthesia

A15 Changing behaviour

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Most quality improvement work involves trying to change behaviour, usually clinical behaviour; for example, to get staff to comply with existing guidelines or to start following new guidelines. We may approach behaviour change by disseminating the new practice in an updated guideline or perhaps by raising awareness in a teaching session, department meeting or posters and emails. However, these approaches often do not lead to widespread adoption of new practices. We also have to think about what motivates people to change and what are the barriers that stop them from making change. Psychologists use a variety of frameworks and approaches to describe behaviour change and the barriers to changing behaviour. Some of these have been used successfully in healthcare to aid implementation of new guidelines, such as the York and Humber achieving behaviour change patient safety toolkit, the COM-B model (capability, opportunity, motivation) and behaviour change wheel, and the Institute for Healthcare Improvement's psychology of change framework.[1–3]

For example, a team looking at intraoperative handover wanted to ensure that anaesthetists followed a checklist when handing over during a case. They presented the new checklist at the departmental meeting and wrote a policy but found that many people were still not following the new process. Using the York and Humber achieving behaviour change tool, they surveyed anaesthetists asking why they did not hand over according to the policy. The answers revealed that some staff thought it took too long, some intended to do it but often forgot, and some did not think it was important to use the checklist. This gave the improvement team several areas to work on: they streamlined the checklist, they placed the handover checklist in a prominent place on the anaesthetic machine, and they shared some examples of critical incidents involving forgotten information at handover, to highlight the importance of the task. These steps improved compliance with the new guidance more than an education session alone.

Time would have been saved in the example above if the critical incidents problems had been shared initially. Provide clinicians with data to illustrate what the problem is at the beginning of the project. If data are combined with patient stories about what impact the change may have on their patients, then the impact is increased. Think about the lessons from emergency laparotomy. Understanding that the mortality for your hospital is 10% at 30 days is made much more impactful when you hear what that number means to a family that lost a loved one. For other projects, one team member may be motivated by wanting to change a process that is slow and cumbersome and another team member may be interested in getting some improvement work on their CV. There are some relatively easy reads available that discuss some theories on motivation and can help you to think how you use change management theories in your improvement work.[4,5]

Remember that we all respond well to feedback, celebration of success and being part of a team. Engagement is increased by making meetings short, effective and including food! Give teams regular feedback about what is working and what is not. Celebrate success and publicise success in any way possible to keep momentum going. Leading change is hard, so you need to be resilient and build your networks of volunteers and champions, who will work with you to make change happen.

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Quality improvement in anaesthesia

A16 Habits of an improver

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Most of this book takes the perspective of helping you and your team with practical guidance on how to structure your measurements and use the correct improvement tools. We know that this is only part of what is needed to make improvements, and that training in improvement methodology alone does not result in staff feeling confident and capable to do quality improvement work.

Professor Bill Lucas and Hadjer Nacer from the Health Foundation have proposed a different way at looking at the field of improvement, describing the key 'habits' seen in people undertaking improvement. These habits are complementary to skills or knowledge, and the proposed 'habits' are being used to develop quality improvement teaching and the curriculum to ensure that we are not just knowledgeable, but that we can use learned improvement skills in the real-world environment.

The diagram in Figure A16.1 lists the habits in five categories: learning, influencing, resilience, creativity and systems thinking. Central to all these habits is good communication, and more central again is co-producing health and social care with patients.

There is a fuller description of each of the habits in the full document.[1]

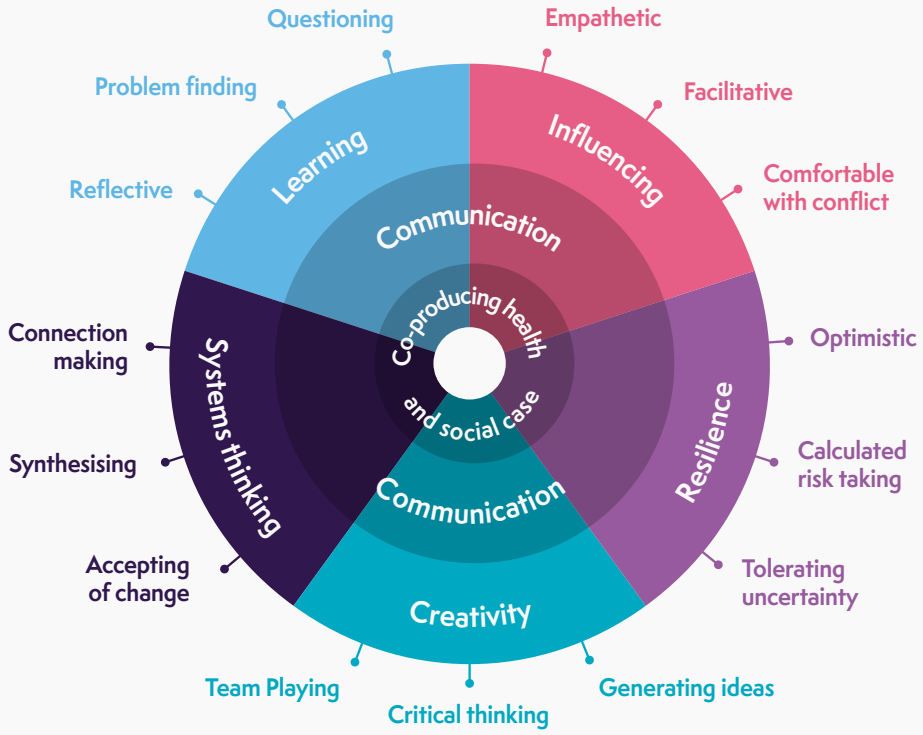

Figure A16.1: The habits of an improver.

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Quality improvement in anaesthesia

A17 Spread and sustainability: how to spread effective ideas and plan for sustained improvement

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This book is all about undertaking improvement work. However, achieving a short-term improvement that fades over time is not an effective use of resources. In addition, if you have a successful improvement project which achieves positive change for your patients, you may want to spread it to further areas of your hospital or to other organisations. There are well-recognised pitfalls of spreading change too early, before your improvement work is ready, which may destine the project to fail. Equally important is maintaining change after the first flush of success. During planning of any improvement project, thought should be given to how successful change can be sustained; for example, what happens when junior doctors rotate or when team leaders leave? Fortunately, there are a number of resources to signpost important considerations for both spread and sustainability.[1–4]

Spread can be defined as actively disseminating best practice and knowledge and implementing each intervention in every available care setting.[1] The Institute of Healthcare Improvement has described the 'seven spreadly sins', which if indulged are likely to lead to failure of the improvement when it is spread.[2] The sins are:

1. Don't bother testing just start with a large pilot.
2. Give one person the responsibility to do it all and depend on local heroes.
3. Rely solely on vigilance and hard work.
4. Spread the success unchanged – don't waste time adapting for different contexts.
5. Require the person or team who drove the initial improvement to be responsible for much wider spread.
6. Check huge amounts of monitoring data at infrequent intervals.
7. Expect huge improvements initially and start spreading right away.

Sustainability can be defined as ensuring gains are maintained beyond the life of the project.[1] The NHS Institute developed a sustainability model which consists of 10 factors encompassing process, staff and organisational issues.[3] Factors that are likely to help to sustain a project which should be considered when planning for sustainability include:

- Does the project have benefits beyond directly helping patients (eg does it reduce waste or cost)?
- Are the befits of the project credible? For example, do all staff know about it and believe in the benefits?
- How adaptable is the new process? Can it be altered for different contexts? Does it depend on specific individuals?
- How will the new process be monitored? Is there a feedback system? Are mechanisms in place to monitor beyond the end of the project?
- How will staff be trained to sustain the process?
- Can frontline staff feed back and change the process as necessary?
- Is there senior leadership support and are the leaders taking personal responsibility to help to break down barriers?
- Are the clinical leaders trusted, influential and believable? Are they actively involved?
- Do the changes fit with the organisation's strategic aims and culture?
- Are there enough resources to support the new process?

These are many things to consider, but without time, financial and leadership support and a culture that is ready for change, improvement is very difficult.[4] Improvement work is particularly vulnerable if it seen to be owned by an individual or a small group, and if it is perceived as a short-term project.[5]

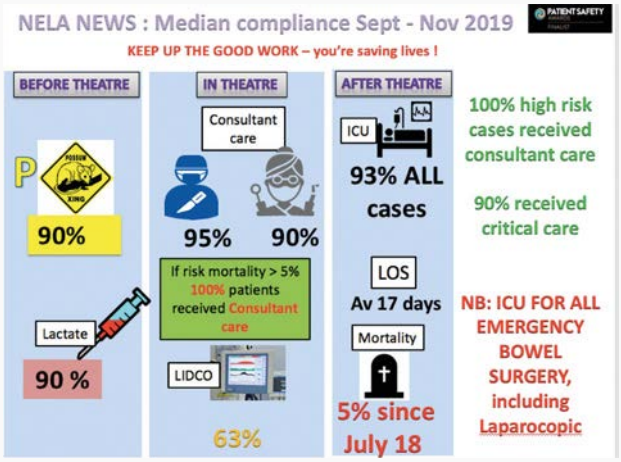

Figure A17.1: A communication newsletter designed to keep all staff engaged in sustaining the emergency laparotomy work at the Royal United Hospital, Bath.

Communication is absolutely essential to a successful sustained project.[6,7] Taking into account the spread and sustainability issues highlighted above, the more people who are involved in a project, who feel part of it and or know what has been achieved, the more likely the project will become embedded as 'the way we do things around here'. Figure A17.1 shows an example of a communication newsletter designed to keep all staff engaged in sustaining the emergency laparotomy work at the Royal United Hospital, Bath.

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A18 Publishing your quality improvement work

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The definition of audit includes an evaluation of a specific quality or quantity. Improvement involves a change for the better, typically of a process or structure leading to improved outcomes. There is much that can be improved in current medical practice. Sharing what we learn from our improvement efforts is an important part of this work.

All improvement work is a social process, and at its heart is the requirement for people, including the people leading the work, to change how they do part of their work. This makes it different from research that examines whether one drug or intervention is better than another in some dimension. Typical clinical research uses a study protocol which provides much of the foundation for the methods and sets up the results section. In contrast, improvement work almost always involves more than one change, and subsequent changes are based on learning gained as the work progresses, also termed 'iterative change'. This difference has often led to difficulties in getting improvement work published, often as it does not fit the traditional introduction, methods, results and discussion structure used in medical journals.

The Standards for QUality Improvement Reporting Excellence (SQUIRE) guidelines were first published in 2008 with the aim of increasing both the quantity of improvement work published and the quality of the published work.[1] These guidelines function in the same way as the Consolidated Standards of Reporting Trials (CONSORT) guidelines for randomised controlled trials and, similarly to the revisions to CONSORT over time, SQUIRE was reviewed, updated and published as SQUIRE 2.0 in 2016.[2] The SQUIRE guidelines provide a checklist that helps anyone working on an improvement project to design and frame their work. It is based around four fundamental questions: 'Why did you start?' 'What did you do?' 'What did you find?' and 'What does it mean?'

Why did you start?

A good quality improvement paper will describe the information that led to the need to make a change. Do this by first providing a summary of the current knowledge relevant to the topic. Describe the known standard or the current best practice, and how local practice compares to this. This provides a description of the quality gap at the start of the improvement work; it also provides a basis for describing the aim of the improvement project. Importantly, include a description of the rationale for the work. This would cover both what you thought were the reasons for the problems that existed in the process, and how the changes initially proposed would lead to improvement.

What did you do?

When we do quality improvement work, we intend to make changes to what is or was routine care. Therefore, describe what was done and how these changes were implemented. Changing routine work will be dependent on the characteristics of the setting or context in which it occurs. SQUIRE guidelines make clear that this is an important area to fully describe to enable your reader to determine how a similar approach may work in their own context. It is common in improvement work to find that the initial proposed changes do not work and this leads to further changes based on the learning.

What did you find?

Your data will usually be presented in time series, usually in the form of a run chart. Quality improvement work occurs in the real world and, as a result, the improvement strategy may change from learning obtained as the data are gathered over time. It is important to record and share these changes. Annotating the run charts to provide a timeline of what changes were made will provide your readers with a true sense of how the work evolved over time. Doing this is more challenging than it sounds. Keep a set of notes as the work progresses, about what you did and what you learned.

What does it mean?

There is a difference between 'doing' improvement and 'studying' improvement.[2] The 'doing' element focuses on what happened to the process and outcomes as part of the improvement work. When 'studying' improvement we should consider whether our rationale for the improvement holds or needs to be updated based on our experience and learning. It also considers the wider impact on the local setting of the improvement work.

SQUIRE 2.0 provides an excellent resource for designing and writing up an improvement study. Helpfully the guideline website (**www.squire-statement.org**) includes an 'explanation and elaboration' section which provides some worked examples. More journals now publish improvement work. BMJ Open Quality was developed just to publish peer-reviewed healthcare work and the improvement reports are listed on PubMed. The website also provides resources such as templates to help run and write up improvement work.[3] The contents of this RCoA document, together with 10 valuable tips provided by an experienced improver, will help you to make improvement part of your daily work and will help to communicate your learning to others.[4]

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B Recipes for continuous quality improvement in anaesthesia

1 Preoperative care

Edited by Dr Anne-Marie Bougeard
QI editor Dr Sharon Hilton-Christie

1.1 Patient information for anaesthesia

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Why do this quality improvement project?

High-quality evidence-based patient information empowers patients. It is an essential part of the surgical pathway as a prelude to consent. It helps patients to understand their treatment and the detail of the process surrounding this. The Sprint National Anaesthesia Project (SNAP-1) showed that patients reported anxiety as being the worst part of having an operation.[1] Well-written patient information will help allay anxiety and lack of understanding through clear explanation. It can also ensure that patients have more realistic expectations and so improves patient satisfaction.

Each person should receive the amount of information they want, in a form that they can understand and digest, to allow them to:

- optimise their preparation for surgery
- take an active part in shared decision making and the consent process
- be well informed as what to expect at each stage of the perioperative care pathway in the hospital so as to reduce anxiety
- be able to actively plan and best manage their recovery from surgery with the help of family, friends or healthcare professionals.

Background

Association of Anaesthetists guidelines on consent state that 'Information about anaesthesia and its associated risks should be provided to patients as early as possible, preferably in the form of an evidence-based online resource or leaflet that the patient can keep for future reference'.[2]

Patient information should cover any choices there may be for anaesthesia, risks of anaesthesia and information about analgesia options. Such information is available via the RCoA website, with a comprehensive range of resources explaining anaesthesia and risks.

Following on from the Montgomery ruling,[3] the information that is provided to the patient should be determined by the question: 'What would this particular patient regard as relevant when coming to a decision about which of the available options to accept?'.[2]

Printed information should be clearly written in simple language and should explain any terms that may not be familiar, bearing in mind that the average reading age of those commonly using information is around 13 years.[4] If hospitals are producing their own patient information resources, they should ensure that they follow the criteria set by the NHS Information Standard for high quality-health information.[5]

Where possible, patient information should be available in languages commonly read by local patients and in formats for those with impaired vision. Translators or readers must be available for those patients unable to read the written information provided. Modern accessibility software on electronic documents can read out text or clear background distractions – for example Browsealoud is now available on the RCoA website.[6]

Suggested data to collect

Standards	Measures
Preassessment nurses and anaesthetists should be trained and updated so they are able to print or signpost to patients a range of patient information resources, depending on the needs of the patient.	Have they been given specific training on available resources? Do they know where to find high-quality evidence-based information in both written and online format, covering: ■ basic information on anaesthesia and recovery ■ information on risks and adverse effects of anaesthesia, ranging from a summary to more in-depth information? ■ information on optimising health, lifestyle and preparation for surgery? ■ more specific information resources for particular procedures?
What resources are available to patients attending preassessment clinic?	■ Screen displaying information or an animation. ■ Posters displaying information. ■ Range of leaflets to read. ■ Computers to access information.
Is the specific information given to each patient recorded in the patient notes? Patient satisfaction with the information given to them at preassessment.	■ Are patients able to read and understand the information provided and are they happy with the format? ■ Do they feel they have the right amount of information? ■ Did this help to inform decisions about anaesthesia, postoperative care and pain relief?
Are resources available to allow all patients to access information?	■ Information for those with low literacy skills. ■ Translated into any common local languages for non-English speaking patients. ■ Accessible information for those with disabilities. ■ Interpreters booked for those who speak no English. ■ Does the information given pertain to local services?
What information is sent or signposted to patients who do not attend preassessment?	

1.1 Patient information for anaesthesia

Dr Hilary Swales
Lead for Patient Information, RCoA

Quality improvement methodology

- Map out current pathways of how patients receive information on anaesthesia and what information is routinely given. Are there any opportunities to improve?
- Consider working with patients to co-design information: can you use patient stories to deliver information in a more engaging manner?
- What training and resources are available to staff on the wards and preassessment clinics?

Mapping

ACSA standards: 1.2.2.1, 3.1.1.1, 3.2.2.3, 3.1.2.1
Basic curriculum competences: HT_BK_01–04, HT_BS_01–08, CE_BS_01–04, CE_BK_01–05
Intermediate curriculum competences: GU_IK_11, GU_IS_01
CPD matrix codes: 1F01, 2A03
GPAS 2020: 2.7.2, 2.9.1, 2.9.2, 2.9.3, 2.9.4, 2.9.5, 2.9.6, 2.9.7, 3.9.1, 3.9.2, 3.9.3, 4.9.1, 4.9.3

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Preoperative care

1.2 Perioperative risk prediction

Dr Michael Berry, Imperial School of Anaesthesia

Why do this quality improvement project?

Central to the decision-making process around surgery is the patient. Accurate risk stratification allows meaningful informed patient consent and shared decision making, as well as careful planning of perioperative care. Hence, every patient contemplating an operation should have an individualised risk assessment.

Background

Traditionally, risk assessment relied on the subjective clinical expertise of the healthcare professionals involved. The main focus of these consultations was to define fitness for surgery and anaesthesia. Increasingly, however, risk assessment is informing processes beyond the confines of the operating theatre. Perioperative risk prediction and stratification is now used to guide perioperative planning, investigation, and physiological optimisation. It informs communication and decision making between clinician and patient and, importantly, between professionals. Relating preoperative risk to much longer-term patient-centred outcomes is currently an area of research.

Perioperative risk assessment:

- allows meaningful discussions with patients around consent, shared decision making and consideration of alternatives to surgery
- helps to determine the need for further specialised investigations and interventions, such as pulmonary function testing or cardiac stress testing
- informs decisions regarding intraoperative monitoring and postoperative admission to critical care
- Perioperative risk stratification is useful in comparing performance across hospitals enabling risk adjusted comparisons
- identifies patients with similar risks profiles, which can facilitate the design of research studies.

Best practice

The RCoA, the Royal College of Surgeons and NCEPOD recommend that all patients should have their perioperative risk recorded on the consent form and in the medical record.[1,2] For hospitals participating in the National Emergency Laparotomy Audit (NELA), documentation of risk is a standard,[3] and the recommendations from the Perioperative Quality Improvement Project is that patients should have an individualised risk prediction.[4]

There are a number of validated risk prediction tools available, all of which may be used. Clinician experience, familiarity with risk prediction, type of surgery and other resource availability (eg cardiopulmonary exercise testing) will influence the choice of tool.

Suggested data to collect

Standards	Measures
All patients undergoing surgery should have their individualised perioperative risk of morbidity and/or mortality recorded both on the consent form and in the medical notes.	■ The proportion of all patients having elective or emergency surgery who have their perioperative risk explicitly recorded in both.
Patients with a predicted hospital mortality greater than 5% are treated as high risk and should be considered for critical care admission following surgery.	■ The portion of patients considered high risk undergoing surgery not admitted to intensive care.
To provide adequate critical care access for patients with a high risk, each hospital should regularly assess the volume of high-risk surgery carried out.	■ The proportion of high-risk patients cancelled on the day of surgery because of a lack of intensive care beds.

All high-risk patients undergoing elective surgery should be seen and fully investigated preoperatively. Expedited surgery should have the same quality of preoperative assessment and investigation.	■ Proportion of patients considered high risk assessed and investigated preoperatively.
All patients undergoing emergency major surgery should have a perioperative risk recorded at the time of booking surgery.	■ Proportion of patient bookings accompanied by a risk prediction.

Quality improvement methodology

Risk assessment and proportions of standards met lend themselves to particularly well to run charts.

Identifying barriers to risk assessment, critical care capacity or the challenges to comprehensively assess patients preoperatively can be examined using process mapping.

Evaluate electronic or manual booking systems to identify how risk prediction could be incorporated into mandatory information, therefore making it available to anaesthetists, surgeons, schedulers, critical care and bed management.

Risk prediction tools

P-POSSUM: www.riskprediction.org.uk
NELA Risk Calculator:
https://data.nela.org.uk/riskcalculator
American College of Surgeons NSQIP Surgical Risk Calculator: https://riskcalculator.facs.org/RiskCalculator
John Carlisle's Perioperative Risk Calculator:
https://sites.google.com/site/informrisk/home
Surgical Outcome Risk Tool (SORT):
www.sortsurgery.com

There are many examples of a 'boarding card' system for emergency laparotomy theatre bookings, where risk prediction is mandatory.[5] Quality improvement projects in the Emergency Laparotomy Collaborative and published by institutions have demonstrated this system well, and it appears to improve care as part of a bundle of interventions.[5,6]

In the elective setting, many perioperative clinics use a risk prediction tool to stratify level of perioperative care using a categorisation or 'traffic light' system. Examples include Southampton University Hospital, York Hospital, Torbay Hospital, University College London.

Mapping

ACSA standards: 1.2.1.1, 1.2.1.2, 1.2.1.3,
Curriculum competences: POM_HK_03, POM_HS_03, POM_HS_04, POM_HS_05, POM_HS_06, POM_AK_01, POM_AK_03, POM_AS_05
CPD matrix code: 2A03
GPAS 2020: 2.5.19, 2.5.2, 2.5.21, 2.5.22, 2.5.23, 2.5.24, 2.5.25, 2.5.5, 2.7.2, 2.9.1, 2.9.12, 2.9.13

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1.3 Prehabilitation before surgery

Dr James Durrant, Northern School of Anaesthesia and Intensive Care Medicine
Dr Gerry Danjoux, James Cook University Hospital

Why do this quality improvement project?

The preoperative period is a 'teachable moment' when patients may be more receptive to lifestyle modification to improve health. We should be able to provide high-quality advice and direct patients to local services to help them improve their health. This wider approach is known as prehabilitation.

Background

Physical inactivity is common in the UK surgical population. Poor cardiorespiratory fitness and sarcopenia are associated with poorer surgical outcomes.[1] Current research into preoperative exercise aims to identify which interventions and exercise modalities are most effective, the optimal preoperative exercise volume and the most beneficial environment for delivery (eg supervised vs non-supervised and hospital vs community setting).[2–4]

Guidelines are available around delivery of a safe and effective exercise prehabilitation programme.[5]

Smoking is common (20% of UK adults). Evidence for the positive impact of preoperative smoking cessation is established,[6] and research has also demonstrated longer-term abstinence from tobacco following a preoperative cessation programme.

Alcohol excess demonstrates a dose–response relationship for adverse perioperative outcome beyond consumption of 14 units/week. Preoperative intervention to reduce consumption to recommended levels has been shown to improve outcomes.[7]

Best practice resources

Exercise prehabilitation guidelines.[5]

Preoperative smoking cessation: Action on Smoking and Health joint statement.[8]

Alcohol intervention before surgery.[7]

Fitter Better Sooner: resources from the RCoA.[9]

Suggested data to collect

- What proportion of patients undergoing elective major surgery have an objective measurement of fitness?
- What proportions of patients have had health-related quality of life questioning?
- What resources are available to patients attending preoperative assessment clinics to encourage lifestyle changes and how can they be accessed?
- What written information on modifiable lifestyle factors is available to patients attending a preoperative assessment clinic?
- Have preoperative assessment personnel had formal training in offering advice and guidance on exercise interventions?
- Are all smokers referred to a local smoking cessation service? (aim for more than 80%)?
- If there are referral pathways in place for interventions, what percentage of those patients use them and what are the outcomes?
- If there is an exercise intervention programme available, what proportions of high-risk patients are offered access to this intervention?
- If there is an exercise intervention programme, what metrics are being recorded?

Quality improvement methodology

In many cases a formal structured exercise programme will be part of a research study and will be a large project to set up. There are areas of the UK where this has started. Examples include the 'surgery school' at University Hospital Southampton,[10] the PREPWELL programme in South Tees,[11] Prehab4cancer in Manchester,[12] PREPARE at Imperial Healthcare.[13]

A quality improvement project may focus on getting the simple interventions right and may focus on how patients can be identified: smoking cessation would be a good example (Figure 1.3.1).

If you were to design an exercise intervention programme, which patients would you target? Is there a screening process in place to identify those who would benefit? Is a smaller intervention possible, for example inspiratory muscle training for patients at risk of postoperative pulmonary complications?

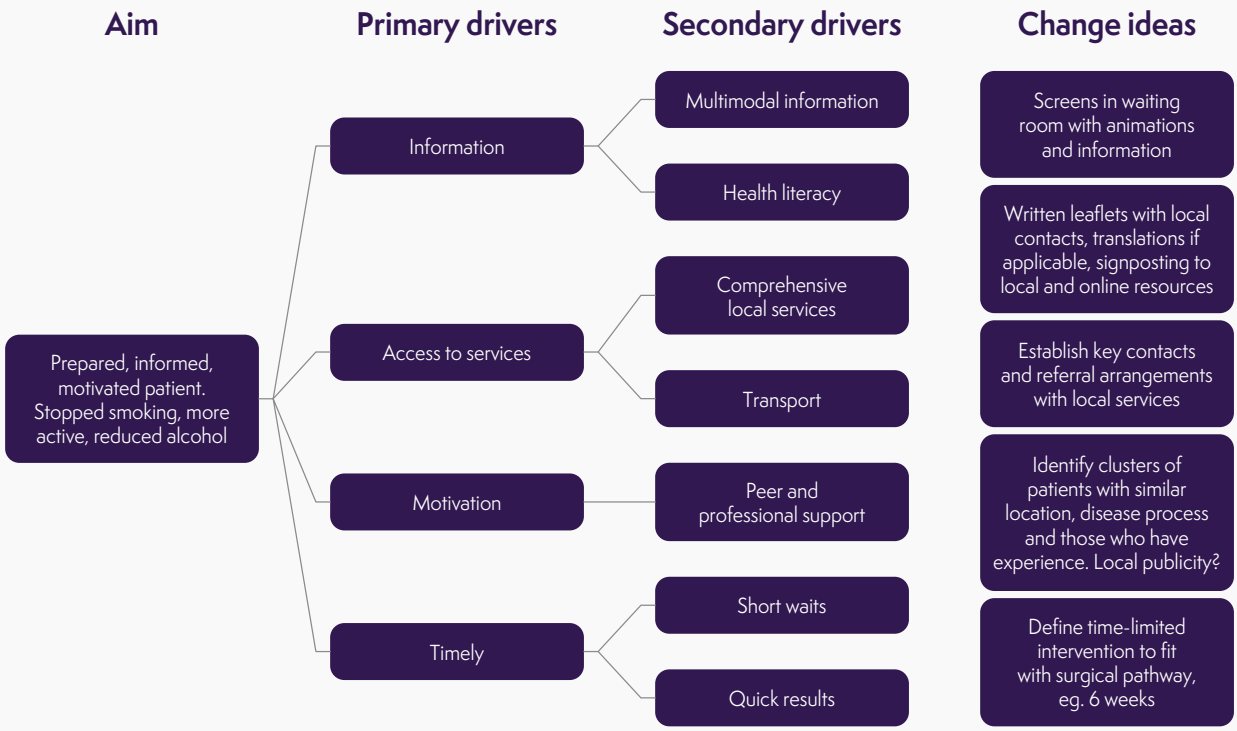

Figure 1.3.1: A quality improvement project on smoking cessation.

Case study: PREPWELL prehabilitation service, South Tees

Patients are identified at point of listing to determine suitability for a pilot, face-to-face, community-based multispecialty and multimodal prehabilitation programme. Following a 'one-stop' multiple risk factor 'entry' assessment, patients embark on a six- to eight-week programme at a community wellbeing centre with multiple health and lifestyle services co-located. A home-based option is also available. They attend twice weekly and exercise for 60 minutes in a supervised 'circuit-based' mixed aerobic and resistance programme tailored to the patient by health trainers. Those at higher risk of postoperative pulmonary complications undergo additional inspiratory muscle training. Patients are then reassessed prior to surgery with a mirroring 'exit' assessment to evaluate lifestyle and fitness benefits. Follow-up for the pilot quality improvement project has demonstrated; improved quality of life, improved fitness levels in 73% of patients, reduction in smoking and alcohol use and high levels of patient enjoyment and engagement with the service.

Mapping

ACSA standards: 1.3.2.1, 3.1.1.1, 3.1.2.1, 3.1.1.2

Curriculum competences: POM_BK_07, POM_BK_11, POM_BK_12, POM_IK_06, POM_IS_05, POM_HK_01, POM_HK_03, POM_HK_04, POM_HK_06

GPAS 2020: 2.5.9, 2.5.10, 2.5.16

1.3 Prehabilitation before surgery

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Preoperative care

1.4 Consent in anaesthesia

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Dr Elizabeth Combeer, Frimley Health NHS Foundation Trust

Why do this quality improvement project?

Consent is integral to all medical practice, including anaesthesia, and is based on the moral and legal premise of patient autonomy. Anaesthetists may be gaining consent for anaesthesia and, in some higher risk cases, this will extend to decision making around surgery. Patients should be involved in a discussion regarding their anaesthetic care.[1] Projects dedicated to strengthening this process will improve the quality of the patient's experience, will ensure that clinicians are working within national guidance and the law, and will demonstrate respect for patients' human rights.

Background

Valid consent is dependent on three factors:[2]

- Information: patients have varying requirements regarding depth and format of information provision. Case law from 2015 has reinforced the need for an individualised approach towards the discussion of risk.[3] Sufficient time must be permitted to allow full understanding and to address questions arising from the information given.
- Voluntariness: the patient must not experience coercion from family, friends or staff when making their decisions.
- Capacity: the default assumption is that an adult has capacity, but this should be evaluated formally if there are concerns.

Best practice

For the majority of patients, the risks associated with anaesthesia are low and it is acceptable for the patient to meet their anaesthetist on the day of surgery, having been provided with information in advance.[1]

Some patients are at higher risk and require longer discussion time and shared decision making.[1] Patients with capacity have the right to decline treatment that clinicians believe to be in their best interests.[4]

A patient who lacks capacity requires a process of consent that is specific to their situation:[5]

- Emergency treatment must be given in the patient's best interests.
- In the absence of family or friends, the assistance of an independent mental capacity advocate should be sought.
- Consideration of lasting power of attorney for health or an advance decision.
- The Court of Protection has the power to appoint a court-appointed deputy as a proxy decision maker for a person lacking capacity.
- Young people aged 16–18 years or children under 16 years who are deemed Fraser competent may give consent but cannot refuse treatment that either their parents or doctors believe to be in their best interests, and a parent may give consent on their behalf.
- Children should be involved but it is their parents who legally give consent. As always, legal advice should be sought in the event of conflict.

National guidance does not require written consent for anaesthesia;[6] however, whatever the local arrangements for documenting anaesthetic consent, the issues discussed including risks, benefits and alternatives should be documented,[6] in addition to any specific concerns addressed.[2] In the event of a discussion involving a patient at higher risk of complications, more extensive documentation should occur.[1]

Suggested data to collect

- Patient satisfaction surveys on the consent process, focusing on different patient subgroups.
- Qualitative and quantitative audit of specific issues relating to consent; for example:
  - ensuring that patients are making independent autonomous decisions and are not coerced
  - efforts to involve the family in decision making for patients lacking capacity prior to proceeding with urgent surgery
  - anaesthetic involvement in best-interests assessments of patients having elective surgery who lack capacity.
- Survey of clinician knowledge of the consent process and management of specific patient subgroups.
- Audit of what written information is given to elective patients prior to seeing an anaesthetist.
- Audit of consent discussion documentation.

Quality improvement methodology

- Qualitative assessment of case examples of patient subgroups detailed above, checking for consistency and appropriateness of approach to consent as based on national guidance and law.
- Process maps may be useful for identifying opportunities to improve multidisciplinary communication and to ensure timely involvement of the correct personnel for patients lacking capacity or who have specific issues that need to be addressed during the consent process.
- Education of staff based on deficiencies identified in knowledge, which may include role playing the practice of consent process.
- Training in shared decision making for anaesthetists and perioperative teams.
- Consideration of amending local documentation processes to improve information delivery and documentation (eg a checklist is present on many anaesthetic charts to allow the clinician to quote general risks during the preoperative visit and acts as a memory aid).

Mapping

ACSA standards: 1.2.1.1, 1.2.1.4, 3.1.1.2
CPD matrix code: 1F01
Curriculum competences: OA_BK_11, OA_BK_12, DI_IK_08, GU_IS_06, AM_HS_01, AT_D1_03
GPAS 2020: 2.3.31, 2.7.2, 2.9.1 to 2.9.15

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1.5 Shared decision making in perioperative care

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Professor Rupert Pearse, Queen Mary University of London

Why do this quality improvement project?

To use quality improvement strategies to improve the delivery of shared decision making (SDM) in perioperative care, through multidisciplinary working and patient involvement.

Background

Shared decision making is a process through which clinicians and patients work together to make evidence based decisions centred on patient preferences and values.[1] Patients involved in SDM have fewer regrets about treatments, better reported communication with clinicians, improved treatment adherence, and an overall better experience with improved satisfaction.[2]

One in three high-risk patients choosing surgery will experience serious medical complications leading to long-term decline in health and quality of life, but awareness of these risks is poor amongst both doctors and patients. Consequently, many high-risk patients do not receive the information they need to make an informed decision about surgery.

Whilst the evidence base for best practice SDM within perioperative care is not yet available, a recent systematic review suggested surgeons more often perceived a consultation as shared, than did patients.[3] Below are suggested drivers and barriers to be considered in quality improvement initiatives focused on bridging this gap and delivering truly informed consent.

Drivers

- Legal - Montgomery judgment cites the discussion of 'material risks' with patients. Implications for perioperative care mainly focus on ensuring robust informed consent.[4]
- Ethical - SDM supports beneficence and non-maleficence.
- Improved patient experience, satisfaction and outcomes seen in studies of SDM outside perioperative care.
- Policy - Department of Health White Paper 2012 'Liberating the NHS: No decision about me, without me'.[5] SDM has also been adopted in the national policy listed below.

Best Practice

Evidence based best practice is not yet available in perioperative care. Wider resources for guidance are given below:

- Legal: Montgomery Judgment recommendations.[4]
- RCoA Perioperative Medicine Programme 'Vision Document' 2015. https://www.rcoa.ac.uk/perioperativemedicine
- National Policy: NICE SDM Collaborative/NHS E SDM Initiative/AoMRC Choosing Wisely UK.[6]
- UK Research: Optimising decision making for high-risk surgical patients (OSIRIS)[7]/Choosing Wisely UK Pilot.[8]

Barriers[9,10]

- Professional culture - 'We do this already', due to lack of clear definition and understanding of SDM and a lack of understanding of clinical and legal obligations specific to perioperative practice
- Timing of consent/SDM - current pathways support the discussion of perioperative risk and involvement of anaesthetists after surgical informed consent has been sought. This can make shared decision making more difficult.
- Lack of standardised methods for risk assessment and risk communication.
- Instituting models which support true multidisciplinary working - SDM requires concurrent input from surgeons and anaesthetists (+/- geriatrician-led perioperative services where available) alongside patients/carers.
- A lack of robust data on postoperative outcomes with and without surgery (emerging in some surgeries; eg abdominal aortic aneurysm, prostate cancer).
- Patient Education/Information - need for evidenced based information in an understandable and accessible format ahead of clinical consultation.
- Strategies for patient activation - patients need to feel empowered to participate in SDM, and some may be reluctant to engage in this conversation.
- Measurement - need qualitative and quantitative methodology. Ceiling effect exists with some of the current tools, and there is no current consensus on how to measure the quality of perioperative shared decision making.

Facilitators

Both professional-facing and patient-facing approaches are needed to implement shared decision making. A national study into SDM concluded 'Skills trump tools, attitudes trump all' highlighting the need for cultural change for patients and professionals.[9]

- Professional education and training on communicating potential harms and benefits in the perioperative arena is available through e-learning - https://moodle.wintoncentre.uk. RCoA Shared Decision Making 'Train the Trainer' workshops are also available.
- Patient Facing Resources - Use of 'Benefits, Risks, Alternatives and doing Nothing' (BRAN, Choosing Wisely UK), 'Fitter, Better, Sooner'
- Decision aids/option grids - multiple options are available

Suggested quality improvement methodology and data collection

1. Baseline Practice - eg using the SDM 9-item questionnaire (SDMQ9 and SDMQDoc) for patients and professionals in surgical or anaesthetic clinics. Eliciting qualitative data through interviews or focus groups.

   Further reading: de Mik SML, Stubenrouch FE, Balm R, Ubbink DT. Systematic review of shared decision making in surgery. BJS 2018; 105: 1721-1730.

2. Implement an education and training shared decision making programme using MAGIC methodology.

   Further reading: Joseph-Williams N, Lloyd A, Edwards A et al. Implementing shared decision making in the NHS: lessons from the MAGIC programme.BMJ 2017;357:j1744.

3. Redesign a single preoperative surgical pathway, following process mapping of current pathway and data from qualitative interviews, to support SDM

4. Review current preoperative documentation for evidence of discussion regarding 'BRAN' ('benefits, risk, alternatives, doing nothing'). Then implement BRAN, or if already implemented, perform post implementation review.

   Further reading: Santhirapala R, Fleisher LA, Grocott MPW. Choosing Wisely: just because we can, does it mean we should? British Journal of Anaesthesia 2019;122(3):306-310.

   Resources: https://www.choosingwisely.co.uk/promotional-resources

5. UK Perioperative Quality Improvement Programme (PQIP) – use your local postoperative outcomes to inform risk assessment/communication.

   Further reading: Wagstaff D, Moonesinghe SR, Fulop NJ, et al. Qualitative process evaluation of the Perioperative Quality Improvement Programme (PQIP): study protocol BMJ Open 2019;9:e030214.

Mapping

CPD: IE01, IF06, 2A03, 2C06
Curriculum: Higher Curriculum GU_HS_02, RC_HS_04, POM_HK_03, POM_HS_05, MT_HS_06
Advanced Curriculum - Assisting colleagues in decisions about the suitability of surgery in difficult situations is a core clinical learning outcome. Additionally, shared decision making is specifically mentioned in AT_D1_01, DS_AS_01, OR_AS_01, TF_AS_18
Professionalism in Medical Practice - CC_D11_01
ACSA standards: 3.1.1.1, 3.1.1.2, 3.1.2.3
GPAS 2020: 2.9.1 to 2.9.15

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1.6 Preoperative fasting

Dr Anne-Marie Bougeard
RCoA Perioperative Medicine Fellow

Why do this quality improvement project?

Starvation prior to anaesthesia has existed since the late 1800s, aiming to minimise the risk of pulmonary aspiration of gastric contents, a rare but severe event. The last 30 years have seen increasing evidence that it is safe to shorten fasting times, but there is evidence that despite clear guidance, patients awaiting surgery may be exposed to prolonged fasting times. Additionally, there is evidence from recent retrospective studies that it may indeed be safe to further shorten fasting times for fluids. Changing practice in this area requires a change in culture for patients, nursing staff, surgeons and anaesthetists.

Background

Excessive fasting times may have adverse consequences for patients, ranging from discomfort to significant morbidity. The Sprint National Anaesthesia Project (SNAP-1) demonstrated that thirst in the perioperative period is one of the most common adverse sequelae of anaesthesia reported by patients.[1] Euvolaemic patients have lower rates of nausea and vomiting, improved levels of comfort and better outcomes from major surgery. Enhanced recovery programmes over the last 15 years have emphasised the importance of euvolaemia and carbohydrate loading to optimise haemodynamics and minimise the effects of the catabolic state associated with the surgical stress response.

Best practice

Patients presenting for elective surgery should have had access to clear fluids before surgery and should have been encouraged to drink to thirst up to two hours prior to surgery. No patient should arrive in theatre having had no fluid intake in the six hours prior to surgery.

Royal College of Nursing minimum fasting times are as follows.

Adults:

- two hours for clear fluids
- six hours for solid food.

Children:

- Clear fluid (up to 3 ml/kg) up to one hour prior to induction of anaesthesia
- four hours for breast milk.

Suggested data to collect

- What written fasting instructions are given to patients in the preoperative phase? Are they clear on what constitutes 'clear fluids'?
- What verbal instructions are given to patients on arrival at the hospital?
- Is water or other clear fluid available for patients to access freely while awaiting surgery?
- Is there information on the walls that patients and their carers may see to reinforce the new guidance?
- When was the last drink on arrival in the anaesthetic room?
- What do patients report as their level of thirst?
- Have there been any cases of aspiration on induction or emergence?
- What are the postoperative nausea and vomiting rates in this cohort of patients?

Quality improvement methodology

This project lends itself well to a baseline audit using some of the above data. The pathway may then be process mapped to understand what information patients are receiving preoperatively about fasting, what form this information is in and whether their route of admission influences the process. In hospital the environment and availability of fluids should be looked at. The interventions lend themselves to sequential plan-do-study-act (PDSA) cycles and improvements can be tracked using run charts tracking starvation times and correlated with patient-reported measures such as thirst and experience.

Case example

The team at North Bristol NHS Trust took this approach in their elective plastic surgery trauma patients to demonstrate continuous improvement in fasting times over a 12-month period. They used PDSA cycles:

- to educate staff and patients and improve written information for patients
- to introduce preoperative drinks and snack boxes on the ward.

Over the course of the project they demonstrated an improvement in fasting times and this was associated with an improvement in patient reported wellness and thirst.

Mapping

ACSA standards: 1.2.1.1, 1.2.1.4
Curriculum competences: POM_HK_05, POM_HK_11, PA_HK_03, PA_HS_05, DS_IK_03,04, POM_IK_04, PA_IK_03, OA_BK_04, PA_BK_03
CPD matrix code: 1I05, 2A03, 2A05, 2D02
GPAS 2020: 2.1.3, 2.5.17

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Further reading

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1.7 Perioperative management of surgery for patients with diabetes

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Why do this quality improvement project?

Some 10–15% of patients who present for surgery have diabetes.[1] The annual National Diabetes Inpatient Audit[2] and the NCEPOD Highs and Lows report[3] have found that patients with diabetes in the surgical population experience more medication errors and more complications than patients with diabetes on medical wards.

Background

Diabetes is one of the most common medical comorbidities in the surgical population. Despite the existence of cross-specialty guidance on best practice for the management of diabetes in the perioperative period,[4] surgical patients with diabetes are experiencing an unduly high rates of complications because of poor glycaemic control. Both hypoglycaemia and hyperglycaemia have significant adverse effects for patients, and hospital-acquired diabetic ketoacidosis is the third most common cause of the condition. The NCEPOD High and Lows report has highlighted issues with poor adherence to guidance and other studies have identified unsafe and inappropriate use of the 'sliding scale'.[3,5]

Best practice

Standards have been set by the Joint British Diabetes Societies for Inpatient Care (JBDS-IP) The Management of Perioperative Care guidelines,[4] which have been endorsed by the RCoA and the Association of Anaesthetists. The Association of Anaesthetists guidelines are very similar to the JBDS-IP guidelines.[1] It is recommended that all hospitals have a lead clinician for perioperative diabetes.

Suggested data to collect

Phase	Measures	Standard (%)
Preoperative	Percentage of primary care referrals containing all recommended information. This includes glycated haemoglobin (HbA1c) less than 69 mmol.mol-1, blood pressure, body mass index, estimated glomerular filtration rate and details of patients' diabetes management (JBDS guidelines, Appendix 12).[4]	80
	Percentage of patients with diabetes referred from surgical outpatients to preoperative assessment.	100
	Percentage of patients for whom a perioperative diabetes plan is created at the preoperative assessment clinic.	100

Operative	Percentage of elective patients with diabetes who are managed by simple manipulation of existing medication if the anticipated starvation time is only one missed meal.	95
	Percentage of patients with diabetes who are listed in the first third of the operating list (morning or afternoon).	95
	Percentage of people in whom a variable rate intravenous insulin infusion is appropriately used. This includes starting only when indicated, using the recommended substrate fluid of 5% glucose in 0.45% saline with potassium chloride 0.15% or 0.3% and stopping appropriately.	100
	Percentage of patients who receive hourly monitoring of blood glucose during their procedure and in recovery.	100
	Percentage of time that people with diabetes have their preoperative and intraoperative blood glucose kept between 6 mmol/l and 12 mmol/l.	100
Postoperative	Length of stay for patients with diabetes undergoing surgery or procedures requiring anaesthesia.	Not more than 10% longer than for people without diabetes
	Percentage of patients with evidence of poor perioperative glycaemic control (diabetic ketoacidosis, hyperosmolar hyperglycaemic state, hypoglycaemia requiring third-party assistance).	0
	Percentage of patients where their discharge is delayed because of diabetes related problems.	0

Quality improvement methodology

1. Planning and prescribing of a variable-rate intravenous infusion of insulin

Draw a process map of the patient journey from preassessment to postoperative ward care. What is the most reliable point to make the perioperative plan and by which staff members? What is the most reliable point to prescribe a variable-rate intravenous infusion of insulin (VRIII) and by whom? Can the prescription be standardised or preprinted to minimise prescribing errors? How can the plan be communicated most accurately across the admission phases and to the patient? How can the plan for termination of VRIII be communicated to and carried out accurately by the ward staff?

2. Monitoring of blood glucose

Look at the process map from admission to the postoperative ward stay. Look for parts where the glucose monitoring is often missed or fails to meet the recommended frequency standard. Which members of staff are present at this point? How can they be prompted to measure glucose appropriately?

3. Stakeholder involvement

- A perioperative lead for diabetes is recommended, as well as engagement with local experts (eg diabetologist with an interest in perioperative care).
- Producing an individualised plan for patients taking into account the surgery they are having, their current regimen and their usual diabetic control (eg diabetic passport).

1.7 Perioperative management of surgery for patients with diabetes

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- Having diabetes 'champions' in the team who are familiar with preoperative pathway for patients with diabetes can help both patients and staff in delivering teaching sessions. Change is often best facilitated 'peer to peer' (ie nurses may best engage nurses, doctors in training may best engage other doctors in training).
- Patient involvement and engagement is key in improving outcomes. Could you include patients in your improvement team or canvas the views of patients when designing your changes?

Case example

The Newcastle Hospitals Perioperative Diabetes Group have embarked on a three-year quality improvement programme to improve all aspects of perioperative diabetic management. On the wards they used sequential plan–do–study–act cycling to improve glycaemic control on surgical wards for vascular patients. They focused on education, provision of guidelines, set up of an in-reach specialist diabetic service and visual flagging of poor glycaemic control on the ward. They were able to improve rates of hypoglycaemia, abolish insulin errors in association with severe hypoglycaemia and reduce patient harm events from 20% to 6%.

In the preoperative setting, identification of poor preoperative glycaemic control has allowed a shift from admission overnight preoperatively to day-of-surgery admission and improved perioperative glycaemic control.[6]

Mapping

ACSA standards: 1.1.1.9, 1.1.3.1, 1.2.1.4, 1.2.1.5, 1.3.1.5
Curriculum competences: DS_IS_01, PB_IK_38, POM_IS_06, POM_IS_07, POM_HK_01, POM_HK_06, POM_HK_04
CPD matrix code: 2A03
GPAS 2020: 2.3.27-30, 2.5.10, 3.2.12, 2.2.9-12, 3.5.19, 4.2.18, 5.3.23-26

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Preoperative care

1.8 Managing frailty in the perioperative period

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Why do this quality improvement project?

Frailty is defined as a syndrome of decreased physiological and cognitive reserve across systems characterised by increased vulnerability to and recovery from a physiological insult. The presence of frailty is recognised as a predictor for poorer outcomes following surgery.[1] As yet, we do not universally screen for frailty in the preoperative setting, and this may impact on our ability to and factor into our risk assessment and decision making about perioperative care.

Background

There is currently an interest in assessing frailty and putting into place processes in the perioperative setting to address the impact of frailty on patient outcomes. While the evidence base for discrete preoperative interventions for frailty that may impact on outcomes is limited, there are models of care emerging that have demonstrated improved outcomes for patients who have been identified as frail and have undergone comprehensive geriatric assessment to plan their care and allow informed decision making around surgery.[2]

The importance of frailty has been recognised in its inclusion in the National Emergency Laparotomy Audit (NELA) dataset in 2018. Frailty is often a product of multimorbidity, and there are cases where referral to a specialist team in care of the older person or general physician will be of benefit, to optimise those comorbidities contributing to frailty in an individual. Quality improvement in this area may start with defining the local epidemiology of preoperative frailty and range as far as integrated clinic and perioperative multidisciplinary follow-up, depending on local resources.

Best practice

- NELA report percentage older than 65 years having a perioperative physician review.[3]
- NCEPOD report: Elective and Emergency Surgery in the Elderly: An Age Old Problem.[4]
- British Geriatric Society Guidance on Perioperative Care of the Elderly.[5]
- Association of Anaesthetists guidelines on perioperative care of the elderly.[6]

Suggested data to collect

Standards	Suggested data to collect
All patients over the age of 60 years admitted electively or as an emergency should have an objective measure of frailty documented.	■ Percentage of patients over 60 years with a frailty score documented.
Routine daily input from medicine for care of the older person should be available to patients over 80 years.	■ Percentage of patients over 75 years seen by geriatrician – currently already captured by existing tools (eg NELA and National Hip Fracture database).
Older and frail patients should have preoperative cognitive assessment using established screening tools.	■ Percentage screened/documented cognitive assessment preoperatively (in preassessment or preoperative visit).
Older patients should be assessed for the risk of developing postoperative delirium and guidelines should be available for the prevention and management of postoperative delirium.	■ Percentage of patients over 75 years screened for delirium before admission and on each postoperative day.
Older and frail patients should have comprehensive geriatric assessment.	■ How often is this available or carried out?

Quality improvement methodology

Process map your preoperative assessment process

Who is responsible for collecting most of the information? What is the most time efficient and practical way to measure cognition and objectively measure frailty? Can it be done during the existing appointment? This will enable you to choose an appropriate tool (examples include the Clinical Frailty Scale,[7] Edmonton Frail Scale). How would a patient be communicated as being at high risk or needing more multidisciplinary work up?

Driver diagram for multidisciplinary input needed for more complex multimorbid patients

Which members of the multidisciplinary team are currently available? What additional team members might you need to help to achieve your aim? Do they have capacity within their service? Is there a role for a smaller intervention? At what point could a comprehensive geriatric assessment be carried out preoperatively? Could it be incorporated into anaesthetic preassessment or done within an existing geriatric clinic?

Case examples

Systematic Care of Older People's Elective Surgery (SCOPES) clinic: Nottingham City Hospital has introduced a comprehensive geriatric assessment for patients considering surgery as part of their cancer management. This allows for targeted interventions to optimise comorbidities, facilitate decision making and plan rehabilitation and postoperative care.

PRIME clinic, Addenbrookes Hospital: since 2014, patients identified as frail in the preoperative assessment clinic are seen by a geriatrician, an anaesthetist, an occupational therapist and a physiotherapist. A comprehensive assessment of physical condition, comorbidities, perioperative risk and medication management is combined with shared decision making and planning of perioperative care.

The proactive care of older people service (POPS) at Guy's and St Thomas' Hospital and Darent Valley Hospital: the POPS service has been well established for some years and has published its successes. It provides a comprehensive service from preoperative through to proactive postoperative management and rehabilitation home. More recently, they have piloted the service in a district general hospital in Darent Valley, with success particularly in improving care in emergency cases.

Mapping

ACSA standards: 1.2.1.2, 1.1.3.1, 1.1.3.2, 3.1.1.1, 3.1.2.1
Curriculum competences: GU_BL_13, GU_BS_07, GU_IK_11, GU_HK_03, GU_HS_02, POM_HS_12
CPD matrix code: 2A03
GPAS 2020: 3.16–3.21, 5.11 5.19, 5.20, 3.18–3.23

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1.9 Management of preoperative anaemia

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Why do this quality improvement project?

Preoperative anaemia is associated with a number of adverse outcomes including an increased likelihood of perioperative blood transfusion, increased length of intensive care and hospital stay, mortality and morbidity.[1] In planned surgery with an expectation of major blood loss (greater than 500 ml), patients with anaemia should be investigated and treated to reduce their risk of requiring blood transfusion in the perioperative period, which in itself is a risk factor for poor outcomes. Approximately 30% of patients attending preassessment clinic for major surgery are anaemic.[2]

Background

There are a number of sound reasons for investigating and treating anaemia in patients undergoing major surgery. While there is currently a paucity of published evidence on the treatment of anaemia in patients preoperatively, there is considerable evidence that patients with anaemia have worse outcomes. There are national and international standards which support preoperative intervention, and it is one of the pillars of patient blood management. Reduction in the likelihood of transfusion benefits the individual and the system as a whole. The ability to deliver improvements in preoperative haemoglobin will depend on a number of variables, and we know that across the UK there is wide variation in the development of perioperative anaemia pathways. The application of quality improvement methodology to this part of the pathway will allow tracking of changes and improvement.

Best practice

National Institute for Health and Care Excellence Guideline 24: Blood Transfusion.[3]

British Committee for Standards in Haematology Guidance for the identification and management of preoperative anaemia.[4]

Simplified International Recommendations for the Implementation of Patient Blood Management (see also the recipe on this topic).[5]

International consensus on the perioperative management of anaemia and iron deficiency.[6]

Suggested data to collect

Standards	Measures
Measurement of haemoglobin six weeks before surgery	
Patients should have an assessment of their haemoglobin at least six weeks before planned major surgery.	■ Proportion of patients with a full blood count available six weeks before planned surgery.
Measurement of haematinics and investigation of anaemia	
Patients identified as anaemic should undergo further investigation of anaemia and intervention to improve haemoglobin prior to surgery. A pathway should exist to allow an expedited approach for imminent surgery where time is limited (eg cancer pathway).	■ Proportion of patients with haematinics performed based on anaemia and documentation of investigation of anaemia where appropriate.

Treatment of anaemia	
Patients undergoing elective major surgery should have had treatment of preoperative anaemia appropriate to the timeframe of surgery. This may be with oral iron, intravenous iron, B12 or folate supplementation as appropriate. Response to intervention should be documented.	■ Proportion of patients who have been treated for anaemia and the effect of the intervention.
Patients on antiplatelet agents and anticoagulants	
Patients on antiplatelet agents and anticoagulants should have written advice on when to stop medication and a documented plan for bridging therapy if required.	■ Proportion of patients who have a documented perioperative anticoagulation plan.

Quality improvement methodology

Measurement of haemoglobin six weeks before surgery

Draw a process map of the routes of referral to preassessment clinic or listing for surgery to identify patients on anticoagulants or antiplatelet agents, and at which points all patients could have a full blood count. How could you move the measurement of haemoglobin earlier in the pathway to facilitate earlier treatment of anaemia? How can you reliably highlight patients on relevant medications and reliably give them medication advice?

Measurement of haematinics and investigation of anaemia

Could the measurement of haematinics be automated? A number of centres have agreements with their local laboratory to run haematinics on patients attending preoperative assessment clinic whose full blood count demonstrates anaemia. This could reduce repeat testing and streamline your process and could facilitate a single point of contact for checking of results and triggering the next step in the pathway.

Treatment of anaemia

Consider a driver diagram looking at all the possible drivers to improve the treatment of preoperative anaemia. This may include GP referral for some patients or set-up of a service to deliver intravenous iron for other patients, depending on the surgery the patient requires and the referral agreements already in place.

Mapping

ACSA standards: 1.2.1.4, 1.2.1.5, 1.3.2.1
Curriculum competences: POM_HK_01
CPD matrix code: 2A03
GPAS 2020: 2.1.3, 2.5.5

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1.10 Patient blood management in perioperative care

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Why do this quality improvement project?

Patient blood management is a systematic evidence-based approach to optimising care for patients who might need transfusion.[1,2] As perioperative clinicians, we are well placed to oversee all aspects of patient blood management along a surgical pathway, in collaboration with haematology and surgical colleagues.

Background

There are patient and surgical factors which may predispose to an increased risk of transfusion in the perioperative period. Blood transfusion is more common postoperatively than intraoperatively. In addition to the management of preoperative anaemia, other aspects of the patient blood management programme are important for anaesthetists and perioperative teams to get right. These are ideal for quality improvement projects and include:

- The identification and planning of perioperative coagulation management in patients at higher risk of bleeding, either iatrogenically through the use of anticoagulants or antiplatelets or because of coexisting coagulopathy as a result of a medical condition.
- The use of perioperative tranexamic acid.[3]
- Consideration of and systems to facilitate the use of cell salvage.[4]
- Use of point-of-care testing to guide transfusion perioperatively.[1]
- Use of restrictive transfusion practice and single-unit transfusion.[5]
- Consenting patients at risk of requiring a blood transfusion in the preoperative consultation.[1]

Best practice

- Blood conservation strategies should be employed to minimise risk of transfusion with allogenic blood. This may include the use of cell salvage and or tranexamic acid in cases with expected blood loss of greater than 500 ml. Not all units have easy access to cell salvage, and awareness of the role of tranexamic acid may not be comprehensive.
- Restrictive transfusion practice in the absence of continuing blood loss of target Hb 70 g/l in patients without cardiovascular risk factors and the practice of single-unit transfusion followed by reassessment.
- A clear plan for perioperative management of patients on anticoagulants, including bridging therapy and when to restart anticoagulants.

Suggested data to collect

- Percentage of eligible cases where tranexamic acid was used, percentage of eligible cases where cell salvage was used, volume of blood collected, transfusion rate with allogenic blood.
- Documentation in notes of transfusion trigger in stable patients; audit of frequency of single-unit transfusions compared with multiple in stable patients.
- Documentation of decision making; surveying awareness of pathways.

Quality improvement methodology

Use of cell salvage

Are there barriers currently preventing cell salvage from occurring? Is it an equipment issue, a staffing issue, training issue or policy issue? A driver diagram may help to identify the factors that will govern the appropriate use of cell salvage in all applicable cases.

Restrictive transfusion policy

Process mapping of patients on a particular surgical pathway who receive transfusion may help to identify at which point in the pathway and why patients are being transfused. Is a target haemoglobin documented postoperatively? Are the ward staff and doctors aware of the transfusion trigger? Is there a written policy on single-unit transfusion? Are there opportunities for teaching and training?

Pre- and postoperative anticoagulation

Process map the patient pathway through preassessment, theatre and postoperatively. What are the factors governing decision making about stopping anticoagulants and bridging in the preoperative phase? Is it easy to identify which patients should be bridged or not? How is bridging organised? Are there cancellations or postponements because of gaps in this process? How are decisions made about restarting anticoagulation? When are these made and how are they communicated?

Case example

Torbay Hospital has demonstrated a culture change in patient blood management, which has led to improvements in patient safety, experience and outcome. They formed a patient multidisciplinary blood management group and embarked on a comprehensive training programme whereby all operating department practitioners were trained in cell salvage and a machine was primed and ready in emergency theatre and obstetric theatre for all cases, regardless of time of day or night. Other measures, including preoperative anaemia management, blood tracking and education on single-unit transfusion and the use of tranexamic acid, have dramatically reduced the use of allogenic blood in the trust. They have doubled the number of patients receiving cell-saved blood and have reduced the surgical/intensive care transfusion rate by 39% over four years (658 units at a cost of over £80,000).

Mapping

ACSA standards: 2.2.2.1, 2.1.1.10, 2.2.2.2
Curriculum competences: GUHK02, GUHS04, POMHK04, POMHK12
CPD matrix code: 2A03
GPAS 2020: 5.2.4, 9.2.20, 3.2.21, 3.2.22, 7.2.26, 7.3.19, 10.2.1, 5.2.34, 9.2.9, 3.2.37, 9.2.28, 11.2.7

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1.11 Perioperative neurocognitive disorders: Delirium and delayed neurocognitive recovery

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Why do this quality improvement project?

The most common postoperative complication for patients over 65 years of age is delirium and longer-term cognitive dysfunction, together termed perioperative neurocognitive disorders, yet until relatively recently little attention has been paid to the assessment and optimisation of brain function in the perioperative period. This project suggests ways of improving the care of our older surgical patients through assessment of cognitive risk, patient and provider education and multidisciplinary collaborative input.

Background

The reported incidence of neurocognitive disorders ranges from 20–40% with the greatest predisposing risk factor being preoperative neurocognitive impairment.[1] Preoperative cognitive impairment may not be evident without the use of a structured screening and diagnostic process.[2] Screening tests (such as the Mini-Cog© or equivalent)[3] should be used routinely to evaluate the brain preoperatively in everyone over 65 years of age.

An abnormal preoperative neurocognitive status predicts a higher likelihood of postoperative delirium, postoperative complications, increased length of stay and discharge to a place other than home.[3] If abnormal preoperative neurocognitive function is recognised, mitigating actions can be taken and the patient and their family can be informed of the risk. Importantly, it is estimated that up to 40% of postoperative delirium events are preventable.[1]

The term 'perioperative neurocognitive disorders' should now be used to describe cognitive impairment that occurs around the time of surgery.[4] The two types of neurocognitive disorder most likely to be seen by anaesthesiologists are:

- postoperative delirium: occurs in hospital up to one week post-procedure or until discharge, whichever occurs first, and meets diagnostic criteria for delirium.
- delayed neurocognitive recovery: cognitive decline diagnosed up to 30 days post-procedure. There is potential for recovery during this time, as acute effects of medication, pain, changes in sleep and nutrition, as well as the physical and emotion stress of surgery and hospitalisation, may still be present.

Best practice and suggested data to collect

Best practice includes preoperative, intraoperative and postoperative actions.

Best practice[1]	Measures
All older surgical patients (over 65 years) should be screened for preoperative cognitive impairment.	■ Proportion of all older surgical patients who are screened for preoperative cognitive impairment.
Older surgical patients (over 65 years) should be informed of their risk of developing perioperative neurocognitive disorders as part of informed consent for anaesthesia and surgery.	■ Proportion of surgeons and anaesthetists including risk of perioperative neurocognitive disorders in the informed consent process.
Patients found to be at high risk on a preoperative screening tool should be placed on a care pathway to mitigate their risk.[5] This should include optimisation of medication.	■ Availability of a care pathway for patients screened at risk for neurocognitive disorders. ■ Percentage of at-risk patients receiving care modified to reduce their cognitive risk.
Patients at risk should be regularly screened for delirium perioperatively using a validated tool.	

Each patient aged over the age of 70 years should have multidisciplinary input available that includes early involvement of medicine for the care of older people. Patients at risk should be screened for frailty.	
Anaesthetists should monitor age-adjusted end-tidal MAC fraction, optimise cerebral perfusion and perform electroencephalogram-based anaesthetic management in at-risk older adults.	■ Availability of protocols and equipment to appropriately manage the brain in older patients.
Commonly used medications that should be used with caution in older surgical patients include first-generation antihistamines (diphenhydramine), anticholinergics, antipsychotics (haloperidol), benzodiazepines (midazolam, diazepam), corticosteroids (hydrocortisone, methylprednisolone), metoclopramide and meperidine.	■ Percentage of at-risk patients who received one or more drugs that increase risk – this percentage should ideally be zero.

Postoperative risk reduction action items:

- Ensuring that care givers or family members can stay or visit during the recovery period.
- Encouraging familiar items from home, such as photographs.
- Returning sensory aids (glasses, hearing aids, dentures) as soon as possible.
- Protecting sleep/wake cycles.
- Reorienting throughout the day.
- Requesting hospital rooms with windows.[5]

Quality improvement methodology

- Set up a pathway for risk assessment and consent in the preoperative assessment clinic. Use plan–do–study–act cycles to work on establishing an easy, acceptable screening process. Ensure that patients are included as key team members and work on improving their experience of preoperative assessment, information and support.
- Educate the multidisciplinary team on best practices for risk mitigation, prevention and supportive perioperative care; use patient stories and examples as well as data to make your case.
- Consider all your stakeholders, meeting as many of them as possible to harness ideas from all staff groups on how to reduce risk and design a care pathway to mitigate harm for at-risk patients. Are there any other departments you could ask to share learning (eg care of the elderly specialists, dementia friendly wards).

Mapping

ACSA standards: 1.1.3.1, 1.1.3.2, 1.2.1.1, 1.2.1.3, 1.2.1.4, 1.2.1.5,1.2.2.1, 1.4.4.2, 3.2.2.1
CPD matrix codes: 2A03, 2A04
GPAS 2020: 2.3.16, 2.3.17, 2.3.18, 2.3.19, 2.3.20, 2.3.21, 2.3.31, 2.3.32, 2.5.10, 2.5.11, 2.5.12, 2.5.19, 2.5.20, 2.5.23, 2.5.24, 2.5.31, 3.3.2, 4.2.18, 4.2.19, 4.3.18, 4.3.19, 4.3.20, 4.3.21, 4.3.22, 4.3.23

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1.12 Management of obesity in the perioperative period

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Why do this quality improvement project?

As the incidence of obesity increases, all anaesthetists will be involved in the care of obese patients. Pre-optimisation of co-morbidities, risk assessment, availability of specialist equipment and experienced clinician input will ensure better patient outcomes and reduce complications.

Background

The World Health Organisation (WHO) defines a body mass index (BMI) >30 kg.m^2 as class 1 obesity; >35 kg.m^2 as class 2 obesity; >40 kg.m^2 as obese class 3 (previously 'morbidly obese'). Adult obesity in England has increased from 15% to 26% between 1993 and 2016. [1]

Obese patients are more likely to have existing co-morbidities affecting the cardiovascular, endocrine, musculoskeletal, gastrointestinal and respiratory systems. The risk of perioperative complications such as difficult airway, post-operative respiratory failure, myocardial infarction, stroke and venous thromboembolism (VTE) is also higher.[2]

Sleep disordered breathing (SDB, encompassing obstructive sleep apnoea (OSA) and obesity hypoventilation syndrome (OHS)) is common and often undiagnosed in the obese population: 10-20% of patients with BMI >35 have severe OSA. Undiagnosed or inadequately treated SDB can increase the risk of post-operative respiratory complications, and lead to pulmonary hypertension and heart failure in the long-term.[2]

Best practice

The Association of Anaesthetists and Society for Obesity and Bariatric Anaesthesia (SOBA) have published a joint guideline[2] recommending organisational and clinical best practice approaches to delivering peri-operative care to the obese patient.

Suggested data to collect

Standards	Measures
Operating lists[2] and medical records should include the patients' weight and BMI.	■ Proportion of pre-operative assessment and/or operating lists that includes the patients' weight and BMI.
Experienced surgeons and anaesthetists should assess and manage patients who are obese.[2,3]	■ Grade of most senior anaesthetic and surgical staff seeing patient pre-operatively & in theatre.
Specialised equipment to assist in the safe management of obese patients (including properly fitting anti-embolism stockings[4]). Requirements should be included in the pre-operative team brief to ensure availability of specific equipment and staff.[2]	■ Availability of and compliance with local protocol and lists or 'obesity packs'[2] that outline equipment specific for the obese patient and their location in all theatre complexes; staff training compliance; proportion of cases in which specific requirements were discussed at WHO team brief.

Screening for SDB.[2] High index of suspicion in patients with BMI >30. Routine use of STOP-BANG questionnaire should be used for screening; scores ≥3, should be pre-operatively assessed by a clinician, to risk stratify, plan further investigations and management.	■ Proportion of obese patients 1) screened for OSA; 2) assessed by a clinician for OSA and 3) managed according to risk stratification.
Appropriate prophylaxis against VTE and early mobilisation.[2]	■ 100% patients should be risk assessed for VTE and receive prophylaxis as per local protocol and receiving correct dose of pharmacological prophylaxis; compliance with enhanced recovery protocols eg time to mobilisation.

Quality improvement methodology

Preoperative record of patient's weight and BMI

- Can entering weight and BMI become a mandatory part of the ward pre-operative checklist/theatre booking form? When/where is it most helpful to record this?

Specialist equipment and staff trained to care for the obese patient

- Map the process for the pre-operative assessment team to inform the appropriate department(s) about specialist equipment are there steps that are unreliable or onerous? Can the process be simplified or automated? Could you do a 'check and challenge' drill or simulation of where to find specific guidelines or equipment?

Screening for sleep-disordered breathing

- Map the pre-operative assessment pathway – is the process to screen, identify, refer, assess and investigate for OSA simple and reliable? Are there multiple modalities to investigate for OSA? Look at a series of cases - how long does the entire process take? Are there any common features that can be improved on or steps made simpler or quicker? Are there sufficient resources (availability of clinician/sleep study slots) to support this pathway?

Mapping

ACSA standard: 1.1.3.4

Curriculum competences: OA_BK_07, OA_BK_08, IG_BK_03, PO_BK_11, GU_BK_11, PB_BK_88, EN_BK_03, DS_IS_01, AM_IK_08, EN_IK_04, PC_IK_18

CPD matrix code: 3A13

GPAS 2020: 2.3.22, 2.3.23, 2.3.24, 2.3.25, 2.3.26, 2.5.10, 2.5.16, 2.5.19, 3.2.18, 3.3.3, 3.3.4, 3.3.5, 3.3.6, 3.3.7, 4.3.24, 4.3.25, 5.3.15 5.3.16, 5.3.17

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1.13 Enhanced recovery after surgery: a narrative review

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The majority of patients presenting for major inpatient surgery will benefit from being enrolled on to an enhanced recovery programme to minimise the risk of complications and promote recovery and restoration of function. In practice, some types of surgery (eg colorectal resection and major urological surgery) have a long and well-established enhanced recovery programme while other surgical subspecialties are not as developed. Enhanced recovery programmes with high rates of adherence to all components have been shown to improve outcomes for patients and hospitals. The principles of enhanced recovery should apply to all patients presenting for surgery.

Adherence to all components of an enhanced recovery programme is not within the control or remit of most anaesthesia and perioperative medicine departments. We have not therefore published an 'enhanced recovery recipe', since it would be too broad. There are, however, many aspects of the programme where anaesthetists make an important contribution and, as such, in this book we focus on these components as entire projects within their own right to maximise the benefits of each, in the pre-, intra- and postoperative phases. Anaesthetists should be involved as part of a team monitoring the overall adherence to and success of enhanced recovery programmes at their institutions, and these recipes can act as a framework for improvement. Some institutions will be doing this through participation in the Perioperative Quality Improvement Programme, and many of the process measures and outcome measures will be readily available to those involved.

Particular attention should be paid to:

- the optimisation of concurrent medical conditions (see recipes on anaemia, patient blood management, diabetes, preassessment, frailty, prehabilitation)
- smoking cessation (see recipe on prehabilitation)
- individualised risk assessment and shared decision making (see recipes on risk prediction and consent for anaesthesia)
- psychological status and management of expectations (see recipe on patient information)
- appropriate length of preoperative starvation (see recipe on diabetes)
- individualised pain management and procedure-specific analgesia strategy, with a focus on multimodal analgesia and the use of opioid-sparing techniques (see recipe on individualised pain management)
- risk scoring for postoperative nausea and vomiting
- strategies to minimise cognitive dysfunction (eg age-adjusted depth of anaesthesia)
- promotion of functional return (ie drinking, eating and mobilising where appropriate – see Part B recipe 3.6)
- appropriate discharge medication (see recipe on opioid deprescribing and individualised pain management).

Many of these domains readily lend themselves to audit and quality improvement, such as looking at the incidence of postoperative nausea and vomiting risk scoring, the frequency of patient-controlled analgesia prescription, the frequency of mobilising on day 1, the rate of drain/catheter/intravenous infusion removal on day 1, the use of regional techniques.

As an overall strategy to improve outcomes in major surgery, a series of quality improvement projects on each part of the enhanced recovery after surgery programme could have significant impact. It would be worthy of consideration for the quality improvement lead and relevant leads for specialties to coordinate this work accordingly.

Mapping

ACSA standard: 1.2.1.4

GPAS 2020: 2.2.5.1, 2.5.10, 2.5.12, 2.5.13, 2.5.16, 2.5.17, 2.5.19, 2.5.2, 2.5.21, 2.5.25, 2.5.26, 2.5.27, 2.5.28, 2.5.29, 2.5.31, 2.5.39, 2.3.16, 2.3.17, 2.3.18, 2.3.19, 2.3.20, 2.3.21, 3 3.3.2, 4.2.9, 4.3.27, 4.3.28

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1.14 Individualised perioperative pain management

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Why do this quality improvement project?

Identification of patients at risk of severe acute post-surgical pain and instigating preventive analgesic techniques can help to prevent chronic post-surgical pain, improve surgical outcomes and increase patient satisfaction. There is evidence that postoperative opioid prescribing can lead to an increased risk of misuse. Anaesthetic prescribers should ensure that clear instructions for deprescribing are given, to avoid inadvertent unnecessary continuation of these medicines in the community. Protocols should be in place to avoid unnecessary discharge prescriptions. Providing individualised perioperative pain management can help to address these issues.

Background

Chronic post-surgical pain is common. It is estimated to occur in between 40,000 and 100,000 patients per year in the UK, affecting up to one-third of patients undergoing cholecystectomy, up to 50% of those undergoing mastectomy/cholecystectomy and up to 85% of patients who have an amputation.[1] It is defined as 'pain developing after a surgical procedure and persisting beyond the healing process (ie at least three months after surgery). Other causes of pain (eg infection) need to be excluded.[2]

There are multiple factors contributing to the development of chronic post-surgical pain,[3] including pre-existing chronic pain and high-dose opioid use, postoperative acute severe pain and acute neuropathic pain.

Patients taking chronic high-dose opioids (more than 100 mg oral morphine equivalent/day) are at risk of harm during the perioperative period. This can either be due to analgesia underdosing leading to severe acute pain or overdosing leading to opioid adverse effects.[4]

Opioids play an important role in the management of acute severe pain. However, they should be tapered as pain resolves to avoid inadvertent long-term use. Discharge opioid prescribing can be problematic for both medical and surgical patients, as there is the potential for misuse and diversion. Duration of prescription is a greater risk factor than dosage, with each repeat prescription increasing the risk of misuse by 40%.[5]

Best practice

Relevant guidelines are published by the RCoA Faculty of Pain Medicine, the British Pain Society and the Australian and New Zealand College of Anaesthetists (ANZCA):

- Opioids Aware (RCoA Faculty of Pain Medicine/Public Health England).[6]
- Acute Pain Management: Scientific Evidence (ANZCA/ANZCA Faculty of Pain Medicine).[7]
- Core Standards for Pain Management Services in the UK (RCoA Faculty of Pain Medicine).[8]
- Guidelines for the Provision of Anaesthetic Services (RCoA Faculty of Pain Medicine).[9]

Suggested data to collect

Identification of patients at risk of difficult-to-manage pain perioperatively

- What is the process for identifying at-risk patients in preassessment (eg type of surgery, existing chronic pain, multiple analgesics, on a pain management programme, history of poor perioperative pain control)?
- Is there a referral process for these patients to consider preoperative planning and individualised technique, including opioid management?
- How is the anaesthetist made aware of these patients?
- Are there protocols in the hospital for escalation of opioids and non-opioid rescue for poor pain control?

Individual hospital chronic post-surgical pain data

- Chronic post-surgical pain in chronic pain outpatients: measure the number of patients seen in your hospital's pain clinic who have chronic post-surgical pain. This will only represent a small percentage of the patients with chronic post-surgical pain, but it can be a useful place to start.
- How many patients attending surgical follow-up clinics have symptoms and signs consistent with chronic post-surgical pain?

Postoperative opioid prescribing

- Protocols for discharge prescription of opioids should be available for both medical and surgical patients. Leaflets should be available for patients explaining pain management after discharge, including an analgesic step-down plan.[9]
- Liaise with pharmacy to audit recent discharge opioid medications. Data collection could include:
  - preadmission diagnoses and opioid medications
  - new diagnoses and procedures performed during admission
  - opioid prescription (drug, dose, duration) during admission and at discharge.

Quality improvement methodology

Process mapping: patient journey for patient with risk factors for developing chronic post-surgical pain

- Process for preoperative identification of high-risk patients (ie chronic pain, high opioid doses – greater than 100 mg/24 hours).
- Referral of these patients to pain specialist team.
- Intraoperative techniques used (eg regional, multimodal analgesia). Is there clear accessible guidance for perioperative teams on postoperative pain management, discharge planning and follow-up?

Postoperative opioid prescribing

- Identify whether protocols exist in your hospital for opioid discharge prescriptions. They should include dose, duration and should be targeted for appropriate patient groups (ie surgical/medical).
- Who prescribes discharge medication? Are there guidelines for opioids prescribed on discharge and are these prescribers trained in tapering opioids and providing instructions to primary care?[6] Could you target these professionals to educate and improve prescribing confidence and practice?[9]
- What guidance exists for patients to understand post-surgical pain management and the risks and benefits of opioid prescribing? Could you work with patients to design better resources for their information?

Mapping

ACSA standards: 1.4.1.2, 1.2.2.1, 1.4.5.3

Curriculum competences: POM_BK_08, PO_BK_07, POM_BK_21, RA-BK_04, RA_BK_17, PM_IS_05, POM_HK_14

CPD matrix codes: 2E01, 2E02, 2A03, 2E01, 2G01

GPAS 2020: 2.4.4, 2.5.4, 2.5.5, 2.5.10, 2.5.17, 2.5.20, 2.5.21, 2.5.22, 2.5.23, 2.5.24, 2.5.25, 4.5.1, 4.5.2, 4.5.3, 4.7.1, 4.7.2, 4.7.4, 4.7.5

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1.15 Patient experience and outcome measures

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Why do this quality improvement project?

Measuring perioperative-related outcomes is central to assessing the effectiveness and quality of medical care and ties into the overarching NHS Outcomes Framework.[1] At a hospital level, outcome measures offer clinicians a better basis for judging and improving their practice and help hospitals to demonstrate quality assurance, improvement and inform funding decisions. These data are also a powerful communication tool, enabling patients to make more informed decisions about their care, while also promoting public transparency and accountability.

Background

Outcomes do not occur in isolation and depend heavily on structures as well as processes. Deciding what outcomes are important, how to measure, interpret and publish them requires a nuanced approach.

Clinical outcomes

Mortality is the most common surgical outcome reported. As perioperative mortality has decreased, attention has turned to morbidity. Of the tools available for assessing morbidity, the postoperative morbidity survey is a commonly used, well-validated measure.

Patient-reported outcomes

Patient-reported outcomes are relevant and important to patients, but they are traditionally not readily captured by clinical outcome tools. An example would be patient-reported outcome measures for patients undergoing hip and knee replacement, varicose vein and hernia surgeries. They have been mandatory since 2009 in the UK and are made available online.

Patient-related experience measures

Patient-related experience measures are captured by patient surveys, 'friends and family tests' and, with regard to anaesthesia, were reported in the Sprint National Anaesthesia Project (SNAP-1) survey and reported on experience of information delivery, postoperative pain, nausea and vomiting, thirst and overall satisfaction.[2]

Best practice

Best practice around perioperative outcome measurement is not defined by a single professional organisation or standard.

- NHS Outcomes Framework.[1]
- The Perioperative Quality Improvement Programme (PQIP)[3] makes comprehensive evidence-based recommendations looking at processes and outcomes and over time will provide valuable information to inform shared decision making.
- NCEPOD 2018: themes and recommendations common to all hospital specialties examine processes likely to influence outcome.[4]
- The Royal College of Surgeons of England Patient Reported Outcome Measures.[5]

Suggested data to collect

1. Mortality and morbidity data

- Is there departmental evidence of engagement in national or local audit projects monitoring mortality and morbidity outcomes (eg National Emergency Laparotomy Audit, PQIP, Trauma Audit and Research Network)?
- What happens to the data, how are they used and fed back to teams locally to improve care? Are there regular meetings, presentations or web tools tracking mortality and morbidity outcomes?
- What tools does your organisation use to measure postoperative morbidity (eg postoperative morbidity survey, Clavien–Dindo)? Who is responsible for collecting these data and what sources are used?
- Are length of stay, surgical site infection, unplanned critical care admission or readmission rates routinely collected and used to inform care?
- What proportions are drinking, eating and mobilising within a prespecified time frame?

2. Patient-related outcomes

- Does your hospital use patient feedback to inform perioperative care?
- Does your institution assess patient-centred outcomes post-surgery (eg disability-free survival or quality of life measures at 6 and 12 months)? What tools are used to collect patient feedback (eg Bauer questionnaire, QoR-15 questionnaire, World Health Organization disability assessment schedule 2.0)?
- Does your anaesthesia department routinely collect data on pain, nausea and vomiting, thirst and satisfaction at points on the patient pathway (eg recovery, day 1, at home)? Is there local variation?

Quality improvement methodology

As well as indicating which areas could be targets for improvement work, regular data feedback can act by itself to improve outcomes.

Good data feedback practice includes making data feedback regular, timely and accessible in a number of formats (in written form, in departmental meetings, via email etc).

Data should be accompanied by comparators in time (eg in run charts), with peers (other hospitals, or colleagues if individual level) and with any national standards.

Data should also be accompanied with advice on how to improve performance (eg reminding staff about their role in preoperative fasting arrangements when giving feedback on thirst or postoperative nausea and vomiting).

Case example

Addressing perioperative drinking times (see also recipe on reducing fasting times). Thirst appears to be one of the most uncomfortable perioperative experiences for all patients. Great Ormond Street Hospital conducted a quality improvement project from 2014–16 to improve fasting times for clear fluids.[6] They used the Model for Improvement to institute sequential interventions with evaluation using the plan–do–study–act framework. They introduced standardised letters and phoned patients before surgery to reinforce fasting instructions. They also used process mapping, failure model and effect analysis to identify where in the pathway it was safe to allow patients to drink after arriving on the ward, as well as varying the type of clear fluid available to children. Statistical process control charts were used to display improvements over time and identified changes and deviations early. The proportion of patients receiving clear fluids within four hours of surgery increased from 19% to 75% without any increase in aspiration rates.

Mapping

ACSA standards: 4.2.2.2, 4.2.3.1, 4.2.3.2
Curriculum competences: AR_BK_05, AR_BK_06, AR_BK_07, AR_BS_10, AR_IK_03, AR_IS_02, AR_HS_07, AR_HS_09, AR_HS_14, AR_AS_01, AR_AS_01
CPD matrix code: 1105
GPAS 2020: 4.7.1

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2 Intraoperative care

Edited by Dr Manisha Kumar
QI editor Dr Romit Samanta

2.1 World Health Organization surgical checklist

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Why do this improvement project?

Within healthcare, errors involving patient safety have often been attributed to inadequate communication or poor teamwork.[1] Since its development, the World Health Organization (WHO) surgical checklist has revolutionised patient safety within the operative setting.[2] However, success of the checklist is critically dependent on participant compliance and engagement in a checklist ethos to reduce adverse events, near misses and mortality rates.

Background

In 2008, the World Health Assembly faced the challenge of improving global healthcare standards. An estimated 234 million operations were being performed globally, with 9.2% resulting in adverse events such as drug- or surgery-related errors.[3] Of these errors, half were identified as preventable.[4] Led by Professor Atul Gawande, the concept of 'Safe Surgery Saves Lives' was conceived. The aim of the project was to achieve a consistently safe surgical journey by ensuring efficient checks, effective communication and a multidisciplinary approach to safety. A 19-point checklist was initially derived and implemented in geographically varied hospitals. The findings of this initial pilot revealed a reduction in major complications by 4% and a reduction in morality of 0.7%.[5] To date, 1790 hospitals over six different continents are actively implementing the WHO surgical checklist.[6]

Best practice

The use of the WHO surgical checklist was mandated for use in the NHS in England and Wales in January 2009. It was strongly commended for use in all hospitals by the Department of Health, Social Services and Public Safety in Northern Ireland and is one of the Patient Safety Essentials in the Scottish Patient Safety Programme – to be used for every patient, every time.[7]

Suggested data to collect

Primary outcomes

- Components of the WHO checklist (sign in, time out, sign out) conducted per patient.
- Compliance in documentation of all components of each checklist.

Secondary outcomes

- Patient safety indicators (eg reduced wrong site surgery, surgical site infections, incidents due to equipment availability and teamwork).
- Members of the team present during each component.
- Time taken to complete each component.
- Safety culture surveys, such as the Manchester Patient Safety Framework.[8]

Quality improvement methodology

Quality improvement will require engagement with all groups of theatre staff involved in the WHO checklist. Take time to understand individual behaviour and beliefs around the WHO checklist. Addressing the barriers to implementation of the checklist is likely to be essential when improving compliance at a given institution. Consider using a behaviour change framework to analyse the barriers to behaviour change in surgical teams to uptake the checklist.

Sharing stories and data about locally identified problems are likely to be powerful drivers (eg instances of wrong site surgery, wrong implant, incorrect block or critical equipment non-availability) to improve compliance by all members of the multidisciplinary team.

Could you highlight best practice and institute some rewards or 'learning from excellence'? Could groups with good WHO checklist compliance and execution be used to teach their peers about good practice (eg surgeons teaching surgeons, scrub nurses teaching scrub nurses)?

You could use measures presented by statistical process control p-charts or run charts to track improvement and effect of interventions. A performance polygon might highlight the elements of the check list where compliance is best and worst.

Mapping

ACSA standard: 1.3.1.3
Basic curriculum competence: POM_BS_11
Advanced curriculum competence: AT_D2_11
GPAS 2020: 2.3.23, 2.5.8, 2.5.17, 3.5.2, 3.5.3, 3.5.4, 3.5.5, 3.5.19, 5.5.40, 5.5.41, 7.2.17, 7.7.4, 8.5.25, 8.7.5, 10.3.3 , 16.5.25, 10.5.8, 18.5.6

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2.2 Conduct of regional anaesthesia

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Why to do this quality improvement project?

- Basic anaesthesia monitoring is an integral component of delivering quality patient care during the perioperative period.
- Adverse events during conduct of anaesthesia are partly attributable to human error.[1]
- Adequate monitoring reduces the risk of incidents by early detection of consequences of errors and by giving early warning signs to the deteriorating condition of patients.[2]
- Standards of monitoring during conduct of regional analgesia with or without sedation should be exactly the same as during general anaesthesia.[1]
- Incorrect placement of a block is a patient-safety incident but has previously been classified as a never event according to the Never Events Policy and Framework published by NHS Improvement.[3]
- In 2011, the Stop Before You Block (SBYB) initiative was introduced by Nottingham University Hospitals NHS Trust and endorsed by the RCoA Safe Anaesthesia Liaison Group and Regional Anaesthesia UK.[4]
- The Healthcare Safety Investigation Branch report Administering a Wrong Site Nerve Block was published in September 2018.[5]

Best practice

The Association of Anaesthetists published recommendations for standards of monitoring during anaesthesia and recovery 2015,[1] which was followed by Regional Anaesthesia UK guidance.[6] Minimum monitoring (electrocardiogram, ECG, pulse oximeter, noninvasive blood pressure) should be in place before commencing regional anaesthesia and should be continued throughout the operative and recovery period.[7,8]

- All patients should have working intravenous access.[9]
- All monitoring equipment should be checked by an anaesthetist in accordance with guidance from the Association of Anaesthetists.
- Audible monitor alarms should be enabled and alarm limits should be set by the anaesthetist.
- Summary of all monitoring and any reasons for carrying out regional anaesthesia without adequate minimum monitoring should be documented in the anaesthetic notes.
- Provision, maintenance, calibration and renewal of equipment are the responsibilities of the institution in which anaesthesia is delivered. Advice regarding procurement and maintenance of monitoring equipment should be taken from the anaesthetic department.
- SBYB should be carried out prior to every single-sided nerve block.
- A STOP moment should take place immediately before inserting the block needle and should involve both the anaesthetist and the anaesthetic assistant.[3]
- The STOP moment should check site and side of block with reference to the surgical site mark.[3]
- Staff should undertake regular training in the SBYB process.
- Suggested data to collect.

Equipment

- Audit of the availability of functioning equipment for minimum monitoring in all areas where regional anaesthesia is practised. Minimum continuous ECG, pulse, oxygen saturations and blood pressure.
- Audit of the use of minimum monitoring during regional anaesthesia. Patients must have appropriate monitoring, including pulse oximeter, noninvasive blood pressure at intervals of five minutes, ECG and end-tidal carbon dioxide monitoring if the patient is sedated.

Documentation

- 100% of records have documented SBYB check and intravenous cannula insertion.
- Audit of documentation in anaesthetic records of monitoring used during regional anaesthesia.

Audit of SBYB practice

- Percentage of anaesthetists who report always performing SBYB.
- Percentage of anaesthetic assistants who report always performing SBYB (standard of 100%). Reasons for non-compliance.
- Percentage of anaesthetists who report performing STOP immediately prior to needle insertion.
- Percentage of anaesthetists who involve anaesthetic assistant in the SBYB process (standard 100%). Reasons for non-compliance.
- Percentage of anaesthetic assistants who have received training in SBYB process and access to continuing training opportunities.

Quality improvement methodology

Prompts and reminders in the pathway may remind anaesthetists and assistants to perform SBYB, but as wrong site blocks continue to occur despite this initiative, a formal STOP moment, involving both anaesthetist and assistant, must be carried out immediately before needle insertion. Think about how you could design a 'hard block' to prevent a block proceeding if the check is not done.

Survey anaesthetists and assistants for their perceived barriers to doing SBYB, which you could display as a Pareto chart. This will give you some initial areas of focus for improvement.

You should pilot any proposed changes to the pathway (paperwork or other prompts) using plan–do–study–act cycles before implementing them as hospital policy.

Mapping

ACSA standards: 1.3.1.5
Curriculum competences: CS_BK_03, IG_BK_02, IG_BS_05, IG_BS_06, RA_IS_01, CS_IS_02, CS_HS_04
CPD matrix codes: 1A03, 2A04, 2G02, 3A07, 3A09
GPAS 2020: 3.2.29, 3.2.30, 3.2.31, 3.2.32, 5.2.35, 6.2.17, 7.2.9

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2.3 Management of the difficult airway

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Why do this quality improvement project?

Complications arising from difficult airways are a leading cause of anaesthetic morbidity and mortality. Improvement in availability of equipment, training, communication and teamwork contribute to improved outcome in difficult airway management.

Background

The Fourth National Audit Project of the RCoA and the Difficult Airway Society (NAP-4): Major Complications of Airway Management in the UK highlighted that while the majority of airway problems happen at induction, a significant proportion occurred during emergence or during transfer to the recovery area.[1] The report highlighted that airway management outside the theatre environment was associated with a higher risk of adverse events. Human factors contributed to airway issues, relating to either the individual or the team in 40% of cases.[1]

Best practice

- The RCoA Guidelines for the Provision of Anaesthetic Services recommends that there should be a full range of equipment relating to the management of the anticipated difficult airway available within the theatre suite.[2]
- The NAP4 report recommended the need for standardised 'airway rescue' carts in all areas within a hospital and the Difficult Airway Society has published guidance on stocking of difficult airway trolleys.[3]
- Simulation training with instruction on human factors has been shown to improve communication within team, reduce task fixation and improve situational awareness and empower team members.

Data to collect

Equipment

There should be a full range of equipment relating to the management of the anticipated difficult airway available where airway management takes place, including at remote sites. This should include nasal endoscopy and ultrasound equipment.

Difficult airway trolleys should be equipped and standardised as per the recommendations of the Difficult Airway Society.[3] The trolley should be stocked in a structured and in a logical manner following the Difficult Airway Society algorithm. Are the difficult airway trolleys standardised across all locations?

Selection of the equipment should be supported by evidence wherever possible and keeping in mind the training needs of all users. Who is the named person so maintenance and replacement of equipment?

All anaesthetists and anaesthetic assistants, including locum, agency and trust grade staff, should have been shown the location and contents of difficult airway trolleys as part of hospital induction.

The equipment should be checked and stocked regularly. Who is issued with the responsibility of checking, stocking and maintenance of all difficult airway trolleys especially in areas with multiple users (eg in accident and emergency, intensive care and radiology suites)?

Follow up of patients with a difficult airway

Is there appropriate handover of potentially difficult airway patients to intensive care and recovery areas? Are patients with difficult airway given adequate information and the Difficult Airway Society airway alert card?

Training and human factors

Training in the use of advanced airway management equipment should be thorough, comprehensive and continual, especially as some of the equipment is used only on rare occasions:

- What is the departmental plan for equipment training?
- Is there appropriate evaluation and training prior to introducing new equipment?
- Do staff have access to adequate time, funding and facilities to undertake and update training?
- How frequent is the training and does it address skill decay?

Quality improvement methodology

Skills and equipment

- Survey all anaesthetists for the barriers to using advanced airway equipment. Do you need to address skills, logistical issues or 'just in time' learning aids for infrequent users?
- Are theatre staff able to identify and locate difficult airway trolleys? Are all anaesthetic assistants familiar with location of equipment needed in managing a difficult airway? Conduct multidisciplinary team 'check and challenge' drills to practise accessing equipment. Can you reduce the time needed to access equipment?

Staffing and training

- There should be regular scenario-based simulation training using equipment identical to that in the clinical environment and incorporating instruction in both technical and non-technical skills. Such training is especially important in high-risk areas, such as obstetrics, intensive care and the emergency department. Regular multidisciplinary rehearsals involving the entire team should focus on developing non-technical skills, improving communication and facilitating teamwork.

Reporting and learning

- Regular team debrief, reporting of critical incidents and near misses, and discussion of cases where plans C and D are needed encourages learning and individual behaviour change. All critical incidents and near misses must be discussed in a constructive manner in joint departmental audits with the surgical team and study days to identify contributing factors and develop practical recommendations for systems changes and improve communication and teamwork.

Mapping

ACSA standards: 2.1.1.11, 1.1.2.2, 1.3.1.5, 2.1.1.1, 2.1.1.5
Curriculum competences: AM BK14, AM BK 16, AM HK01-07
CPD matrix codes: 2A01, 3A01
GPAS 2020: 3.2.14, 3.2.18, 3.2.20, 3.5.18, 5.2.27, 9.2.11, 10.5.19

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2.4 Anaesthetic record keeping

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Why do this quality improvement project?

The anaesthetic record is an essential component of documentation. Accurate and detailed anaesthetic records provide valuable information on preoperative assessment, intraoperative care, response to treatment, and postoperative care instructions.

Background

The anaesthetic record is central to understanding perioperative events and aids communication and handover between colleagues. It is a useful source of information for quality improvement and can assist in the event of medicolegal proceedings.

While there is no recommended anaesthetic record format, in the last 10 years publications from professional organisations have highlighted specific areas, such as basic standards of record keeping, recording of physiological details and recording of consent. This has led to an increase in the required amount of information to be recorded, so paper anaesthetic records may not easily support recommended record keeping and may require frequent redesign.

Electronic records may enhance the quality of documentation, particularly with automatic capture of monitoring and equipment data, but they are not widely used yet in the UK. The quality of record keeping should still be assessed using the same standards as for paper records.

Best practice

The Good Anaesthetist, produced by the RCoA and the Association of Anaesthetists in 2010,[1] sets a standard for all anaesthetic records to be clear, accurate and legible. Records should be made at the same time as the events wherever possible, and should include details on clinical findings, treatment given and any information given to patients. Further detail on what should be recorded has been stated in other publications from these organisations.

Suggested data to collect

Data completion:

- patient name and unique identifier recorded
- anaesthetist name and GMC number
- consultant supervisor recorded for non-consultants
- appropriate anaesthetic equipment check at the start of the list and before each patient
- appropriate monitoring in place from before induction of anaesthesia through to the post-anaesthesia care unit
- consent discussion recorded – risk, benefits, alternatives
- patient agreement to intervention
- recording appropriate physiological data at recommended interval.

Legibility:

- The record should be legible.
- Only recognised abbreviations are used.

These standards should be achieved 100% of the time and should serve as a minimum standard for all anaesthetic records. National Audit Project reports and other guidelines on specific areas of anaesthetic care provide further recommendations of what should be recorded in specific situations.[2–5]

Quality improvement methodology

- Anaesthetic records should be reviewed against the standards above. The number reviewed should ensure that a representative range of anaesthetists, grades and specialties is included. You should also aim to review charts written for elective and emergency procedures: does the chart support good documentation in all circumstances? Is the chart suitable for areas with different requirements, such as obstetrics?
- What are the common components not recorded? You can display these in a Pareto chart. Could charts be redesigned to make recording frequently missed data more reliably?
- Are there any unnecessary data recorded on the charts or recorded in duplicate across medical and nursing charts? Could you streamline the data recording to remove some unnecessary items?

Mapping

ACSA standards: 1.1.1.1, 1.1.3.3, 1.2.2.1, 1.3.1.5, 1.4.5.1, 2.1.1.1, 2.3.1.1, 2.3.1.2, 3.1.1.2
CPD matrix codes: 1F01, 2A03
Curriculum competences: IO_BS_06, CS_BK_01
GPAS 2020: 3.5.6

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2.5 Awareness under anaesthesia

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Why do this quality improvement project?

Awareness under anaesthesia can be extremely distressing for the patients, especially when it is associated with recall.[1] Reducing this risk will benefit patients by reducing the risk of long-term psychological impact of this rare but devastating outcome.

Background

As demonstrated by the Fifth National Audit Project of The Royal College of Anaesthetists and the Association of Anaesthetists (NAP5), general anaesthesia can fail, leading to awareness. The exact cause of awareness is often hard to identify but it may be due to failure to deliver an adequate amount of the anaesthetic or to the patient having a higher than usual requirement.[2] Patients who have had accidental awareness also need appropriate follow-up and management, with the aim of reducing the risk of long-term psychological sequelae.

Best practice

NAP5 identified areas of practice that can be improved. A support pack detailing the steps to take when patients have suffered accidental awareness has been developed.[3]

Suggested data to collect

Preoperatively

- Do all patients have the risk of awareness included in their preoperative discussion for general anaesthesia and sedation?
- How are patients with increased risk of awareness identified? This includes:
  - use of neuromuscular blocking drugs
  - obesity
  - known or predicted difficult tracheal intubation
  - where awake extubation methods are planned
  - general anaesthesia for caesarean section
  - rapid sequence induction
  - total intravenous anaesthesia (TIVA) in the presence of neuromuscular blockade
  - emergency surgery especially in the frail or critically ill
  - family history or past history of accidental awareness during general anaesthesia (AAGA).
- How are the patients counselled preoperatively if they are found to be at high risk or have had AAGA in the past? Do they use the guidance phraseology in the NAP-5 handbook?

Intraoperatively

- If the patient is identified as being at high risk, what are the additional steps taken to ensure that the risk is minimised?
  - Are staff trained on the appropriate use of TIVA and related equipment and is enough equipment available for use?
  - Do the logistics of anaesthetic rooms and operating theatres support anaesthesia during patient transfer? Can you reduce the 'gap' during transfer?
  - Do all anaesthetic machines have an end-tidal volatile alarm enabled as standard?
  - Do the World Health Organization safety checks include AAGA-related checks, including a check that surgery is finished before emergence?

Postoperatively

- What is the pathway to early identification of awareness? Awareness is unlikely to be directly reported to anaesthetic practitioners; are there clear lines of escalation for the ward or recovery staff to notify anaesthetists of potential awareness events?
- How are patients followed-up after the event? Is there an established link with psychological services?
- Is the local policy of detailing steps to follow after accidental awareness?
- Is there a responsible person who is nominated to manage and collect data on accidental awareness?
- Are all cases of awareness reported as critical incidents and reviewed?
- Is there a mechanism for learning and sharing after an event?

Quality improvement methodology

- Draw out a process map of the patient journey from the point they are assessed for potential risk of accidental awareness.
  - Are there any gaps in local processes can could lead to harm? Note the steps listed in detail in the NAP-5 handbook. Are there any supporting aids within the clinical environment to remind staff of the key learning points from NAP5?
- AAGA is a rare event and so it is unlikely that clinical staff will reliably commit the actions necessary in response to reported AAGA to memory. Anaesthetic departments should consider appointing a local lead to help staff and patients through the recommended follow-up steps or customising a local 'awareness toolkit' using the NAP5 toolkit to ensure that all relevant steps are followed.

Mapping

ACSA standards: 1.2.1.4, 1.2.2.2, 3.1.1.1, 4.2.2.2
GPAS 2020: 3.2.32, 3.5.7,3. 5.8, 3.5.24, 3.5.25, 3.5.26, 3.7.2, 9.7.6, 10.9.2
Curriculum competences: Annex G sections G13–G17

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2.6 Perioperative temperature management

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Why do this quality improvement project?

Maintaining normothermia in the perioperative period reduces complications and discomfort for patients.

Background

Temperature monitoring is essential during induction and maintenance of anaesthesia and should be available during recovery from surgery.[1] Both hypothermia and hyperthermia (including malignant hyperthermia) can complicate anaesthesia.[2,3]

Inadvertent perioperative hypothermia can lead to morbidity, including prolonged recovery and hospital stay,[4] increased blood loss and transfusion, and an increased incidence of pressure sores,[5] wound infections[6] and morbid cardiac events.[7] Reducing the incidence of inadvertent perioperative hypothermia through appropriate perioperative care can reduce the incidence of these complications.

In hyperthermia, the margin between temperatures for normal cellular processes and cell damage from high temperature is very small compared with hypothermia. Hyperthermia can be corrected by cooling.

Patients are at higher risk of hypothermia and its consequences if any two of the following apply:

- American Society of Anesthesiologists grades 2–5 (the risk at 5 is greater than at 2)
- preoperative temperature below 36.0 degrees C
- combined regional and general anaesthesia
- intermediate or major surgery
- at risk of cardiac complications
- extremes of age.

Best practice and suggested data to collect

These standards reflect those set out in the National Institute for Health and Care Excellence Clinical Guideline 65, an updated version of which was published in 2016.[8]

Standard	Measures
Preoperative phase	
Except in an emergency, 100% of patients should have a core temperature of 36 degrees C or higher before coming to theatre.	■ Core temperature and time of last reading on ward.
100% of patients should be offered prewarming and those with a temperature of less than 36 degrees C should receive it.	■ Was the patient offered prewarming? ■ Did the patient receive prewarming?
100% of patients should arrive in theatres covered with two blankets or a duvet.	
100% of patients should report being comfortably warm on arrival in the anaesthetic room.	
Intraoperative phase	
100% of patients should have their temperatures measured on arrival in theatre, every 30 minutes throughout the operation and at the end of surgery.	■ Core temperature at operation start. ■ Frequency of temperature measurement intraoperatively. ■ Core temperature at end of operation. ■ Method of temperature measurement.
100% of intravenous infusions greater than 500 ml and all blood products and irrigation fluids should be warmed.	■ Was active fluid warming employed?
Active patient warming should be initiated in the anaesthetic room for all procedures where the total operative time (from first anaesthetic intervention to arrival in recovery) is greater than 30 minutes.	■ How long after first anaesthetic intervention was active warming commenced? ■ What type(s) of active warming was employed?
Postoperative phase	
100% of patients should arrive in recovery with a temperature of 36 degrees C or higher.	■ Core temperature on arrival in recovery
If core temperature is less than 36 degrees C, active warming should be employed on 100% of patients.	■ Was active warming used in recovery?
100% of patients' core temperatures should be 36 degrees C or higher on discharge to ward.	■ Core temperature on discharge to the ward.

2.6 Perioperative temperature management

Dr C Mark Harper
Royal Sussex County Hospital

Quality improvement methodology

Map out the patient journey from the admission area to leaving recovery. Work backwards from your goal through each step in the patient journey until you reach the admission lounge, to identify the steps that need to be taken to achieve the goal. A driver diagram would help to visualise the factors involved in ensuring patient normothermia; for example:

- the environmental (ward, anaesthetic room, operating theatre or recovery)
- people related (staff education, awareness and time)
- equipment related (blankets, availability of warming devices and consumables).

A key part of any system improvement is stakeholder analysis and involvement. Engaging people at every step of the process is the key skill and will help to deliver change.

Visualising measurement

- Repeated sampling of a small number of patients who might be high risk.
- Percentage of patients normothermic at each stage could be plotted on a statistical process control p-chart.
- A statistical process control u- or t-chart can be used to capture rare events (eg hyperthermia).

Mapping

ACSA standards: 1.3.1.5, 2.1.1.5, 2.1.1.9, 2.1.1.10
GPAS 2020: 1.3.2.2, 3.2.20, 3.2.21, 3.2.30, 5.2.23, 5.2.32, 5.2.42, 10.2.1, 10.2.6, 10.3.4, 16.2.4, 16.2.5, 16.2.6

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Intraoperative care

2.7 TIVA/TCI training for anaesthesia and intensive care trainees

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Why do this quality improvement project?

All anaesthetists must be able to deliver total intravenous anaesthesia by target controlled infusion (TIVA/TCI). This technique has major advantages for many patient groups and is the only safe technique for administering general anaesthesia to patients with malignant hyperthermia. Inhalational anaesthesia is also not possible in all circumstances (e. lack of scavenging, transfer of anaesthetised patients).[1]

The Fifth National Audit Project (NAP5) found that cases of awareness during TIVA were mostly preventable and the most common contributory factor was lack of TIVA education and training. It has been suggested by previous surveys that TIVA teaching and training in the UK and Ireland is not adequate and that many anaesthetists lack the confidence to use TIVA.[1,2]

Background

Training in TIVA/TCI should begin during basic training for all anaesthetic and intensive care trainees and should continue into intermediate and higher training. Trainees should be competent in the use of TIVA/TCI prior to unsupervised practice in this technique, including transfer of patients anaesthetised with an intravenous propofol infusion.[1]

Best practice

The Society for Intravenous Anaesthesia recommends 25 cases (10 consultant-led, 10 with close supervision and 5 solo cases) before basic trainee competence has been achieved.[3]

Suggested data to collect

Standards	Measures
Trainees should be achieving Society for Intravenous Anaesthesia recommended TIVA/TCI case numbers during the course of their core training.	■ Percentage of core trainees who have logged the requisite number of TIVA/TCI cases by the end of this training level.
Trainees should maintain their skills in delivering TIVA/TCI during intermediate and higher training.	■ Percentage of intermediate trainees who have logged a suggested minimum of 10 cases, ideally including 5 solo cases per training year.
Trainees should attend at least one formal TIVA/TCI teaching session per training level.	■ Number of formal TIVA/TCI sessions attended per training level; either as part of the school of anaesthesia's internal teaching programme or other suitable external course or teaching.

Quality improvement methodology

Trainers

- Are there a sufficient number of consultants, specialty doctors or senior trainees competent to teach and supervise core trainees in basic TIVA/TCI anaesthesia?
- Is there a departmental lead for TIVA/TCI? Do trainees have access to suitable trainers during elective theatre sessions? Has this been taken into account during completion of departmental rotas and training carousels?
- Are trainees able to report any deficiencies in TIVA/TCI case numbers and what action is taken to address these. Modified Cappuccini tests specifically relating to TIVA/TCI could be performed.[4]

Teaching

- Is there a teaching programme within the school of anaesthesia which delivers formal TIVA/TCI teaching at all appropriate training levels?
- If trainees are unable to attend their school's internal teaching, are they aware they should attend a suitable external course/study day and is there are robust process for requesting study leave and adequate study budget?

Equipment

- Is there sufficient equipment for the safe delivery of TIVA/TCI anaesthesia (TCI pumps and processed electroencephalogram monitoring) available within the anaesthetic department to allow for the provision of training.

Mapping

ACSA standards: 1.3.1.5, 2.5.3.1, 2.5.3.2, 2.5.6.1, 4.1.2.1

Curriculum competences: CI_BK_30, PC_BK_52, PR_BK_22;23;24;28, CS_IK_04, EN_IK_02, NA_IK_04;05, PC_IK_20, POM_IS_22, PR_IS_01;03, CD_HK_11, CK_HS_05, POM_HS_11

CPD matrix code: 1E06

GPAS 2020: 3.4.1, 3.4.3, 3.4.5

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2.8 Practical use of total intravenous anaesthesia and target-controlled infusions

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Why do this quality improvement project?

The Royal College of Anaesthetists and Association of Anaesthetists Fifth National Audit Project (NAP5) found that failure to deliver the intended dose of a drug was one of the major contributory factors behind accidental awareness under general anaesthesia during total intravenous anaesthesia (TIVA). Meticulous attention to practical aspects of TIVA practice is essential to avoid over- and underdosing of drugs and attendant complications.[1,2]

Background

TIVA was used for 6.6% of cases nationally according to the NAP5 activity survey in 2014.[1] While the current prevalence of TIVA in the UK is not known, it is likely to have risen following increasing awareness of the environmental impact of volatile anaesthetic agents and the possible effect of TIVA in reducing cancer reoccurrence.[3,4]

Best practice

Joint guidelines from the Association of Anaesthetists and the Society for Intravenous Anaesthesia for the safe practice of TIVA were published in 2018.[2]

Standard	Suggested data to collect
A target-controlled infusion (TCI) pump should be used for maintenance during TIVA.	■ Documentation of use of TCI on anaesthetic charts for TIVA cases. ■ Number of TCI pumps available and incident reports of times when pumps unavailable.
A standardised concentration of propofol and dilution of remifentanil should be used for all TIVA cases.	■ Stock check of available propofol concentrations and/or review of concentrations of drugs on anaesthetic charts for TIVA cases.
Specific designed infusion sets should be used to deliver TIVA.	■ Survey of anaesthetists/operating department practitioners regarding which infusion sets should be used for TIVA. ■ Incident reports of times when sets unavailable.
TCI pumps should be programmed after the syringe containing the drug has been inserted to avoid 'wrong drug wrong pump' error.	■ Review of incident reports for the frequency of 'wrong drug wrong pump' error.
The patient's intravenous access (peripheral cannula or central venous catheter) should be visible wherever practical.	■ Review of anaesthetic charts for documentation of IV access visibility and/or survey of anaesthetists to measure the frequency of, and barriers to, IV access visibility.
Processed EEG (pEEG) monitoring should be used whenever neuromuscular blocking drugs (NMBD) are used during TIVA.	■ Review of anaesthetic charts for documentation of use of a processed electroencephalogram (pEEG).
The same standards of practice and monitoring is maintained when TIVA is used outside of the operating theatre.	■ Use of TCI pumps and pEEG monitoring documented on anaesthetic charts and transfer documentation.

Quality improvement methodology

Checklist

Is there a departmental checklist to promote safe TIVA/TCI practice? An example checklist is:[5]

- Dedicated TCI pumps, programmed with correct:
  - drugs
  - dilution
  - demographics
  - models.
- Is TCI infusion set and intravenous access:
  - designed for the task
  - patent and flushed
  - secure
  - visible
  - to be resited after induction?
- Are neuromuscular blocking drugs to be used?
  - Attach pEEG to the patient.

Department

- Is there a departmental lead for TIVA/TCI anaesthesia?
- Is there clearly defined accessible local policy regarding which TCI pumps, models, drug dilutions, infusion sets and pEEG device are to be used during TIVA/TCI?
- Is there cooperation with the surgical team and theatre staff to promote the visibility of intravenous access?
- What is the continuing training for use of TIVA?

Mapping

ACSA standards: 1.1.1.4, 1.1.2.1, 1.3.1.3, 1.3.1.5, 2.1.1.1, 2.2.1.1, 2.3.1.1, 4.1.2.1, 4.2.1.1

Curriculum competences: CI_BK_30, PC_BK_52, PR_BK_22;23;24;28, CS_IK_04, EN_IK_02, NA_IK_04;05, PC_IK_20, POM_IS_22, PR_IS_01;03, CD_HK_11, CK_HS_05, POM_HS_11

CPD matrix code: 1I03, 3A06

GPAS 2020: 2.18, 2.32, 2.39

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2.9 Intraoperative blood management strategies

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Why do this quality improvement project?

Perioperative anaemia and allogenic blood transfusion are both preventable surgical risks and have been shown to be independent risk factors for poor postoperative outcomes, including morbidity and mortality.[1] Quality improvement in transfusion practice can therefore help to improve patient outcomes and safety.

Background

Anaesthetists play an important role in ensuring appropriate and safe transfusion of blood, blood components and their alternatives. The Association of Anaesthetists has produced updated guidelines on the use of these products.[2] These guidelines incorporate the concept of 'patient blood management', a multidisciplinary and evidence-based approach to optimising blood transfusion.[3] It aims to reduce the use of blood transfusion by focusing on three areas perioperatively: detection and management of anaemia, minimisation of bleeding and blood loss, and management of and improvement of tolerance of anaemia. The National Comparative Audit of Blood Transfusion in elective surgery is a collaborative UK-wide audit that has provided benchmark standards for the implementation of patient blood management.[4]

Best practice

The National Institute for Health and Care Excellence (NICE) Quality Standard 138 (2016)[5] is based on the NICE blood transfusion guideline published in 2015.[6] It lists a set of specific, concise and measurable standards that can be used to support quality improvement.

Suggested data to collect	Measure
Detection and treatment of preoperative anaemia (Association recommendations 1 and 2).	■ Proportion of patients preoperatively screened, treated and followed up for anaemia.
Iron supplementation for patients with iron deficiency anaemia (NICE quality statement 1).	■ Proportion of patients with iron deficiency anaemia who receive iron supplementation.
Patients who may need or have had a blood transfusion are given verbal and written information (Association recommendation 3; NICE quality statement 4).	■ Proportion of patients meeting criteria who are given appropriate information.
Reassessment after red blood cell transfusions (Association recommendation 4; NICE quality statement 3).	■ Proportion of patients transfused with single units, with haemoglobin checked before and after each unit.
Patients having surgery who are expected to have moderate blood loss are given tranexamic acid (Association recommendation 5; NICE quality statement 2).	■ Proportion of patients who had moderate blood loss given tranexamic acid intraoperatively.
Availability of a massive transfusion protocol (Association recommendation 7).	■ Proportion of anaesthetists aware of and able to identify local massive transfusion protocol.
Patients who continue to bleed are actively monitored by point of care and/or regular laboratory tests (Association recommendation 10).	■ Proportion of patients who are bleeding tested appropriately intra- and postoperatively.

Quality improvement methodology

Iron supplementation

Draw out a process map of the time between booking a patient for surgery to the day of surgery:

- Are there ways this pathway could be made simpler or quicker?
- When is haemoglobin first checked?
- How is information fed back to the patient and their general practitioner?
- If it is required, who prescribes the iron supplementation, and is there enough time between the prescription and surgery to complete an appropriate course?
- Which parts of the process are least reliable and how often does surgery get cancelled as a result?

Use of tranexamic acid

- Who determines the estimated blood loss at the briefing and is this documented?
- Is the use of tranexamic acid considered/suggested by the surgeons?
- Look at cases which fail the required standard and determine whether there are any common features (eg types of surgeries, types of patients, groups of surgeons or anaesthetists). This information could be displayed in a Pareto chart. Is further education on recent guidelines needed?

Reassessment after red cell transfusions

Make a process map of ordering blood for a patient undergoing surgery with a risk of blood loss:

- Is blood transfused in single units?
- Is haemoglobin checked between units transfused and, if it is, how is it checked?
- Does the availability of near-patient testing (as compared with laboratory results) alter the proportion of patients tested between units?

Mapping

ACSA standards: 2.2.2.1, 2.2.2.2
Curriculum competences: GU HK 02, GU HS 04, POM HK 12
CPD matrix codes: 1I05, 2A05, 3I00
GPAS 2020: 3.2.5,3.2.6, 3.2.11, 3.2.13, 3.2.14, 3.2.22, 3.2.23, 3.4.4, 3.5.18, 3.5.19

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2.10 Think kidneys

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Why do this improvement project?

All hospital patients are at risk of acute kidney injury. A significant number of episodes of surgery-associated acute kidney injury and associated deaths are potentially preventable, which would improve patient safety and a reduce healthcare costs.[1]

Background

Renal function is sensitive to hypotension and hypovolaemia and is a feature of severe illness, leading to increased mortality and morbidity including the development of chronic kidney disease requiring haemodialysis. Patients undergoing intraperitoneal emergency surgery in the presence of hypovolaemia and sepsis are especially vulnerable.[2] Surgery-associated injuries account for 30–40% of in-hospital episodes of acute kidney injury but they are often under-recognised and badly managed.[3]

Outcomes may be influenced by:

- fluid and haemodynamic optimisation
- the use of nephrotoxins and renally metabolised and cleared drugs perioperatively
- anaesthetic care such as ventilatory management and perioperative glycaemic control.[4]

All surgical patients should therefore be risk assessed preoperatively and measures taken to inform risk reduction. If acute kidney injury is present, it should be detected and managed appropriately, together with education and support of patient and carers, and the early involvement of senior clinicians.

Best practice

The 2009 the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) analysed care of patients dying with acute kidney injury and produced recommendations around admission and assessment of those with or at risk of acute kidney injury as well as subsequent referral and support.[5] Think Kidneys is a national programme designed to prevent acute kidney injury and improve care in accordance with National Institute of Health and Care Excellence quality standards.[6] The Guidelines for the Provision of Anaesthetic Services highlight the identification of high-risk surgical patients based on objective assessment including renal function and early consultation with nephrologists when acute kidney injury is present.[7]

A modified toolkit based on that has been developed by NCEPOD, but with specific emphasis on key perioperative issues, can be used.

Suggested data to collect

Risk assessment

- Has the risk of acute kidney injury been documented and discussed in those having emergency intraperitoneal surgery?

Recognition

- Has a comparison of preoperative renal function been made with baseline results or estimated glomerular filtration rate documented in chronic kidney disease?

Perioperative management

- Perioperative fluid therapy:
  - Has fluid balance been documented?
  - Has glucose control been implemented where appropriate?
  - Has anaemia been corrected?
- Have nephrotoxins been stopped in patients at risk of acute kidney injury as well as kidney-sparing diuretics and metformin?
- Management of blood pressure, electrolytes and pain relief:
  - Is there a plan for postoperative follow-up?

Referral and support

- Was the patient referred to a nephrologist or critical care physician appropriately (eg renal transplant/stage 3 acute kidney injury)?

Quality improvement methodology

- Drawing out a process map of patients journey from preassessment to theatre can highlight areas where you could screen for risk factors for acute kidney injury or institute preventative steps.
- A stakeholder group can be formed to look at the process map and identify local problems and potential solutions. Patient involvement is helpful to design patient information and education on kidney disease and acute kidney injury prevention.
- The most common contributory areas to perceived failures of care should be displayed in a Pareto chart, to focus improvements in the right area.
- Balancing measures (eg the number of blood transfusions or incidence of hypoglycaemia) should be used to ensure that there are no adverse effects from implemented changes.

Mapping

ACSA standards: 1.2.1.1, 1.2.1.4, 1.2.1.5, 1.2.1.5, 1.1.3.1, 1.3.2.1, 1.4.3.2

Curriculum competences: POM_HK_10/11/12, POM_HS_14/15, POM_HK_15. Annex F: 3.4, 4.4, 4.7

CPD matrix codes: 2C04, 2A05

GPAS 2020: 5.5.29

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2.11 Management of elective abdominal aortic aneurysm surgery

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Why do this quality improvement project?

Elective abdominal aortic aneurysm (AAA) repair is complex high-risk surgery. In-hospital postoperative mortality is 3.2% after open repair and 0.7% after endovascular aneurysm repair.[1] Patient outcomes after elective AAA repair have dramatically improved over the past 10 years, following the introduction of the Vascular Society of Great Britain and Ireland AAA Quality Improvement Framework. However, there remains some variation between hospitals and the latest audit of standards identified a number of key areas requiring improvement.

Background

As most AAAs do not produce symptoms and rupture has a 75% mortality, the national screening programme aims to detect and treat high risk aneurysms to reduce mortality. According to the National Vascular Registry, just over 4,000 elective AAA repairs took place in 2018. The proportion of cases performed by open repair (38%) and endovascular repair (68%) remained similar to the previous two years.[2] Best practice in perioperative care includes the use of evidence-based care bundles and effective multidisciplinary working.

Best practice

- Vascular Anaesthesia Society of Great Britain and Ireland guidance on AAA repair.
- RCoA vascular accreditation standards.[3]

Suggested data to collect

Standards	Measures
All patients with an aneurysm greater than 5.5 cm on screening should undergo standard preoperative risk assessment.	■ Percentage of AAA repairs who had an elective AAA Safe for Intervention Checklist.[4]
All patients should undergo computed tomography angiography (CTA) for assessment as an integral part of AAA care pathway.	■ Percentage of patients undergoing CTA.
All patients should be seen by an anaesthetist with interest in vascular anaesthesia prior to listing for surgery.	■ Percentage of patients seen by a specialist vascular anaesthetist. ■ What local arrangements are in place to comply with this standard?
All patients should undergo functional testing prior to surgery (eg complete physical examination, multiple-gated acquisition scan, magnetic resonance imaging).	■ Percentage of patients undergoing functional testing.
Patients should be assessed for surgery through a multidisciplinary team process involving surgeon and radiologist and an anaesthetist with interest in vascular anaesthesia.	■ Is there an multidisciplinary team process and is it supported by a coordinator? ■ Which clinicians are present at multidisciplinary team? ■ Percentage of patients who underwent AAA repair who have been discussed in a multidisciplinary team setting.

A shared decision-making process with patients to discuss the risks and benefits of scheduled or elective major vascular surgery should be recorded.	■ What percentage of patients have this level of discussion recorded? ■ What is the provision of patient information available? ■ Percentage of patients offered a AAA treatment leaflet describing both surgical and anaesthetic risks involved.
Anaesthesia for all patients undergoing AAA surgery should be provided by or directly supervised by a vascular anaesthetist.	■ Percentage of patients anaesthetised by specialist vascular anaesthetist.
Postoperative care.	■ Where did the patient go immediately postoperatively (level 1/2/3)? ■ Was their postoperative location planned?

Quality improvement methodology

- The National Quality Improvement Programme for AAA details a number of quality improvement approaches.[1] The Programme recommends the use of plan–do–study–act cycles and sharing best practice across units using the Collaborative Breakthrough Series model.[5]
- There is a wealth of data captured in the National Vascular Registry; is this information fed back regularly to clinical teams and discussed at departmental meetings?
- Draw a process map of the elective AAA pathway and compare it to best-practice pathways mapped by the National Quality Improvement Programme for AAA. Where can you improve your pathway to make it more reliable and efficient?
- Do you capture patient feedback along the pathway and how is it used?

Mapping

ACSA standards: 1.1.3.1, 1.1.3.3, 3.2.2.3

GPAS 2020: 2.5.19, 2.5.20, 2.5.21, 2.5.22, 2.5.23, 2.5.24, 3.2.5,3.2.6, 3.2.11, 3.2.13, 3.2.14, 3.2.22, 3.2.23, 3.4.4, 3.5.18, 3.5.19, 15.1.2, 15.1.7, 15.3.1, 15.3.2, 15.4.2, 15.4.5, 15.5.4, 15.9.1, 15.2.11, 15.2.12

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2.12 Intraoperative patient handover

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Why do this quality improvement project?

Intraoperative handover of anaesthetic care is a common event and failures in communication may lead to morbidity and mortality. This project highlights the key areas where improvements can be made to ensure continuity of care and patient safety.

Background

In recent years there have been a number of initiatives directed at improving transfer of information during transition of care. Although the intraoperative period is critical, there have been relatively few studies on transfer of information in the theatre environment. Several studies have highlighted an increase in both morbidity and mortality associated with intraoperative handovers.[1–3] Poor communication is recognised as contributing to adverse events in healthcare, with communication during handovers being a specific area of concern.[4] However, intraoperative handover remains an informal process with little structure.[5]

Best practice

The Association of Anaesthetists' standards of monitoring during anaesthesia and recovery.[6]

The Association of Anaesthetists' immediate post-anaesthesia recovery guidelines.[7]

Suggested data to collect

- Is there a formal intraoperative handover process?
- Is there are checklist that is used for intraoperative handover:
  - measured with anaesthetic documentation audits
  - measured with questionnaires of recovery or critical care staff
  - survey of staff practice?
- Have there been any critical incidents or near misses related to intraoperative handover that have affect patient care?
- Have any recurring communication gaps been highlighted already?
- Is there formal training on information transfer to minimise errors?
- What are the views of different anaesthetic grades of the handover process?

Quality improvement methodology

The SBAR (situation, background, assessment and recommendation) tool could be used to structure the handover:[8]

Situation	Background	Assessment	Recommendations
Patient details	Medical history	Anaesthetic technique	Physiological targets
Operation progress	Anaesthetic history	Airway grade	Analgesia plan
	Allergies	Venous access	Fluid plan
		Monitoring	Antiemesis plan
		Intraoperative course	Patient destination

The Anaesthetic Component World Health Organization checklist, as modified in the Fifth National Audit Project report could be used:[9]

Airway	■ Is the airway management plan clear? ■ Is the airway secure?

Breathing	■ Is the circuit intact and connected? ■ Is the correct gas mix on? ■ Is there adequate lung ventilation? ■ Is it suitably monitored?
Circulation	■ Is venous access appropriate and secure? ■ Is the circulation suitably monitored?
Fluid balance	■ Estimated blood loss? ■ Special concerns (eg Jehovah's Witness, allergies, abnormal blood results)
Drugs	■ Is there adequate anaesthetic agent? ■ Is it suitably monitored? ■ Are emergency, reserve and other drugs available? ■ Is blood available?
Effective team	■ Are suitably trained staff present and identified? ■ Any special concerns not covered above? ■ Has the management plan been communicated?

- Data and improvement ideas could be collected via observation of handover interactions.
- Stakeholder and problem-driven approaches where identified handover issues or communication gaps are used as drivers to change current practice (eg drug errors, never- or near-miss events).
- A structured handover tool could be developed for use and tested using simulation.
- The use of any developed tool should be consistent throughout the perioperative period. This will require involvement of allied health professionals for implementation.
- Anaesthetic charts could be modified locally to ensure that key information areas for handover are easily identifiable and formally documented.

Mapping

ACSA standards: 1.1.1.5, 4.1.0.5

Basic curriculum competences: IO_BS_06; IO_BS_08, POM_BS_11, POM_BS_21

CPD matrix codes: 1E06, 1I03

GPAS 2020: 2.5.37, 3.5.19, 3.5.22, 3.5.23, 4.1.5, 4.5.54, 5.5.56-5.5.60, 8.1.7, 8.1.8, 8.5.26, 16.3.16, 18.1.2

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2.13 Management of death in the operating theatre

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Why do this quality improvement project?

Death in the operating theatre is rare. In addition to the devastating impact on family members of the deceased, staff may feel a sense of personal responsibility for the events and the outcome, whether the event was a direct consequence of their actions or not. This can affect family life and the treatment of subsequent patients and can have long-term physical, emotional and psychosocial symptoms.[1,2] It is therefore crucial to ensure that as well as analysing deaths for lessons to improve the system, we care for the relatives and staff involved to prevent long-term psychological sequelae.

Background

Although death or other catastrophe is a rare outcome, most anaesthetists will be involved in such events during their career.[3] Any member of the theatre team may be affected by an event in theatre which leads to the harm of a patient, regardless of whether an adverse outcome was anticipated or not. There is some evidence that death during high-risk cases, where death may be expected, can have a greater impact on the staff involved than unexpected deaths in low risk cases.[4]

There is an increased emphasis on openness after incidents and a 'just culture' not focused on blame but on understanding the system factors involved in adverse outcomes. Whether or not the death is due to an error, there should be an open attitude to learning and support for all involved and full disclosure of events to relatives.

Best practice

Immediate measures

- A senior member of staff not involved in the incident should take leadership of the further management of the situation.
- Contemporaneous records of the event must be kept and all involved staff must provide their statements at the time.
- An accurate and contemporaneous record of the anaesthetic, operation and event must be kept. These must be timed, dated and signed. Electronically stored monitoring records must be printed and filed in the notes.
- The clinical commitment of staff must be reviewed immediately by the most senior anaesthetist available, preferably the clinical director, with the expectation that the team will not continue with their routine duties.
- If the incident involves a trainee, the supervising consultant anaesthetist should immediately make arrangements to relieve the trainee of their clinical commitments. The educational supervisor should also be notified.
- In the case of an unexplained anaesthesia-related death, all equipment and drugs should be kept for investigation. An accurate record should be made of all the checks undertaken including time and date of inspection. Clinical engineering and pharmacy should be informed as appropriate as soon as possible after an incident.
- A critical incident form should be completed electronically immediately after the event.

Communication with patients and relatives

- Senior members of the surgical, anaesthetic and nursing team responsible for the patient should be responsible for breaking bad news using a team approach.[5]
- The content of all discussions should be noted in the patient's record and should follow the General Medical Council's duty of candour guidance.[6]

Effective staff support systems

- The team should discuss the need for a short initial debrief to clarify information and next steps and to identify any team members who may require extra support. This should be facilitated by a senior staff member not directly involved in the incident.
- A senior colleague or mentor should be assigned as continuing support for the team. They should aim to check in with all members of staff involved within a week of the incident.
- Team discussion is useful in identifying and assisting staff adversely affected by an intraoperative death. All members of the team should feel able to speak freely without blame or judgement.
- The case should be discussed at departmental clinical governance or morning meeting within three months of the event or within three months of the outcome of the coroner's referral, if applicable.

Suggested data to collect

There should be a departmental policy for a death in the operating theatre, linking to hospital duty of candour, staff welfare and Association of Anaesthetists' wellbeing guidance.[1]

As part of the analysis of all intraoperative deaths, there should be an audit to ensure that 100% of above steps have been taken.

Quality improvement methodology

- Teams should test the effectiveness of the above measures using simulations and a 'check and challenge' rehearsal for various staff members.
- The aids for use in the event of an intraoperative death should be easy to access and easy to follow for those unfamiliar with the local policy. As the policy will be actioned infrequently, it is not likely that many features will be committed to memory, and so should use human factors solutions such as checklists.
- Those formulating a local policy should undertake a stakeholder analysis to ensure that they involve all relevant stakeholder in the design of resources to use in the event of a death on the table. Have you included your staff support services or shared the learning from other teams who may deal with deaths and so have an existing policy, for example for the emergency department?

Mapping

ACSA standards: 1.1.1.6, 4.2.1.3
GPAS 2020: 3.5.15, 3.5.16, 5.5.45

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3 Postoperative care

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3.1 Recovery room staffing and monitoring provision

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Why do this quality improvement project?

Life-threatening emergencies may arise during the immediate postoperative period. However, the majority are easily remedied if they are recognised and treated promptly. Adequate staffing and appropriate monitoring in recovery are therefore vital to keeping patients safe.[1]

Background

The post-anaesthetic care unit (PACU) denotes any clinical area where patients recover from anaesthesia, and therefore includes those colloquially referred to as 'recovery' or 'the recovery room' in many UK hospitals.

The PACU is a high-risk area for life-threatening airway complications, as highlighted in The fourth National Audit Project and several NCEPOD reports.[2,3] Emergence from anaesthesia is potentially hazardous and patients require a high standard of observation until recovery is complete.[4] The RCoA and the Association of Anaesthetists recommend that PACU staffing and monitoring standards should be maintained in any area where anaesthesia is administered. This includes labour wards, cardiology and radiology suites, dental, psychiatric and community hospitals.[4,5]

Best practice

Hours of operation

Recommendations from the Association of Anaesthetists state that the PACU must have sufficient numbers of trained staff available throughout all operating hours, and if an emergency surgical service is run the PACU must remain open 24 hours a day.[6]

Staffing levels

No fewer than two nurses should be present if one patient is in the PACU. Any patient unable to maintain their own airway must be nursed continuously on a one to one basis by a nurse who has no other duties. Staffing should be sufficient to meet this requirement even in peak periods.[5]

Competencies required

All PACU staff should have been trained in and deemed to have achieved locally or nationally agreed prescribed competencies.[5]

Monitoring

Monitoring is required until the patient has fully recovered from anaesthesia and as a minimum should include clinical observation supplemented by pulse oximetry, non-invasive blood pressure and temperature monitoring. An electrocardiogram (ECG), nerve stimulator, capnography and glucometer must be immediately available should they be needed.[7]

Depending on the local surgical case mix, some PACUs may additionally consider immediate access to near patient testing (eg arterial blood gas, HemoCue or point-of-care coagulation testing) a desirable standard of care.

Record keeping

All patients should have regular observations documented until PACU discharge.

Suggested data to collect

Staffing

- Percentage of staff present in the PACU trained to the recognised standard, audited at different times of day and night.
- Percentage of patients admitted to the PACU out of hours where there are two members of staff present in the PACU until the patient is discharged.
- Any periods where the PACU has to be closed to new admissions due to inadequate staffing levels should be highlighted.
- Underlying reasons for inadequate staffing levels, or inadequately trained PACU staff.

Staff-patient ratios

- Percentage of patients recovering from spinal, epidural or general anaesthesia who are cared for in a specifically designated recovery area with sufficient numbers of adequately trained staff.
- Percentage of unconscious patients who are being cared for on a one to one basis.
- Percentage of conscious patients requiring critical care or critical care monitoring who are being cared for in a ratio of one nurse to two patients.
- Percentage of conscious stable patients who are being cared for by nurses not involved with the patients above (eg patients ready for discharge awaiting transfer to the ward).

Patient monitoring

- Percentage of patients with an advanced airway in place who have continuous capnography monitoring.
- Percentage of patients having their observations recorded with appropriate frequency.
- Percentage of patients monitored with non-invasive blood pressure, pulse oximetry and temperature.
- Ease and speed of applying further monitoring such as capnography, ECG or nerve stimulator.
- Ease and speed of obtaining ABG, blood glucose, HemoCue or point-of-care coagulation results.
- Percentage of patients with complete documentation of observations from PACU arrival until discharge.
- Reasons for inadequate monitoring or delay in applying additional monitoring when required (eg shortage of monitoring devices, monitoring device broken/not charged/being used elsewhere).

Data should be collected in all areas of the hospital where patients are recovering from anaesthesia. The adequacy of facilities in outlying areas should be audited regularly.

Quality improvement methodology

- Critical incidents in the PACU should be recorded and reviewed on a monthly basis, including analysis of developing themes. Learning points should be disseminated to all PACU staff. These points may be combined with data collected above to suggest areas for improving patient safety in the PACU – stakeholder analysis will be crucial to make sure that a wide range of improvement ideas are generated.
- PACU staff should be encouraged to participate in suggesting and designing interventions to address areas for improvement (eg where incomplete documentation of patient observations has been highlighted), PACU staff may be able to suggest appropriate solutions (eg more time for documentation, availability of automatic printouts).
- In-situ simulation or 'check and challenge' drills could be practised to review processes for accessing and apply additional monitoring or escalating care in a deteriorating patient in recovery.

Mapping

ACSA standards: 1.5.1.1, 1.4.1.1, 1.4.2.1, 1.4.2.2, 1.4.2.3, 1.4.2.4, 1.4.1.3, 4.2.2.2

Curriculum competences: PO_BK_02, PO_BK_03, PO_BS_05, DI_IK_03, AT_D1_01, AT_D1_09, AT_D2_05, AT_D3_08, CD_AK_15

GPAS 2020: 4.1.8, 4.2.17, 6.5.18, 6.5.19, 6.5.20

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3.2 Patient handover in the post-anaesthesia care unit

Dr Philip Jackson
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Why do this quality improvement project?

An effective handover from the anaesthetist to a post-anaesthesia care practitioner is essential for patient safety and quality of care. Ineffective handover is a common factor in safety incidents.

Background

The quality of handover depends on three key areas:[1,2]

- transfer of information
- transfer of responsibility and/or accountability
- team dynamic and environment.

Poor communication is recognised as contributing to adverse events in health care, with communication during handovers being a specific area of concern.[3,4] In many centres, handover remains an informal process, with little structure.[5]

Best practice

The Association of Anaesthetists' guideline on post-anaesthesia recovery states that, after transfer to the post-anaesthesia care unit (PACU), 'the anaesthetist must formally hand over the care of a patient to an appropriately trained and registered PACU practitioner'. There are tools and frameworks available to standardise information transfer between practitioners,[6,7] as recommended by the Association of Anaesthetists' guideline,[5] including formal handover checklists.

Suggested data to collect

- Is there a structured handover process already or is it an informal process?
- Is the verbal handover supported by written documentation?
- Is there a handover checklist available? Is it used or perceived as useful? What percentage of the mandatory handover information is covered in each handover?
- Have any particular problems been highlighted already by:
  - recovery staff?
  - anaesthetists?
  - theatre staff?
  - surgeons?
  - midwives?
- Have there been any critical incidents or near-misses related to handover?
- How long does handover take? (An unnecessarily long formal handover process is unlikely to be used by practitioners day to day.)

Quality improvement methodology

- Problem driven solutions are most likely be to be successful. Ensure that common incidents reported in your department are addressed by your handover process and included in any accompanying teaching.
- Forming a stakeholder group including anaesthetists, operating department practitioners, recovery and theatre staff and patients will facilitate identifying problems.
- Testing handover processes can be done in multidisciplinary simulation. Implementation may include joint training, workshops and simulation, as well as environmental and structural changes to support handover.
- A pareto chart might be a useful way to identify the themes that contribute most to perceived communication gaps.

Mapping

ACSA standard: 1.1.1.2
Basic level curriculum: PO_BS_05
GPAS 2020: 4.1.4, 4.5.4, 4.5.6

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3.3 Postoperative nausea and vomiting beyond recovery

Dr Simon Trundle, Barts and the London School of Anaesthesia
Dr Toby Reynolds, Royal London Hospital

Why do this quality improvement project?

Despite advances in anaesthetic technique and medications, postoperative nausea and vomiting (PONV) remains a common complication of general anaesthesia, with nausea affecting around 50% of patients.[1] As well as contributing to clinical outcomes such as wound dehiscence, dehydration, electrolyte imbalance and pulmonary aspiration,[2] PONV leads to increased demands on resources and is an important outcome for patients, who often rate it as worse than postoperative pain.[3,4]

Background

Several published quality improvement projects have shown that implementing a systematic approach to assessing PONV risk and modifying anaesthetic technique accordingly can reduce PONV incidence.[5–9] PONV is multifactorial in nature and an approach to its management that includes both pharmacological and non-pharmacological interventions should be considered and has been found to be effective.[10,11]

Best practice

There are no consensus guidelines for PONV in adults in the UK, but guidelines produced by the Society for Ambulatory Anaesthesia in the United States have achieved international recognition.[1] These guidelines recommend, among other standards, that patients receive a risk assessment for PONV, that baseline risk factors are reduced where possible and that prophylactic treatment is administered in accordance with risk. Furthermore, the guidelines stress that departments need to assess whether any suggested algorithms for PONV prophylaxis are actually implemented. The Association of Paediatric Anaesthetists of Great Britain and Ireland produced guidance for paediatric patients in 2016.[12]

Accordingly, departments should determine a consistent local approach to PONV (which could involve a local guideline or algorithm, or reference to a national guideline) and measure both implementation of this approach and the incidence of PONV itself.

Suggested data to collect

Best practice standard	Suggested data to collect
All patients should have a preoperative risk assessment score for PONV.	■ Percentage of patients assessed preoperatively for risk of PONV.
Intraoperative antiemetics should be given in accordance with local guidelines.	■ Percentage of patients receiving PONV prophylaxis as per local guidelines.
When PONV has developed, patients should have timely rescue treatment.	■ Percentage of patients receiving treatment of PONV as per local guidelines. ■ Percentage of all patients developing PONV during the first 24 hours.

Quality improvement methodology

- Collection of baseline data to identify the scale of the problem and the presentation of these results locally to all stakeholders involved are key. A Pareto chart of most common specialties involved can help to focus improvements where they are most needed.
- Process mapping the local perioperative pathway to identify where risk assessment could most easily be carried out and the points where implementation of the agreed approach is ineffective will be essential to improving the process.
- Feedback to all stakeholders of their individual incidence of PONV and other process measures is helpful to inform practitioners of the case for change.
- Regular presentation of data will help to improve compliance with guidelines and decrease both the incidence and severity of PONV.
- Patient feedback and sharing patient stories about the impact of PONV can also create a compelling case for change.

Mapping

Curriculum competences: PO_BK_08, PO_BS_08, OA_BK_14, DS_BK_09, PA_BK_07, POM_BK_24, POM_BK_18, PR_BK_56

CPD matrix codes: 1A02, 1105, 2A03

ACSA standards: 1.1.1.2, 1.4.1.2, 1.1.1.9

GPAS 2020: 3.5.22, 3.5.23, 4.1.4, 4.5.4

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3.4 Record keeping in recovery

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Why do this quality improvement project?

Clear, accurate and legible medical records are necessary for the reliable transfer of information between different healthcare professionals and, as such, are also required by the General Medical Council.[1] Good record keeping will allow others to understand a patient's clinical course in recovery and their response to any interventions. Good records will also facilitate the measurement of outcomes in the immediate postoperative period, while inadequate records may make it challenging to respond to complaints.

Background

The immediate postoperative period is one of the most closely monitored episodes of a patient's hospital stay, reflective of the risk of life-threatening complications. Failure to ensure that a patient has regained a safe level of physiological performance before leaving recovery could have devastating consequences. Thus, documentation of that patient's condition on arrival and at the time of discharge features strongly in standards and guidelines for the UK and the United States. The Association of Anaesthetists' guidelines for this period list a minimum dataset of information to be recorded, including the occurrence of any of a set of prespecified complications,[2] while the American Society of Anesthesiologists' standards encourage the use of post-anaesthesia care unit scoring systems at sequential timepoints during a patient's recovery.[3]

Common outcome measures for anaesthesia, such as pain and nausea and vomiting, are most effectively measured in recovery and should form part of the recovery record. Both the Association and the RCoA note that it is desirable for recovery data to be electronic and collected automatically.[2,4]

Best practice

As an absolute minimum, the Generic Medical Record Keeping Standards require each page of the medical record to contain a patient's name, identification number and location in the hospital.[5] Each entry should be dated, timed, legible and signed.

The RCoA's Guidelines for the Provision of Anaesthetic Services require maintenance of careful records, including instructions, patient observations and drug administration for the postoperative period.[4] Association guidelines are more specific, detailing a minimum dataset for the recovery period.[2] For patients receiving critical care in recovery, Association guidelines note that after four hours' stay, the recovery record also needs to contain the Critical Care Minimum Dataset.[2]

Other information in the recovery record will depend on the anaesthetic and surgical techniques used. For example, the dermatomal sensory level and the presence of motor block should be recorded for patients with neuraxial blocks.

Suggested data to collect

Data to be collected should be determined locally and should be realistic, based on local needs.

Outcome measures will be difficult to link to recovery records, so process measures such as those suggested below should be used instead. It may be worth collecting a balancing measure such as the amount of time required to record data in recovery.

- Percentage of patients whose recovery record meets Generic Medical Record Keeping Standards (their name, identification number and location in the hospital are on every page, and every entry is dated, timed, legible and signed by the person making the entry).
- Percentage of patients whose recovery record contains the Association's minimum dataset.
- Percentage of patients receiving critical care in recovery for more than four hours whose recovery record contains the Critical Care Minimum Dataset.
- Specific measures, such as the percentage of patients with epidurals for whom block height was recorded.

Quality improvement methodology

- Where record keeping is already considered to be done well, clinical audit is a suitable methodology. A sample of recovery records is analysed and compliance with the standard is assessed. Examples of good practice should be shared and analysed for lessons to learn.
- Develop a driver diagram to identify factors that will improve compliance with best practice. What are the barriers to behaviour change? Consider using a behaviour change model to highlight factors which could lead to better record keeping (eg clinical time limitations, anaesthetic record design).
- Improvements after interventions can be displayed using run charts. These charts can be displayed in recovery, so that all staff can see the impact of the interventions tested.

Mapping

ACSA standards: 2.3.1.1, 2.3.1.2, 4.2.3.1
CPD matrix code: 1G01
Curriculum competences: IO_BS_06
GPAS 2020: 4.2.10, 4. 2.16

References

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3.5 Postoperative visiting

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Why do this quality improvement project?

Despite being recognised as an important part of the holistic role of the anaesthetist,[1] the exact requirements for anaesthetic involvement in postoperative care beyond pain control are poorly described.[2] Patients should have access to anaesthetic input immediately following surgery, and all patients fulfilling specific criteria will require a formal anaesthetic review within 24 hours postoperatively.[3] Anaesthetic input into postoperative recovery is likely to improve pain management and reduce the risk of complications, as well as giving the anaesthetic team valuable feedback about the impact of their perioperative care.

Background

In light of the risk of life-threatening complications, the immediate postoperative period is closely observed in the recovery area. Anaesthetists are well-practised at review at this stage, and their attendance is expected within minutes.[4] However, early postoperative complications that can impact on morbidity and mortality outcomes can arise following discharge to the ward,[5,6] and may also be appropriately dealt with by an anaesthetist. These outcomes include physiological alterations, pain and the need for efficient assessment and transfer of high-risk patients to intensive care. A quality improvement project in this area may contribute to optimising postoperative care, controlling complications and potentially improving patient satisfaction.[7]

Best practice

RCoA guidance specifies groups of patients who should be visited by an anaesthetist within 24 hours of surgery:

- those graded as American Society of Anaesthesiologists physical status 3, 4 or 5
- those receiving epidural analgesia in a general ward
- those discharged from recovery with invasive monitoring in place
- those for whom a request is made by other medical, nursing or other clinical colleagues
- those for whom there is any other appropriate need.

Suggested data to collect

Quantitative

- Is there a departmental policy on postoperative follow-up?
- What is the process to ensure that patients are followed-up by appropriate member of the team?
- Number of patients falling into the patient groups highlighted for postoperative review.
- The percentage of patients who are visited postoperatively by an anaesthetist.
- The percentage of patients who are visited postoperatively by their own anaesthetist.

Qualitative

- What information is recorded from the visit and where are the data entered?
- What actions have been taken following review?
- Reasons for failure to visit (eg patient discharged, time constraint, staffing)?
- Near misses of incidents averted by an anaesthetic postoperative visit.

Quality improvement methodology

- A sample of operating lists should be analysed for patients who qualify for a postoperative review. Notes for these patients should be checked to determine whether a review has taken place. If postoperative reviews are not yet standard practice, this audit would indicate the resource needed to set up a review process.
- A driver diagram of key drivers to deliver regular postoperative reviews should be written, based on local stakeholders' assessment of the drivers.
- Stakeholder engagement is crucial to facilitate anaesthetic postoperative review. Is the process clear and accessible to surgeons, pharmacists, ward staff and associated health professionals involved in postoperative care? If reviews reduce workload for other groups, can their support be used to build a business case for a funded service?
- Patient involvement in setting up a review process is helpful to ensure that patient-centred measures are included in any review. What aspects of care do patients think the review visits would improve? Patients can also help to produce any resources to inform patients about postoperative recovery.

Mapping

ACSA standard: 1.4.4.2
Curriculum competences: PO_BK, POM_IK 16–22, POM_HK 13–19, POM_AK
CPD matrix code: 2A07
GPAS 2020: 4.1.11, 4.5.6

References

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3.6 Drinking, eating and mobilising after surgery

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Why do this improvement project?

The ability for a patient to drink, eat and mobilise (DrEaM) after surgery can be used to evaluate the quality of any chosen anaesthetic technique in the context of a particular surgical procedure.[1] Patient outcomes can be significantly improved by using quality improvement methodology to study the impact of elements of anaesthetic technique which promote timely DrEaMing postoperatively.

Background

The determinants of early DrEaMing influence the quality of recovery. Anaesthesia quality indicators such as the presence of postoperative nausea and vomiting, moderate to severe pain, delirium and hypothermia can be measured and used to help to identify anaesthetic techniques which promote the best outcomes. Agreed ideal endpoints should be surgery-specific, and age, comorbidity and frailty may need to be adjusted for, depending on the population undergoing surgery.

Best practice

Much of the work published on enhanced recovery after surgery describes best practice, as do guidelines such as those issued by the British Association of Day Surgery and the Association of Anaesthetists.[2,3] The editorial by Levy *et al*[1] references the use of postoperative quality indicators to improve quality of recovery in both a district general and teaching hospital setting.[4,5] Best practice includes having a real-time understanding of the quality of recovery and an improvement programme in place to understand and improve the performance of the perioperative medicine service.

Suggested data to collect

The hospitals recruiting to the Perioperative Quality Improvement Project (PQIP) are collecting DrEaMing data in their patients, so using these data if they are already being collected would be an ideal starting point. The advantage of collecting these data is that you can track improvement over time and evaluate how your department is performing in comparison with other similar units in the UK. The following data could be collected (it is important that the data are standardised to the surgical procedure (or group of related procedures)):

- postoperative nausea and vomiting scores for the first 24–48 hours
- pain scores over a time-period specific for the patient's surgery
- delirium scores for the first three days in those at risk (usually 65 years and above)

Postoperative delirium may not become apparent for the first 24 hours. A score should be taken daily. Ideally, cognition should have been assessed preoperatively. The 4AT rapid clinical test for delirium and the Confusion Assessment Method have been validated for the use in this setting.[6,7]

- time to first drink
- time to first food
- time to mobilising (an agreed description of what mobilising means in each surgical context is required to make this a meaningful metric).

Quality improvement methodology

What are the determinants of DrEaMing? A driver diagram may help you to identify the points in the patient's journey that would influence ability to eat, drink and mobilise.

- Start with the preoperative phase; consider the fasting period, use of carbohydrate drinks, risk scoring for postoperative nausea and vomiting, and existing limitations to mobility, which may be patient-specific.
- Are the patients expecting DrEaMing to happen on day 1 postoperatively? Is this supported by patient information resources?
- Intraoperatively, look at anaesthetic techniques, use of opioids, regional anaesthesia, prophylactic antiemetics and type of surgery.
- Postoperatively, consider how the patient will eat, drink and mobilise. Do they have access to food and drink on the ward? What advice have they been given?
- Who will help them to get out of bed and when? Are they attached to devices, lines and catheters which may impede getting out of bed? Is there a role for grouping patients together for motivation (eg an enhanced recovery ward where patients move together along the ward as they progress through their recovery)?

- DrEaMing lends itself well to a run chart once you have looked at the process and drivers. This is available on the PQIP dashboard. Engagement of staff on the ward is key, both to improving and qualitative data documenting what is happening and any barriers to change.
- Would a dashboard on the ward be helpful for keeping staff informed of their progress?

Mapping

ACSA standards: 1.4.1.2, 1.2.1.4, 1.2.1.5, 1.4.5.1, 1.4.4.2, 1.4.4.1, 3.1.1.2, 3.1.2.2, 4.2.2.2

Curriculum competences: DS_IS_01, GU_IK_09, EN_IS_10, POM_IS_04, POM_IK_11, POM_IS_21, POM_IK_18, AR_AS_01, IS_K_15, IS_K_20, IS_K_22

CPD matrix codes: 1D01, 1D02, 1G01, 1I02, 1I05, 2A03, 2A07, 3A02, 3A03, 3A04, 3A05, 3A06, 3A08, 3A12, 3A13

GPAS 2020: 3.5.10, 3.5.17, 3.5.19, 3.7.1, 3.7.4, 4.2.18, 4.3.19, 4.3.20, 4.7.1, 4.7.5

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3.7 Recovery discharge protocols

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Why do this quality improvement project?

The timely discharge of postoperative patients from recovery to an appropriate destination maximises theatre efficiency, maintains patient safety and improves patient satisfaction. Comprehensive recovery discharge protocols that enable recovery staff systematically to assess when patients are fit for discharge are clearly fundamental to this aim, ensuring that patients are discharged neither too early nor with unnecessary delay.

Background

Locally tailored recovery discharge protocols are recommended by both the RCoA and the Association of Anaesthetists.[1–3] Their importance has also been highlighted in national audits where major adverse events commonly occurred in the immediate postoperative period.[4,5] The RCoA's Guidelines for Provision of Anaesthetic Services and Anaesthesia Clinical Services Accreditation schemes similarly propose explicit standards for recovery discharge protocols.[2,6] Discharge protocols based on the Aldrete score have been shown to reduce length of stay in the post-anaesthetic care unit (PACU);[7] adequate patient comfort is an additional recommended criterion in most recovery discharge protocols.

Best practice and suggested data to collect

Standards	Measures
Discharge protocols should be appropriately tailored where necessary for patient groups who may have specific additional needs in recovery and following discharge (eg maternity theatres, children, frail/elderly and obese patients).	■ Presence of locally tailored discharge protocol(s). ■ Staff awareness of and familiarity with local discharge protocol.
Discharge from the PACU is the responsibility of the anaesthetist. However, clear discharge criteria and protocols permit safe delegation of this responsibility to PACU staff, provided that they are correctly implemented.	■ Percentage of patients assessed for discharge readiness using the protocol. ■ Percentage of patients discharged from recovery to a general ward who are satisfied discharge criteria. ■ Percentage of patients not meeting discharge criteria who received anaesthetic review prior to discharge.
For patients who have not met discharge criteria, an anaesthetist must be available at all times to review such patients promptly.	■ Time taken for the anaesthetist to review patients not meeting discharge criteria after being contacted and reasons for delay.
After medical assessment, patients who do not fulfil the discharge criteria may be transferred to a critical care unit.	■ Percentage of patients not meeting discharge criteria who were discharged to a safe clinical area (eg high dependence or intensive care unit or other critical care facility); patients discharged to general wards despite not fully meeting all discharge criteria, (eg patients who still have mild-moderate pain or nausea). Every PACU should have well-defined criteria for fitness for discharge of patients to the ward or other clinical areas. ■ Measure of overall duration of stay in recovery. ■ Duration of stay in recovery despite the patient fulfilling discharge criteria. ■ Reasons for staying in recovery beyond readiness for discharge.
Standardisation can improve patient care by ensuring information completeness, accuracy and efficiency (the use of checklists should be considered). Staff should comply with the local standardised handover process.	■ Percentage of patients with adequate documentation of patient handover between recovery and ward staff.
When handing over to ward staff, patients should be transferred to the ward accompanied by two members of staff, at least one of whom should be suitably trained.	■ Percentage of patients where two members of staff (of whom at least one was adequately trained) transferred the patient from recovery.

3.7 Recovery discharge protocols

Dr Natalie Hester, Dr Oliver Boney
Barts and the London School of Anaesthesia

Quality improvement methodology

- Ownership of the quality improvement initiative should ideally be shared among staff involved in post-anaesthetic recovery, so a multidisciplinary group is key, including staff from wards or other areas to where patients are discharged.
- Ask patients for their perception of recovery after theatre. What is important to them and are you measuring it?
- You could use a Pareto chart to display the most common reasons for delayed discharge from recovery.
- Recovery processes are ideal for small tests of change, as they may be repeated many times in one day. Can you practice and refine your improvement idea over one shift?

Mapping

ACSA standards: 1.1.1.1, 1.1.1.2, 1.4.4.2, 1.2.1.3, 1.4.1.3, 1.4.4.1, 4.2.2.2

Curriculum competences: PO_BK_13, PO_BK_14, PO_BS_03, PO_BS_05, PO_BS_10, DS_IK_03, DS_IK_02, DS_HS_01, AT_D1_01, AT_D4_01, AT_D4_01, AT_D4_02, AT_D6_01

GPAS 2020: 4.1.8, 4.2.17, 6.5.18, 6.5.19, 6.5.20

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Postoperative care

3.8 Patient satisfaction: a quality improvement project worked example

Dr Adam Revill
Torbay and South Devon NHS Foundation Trust

Why do this quality improvement project?

Mortality and major morbidity are not useful outcome measures for anaesthesia, as they are so rare. Global patient satisfaction asked within the first 24 hours of surgery is also not useful because high satisfaction rates can occur despite concurrent severe adverse effects from anaesthesia. Quality improvement efforts should focus on other measures that patients link to satisfaction.

Examples of these measures from the Perioperative Quality Improvement Programme (PQIP) Bauer questionnaire for my local hospital compared to national figures are shown in Figure 3.8.1.[1]

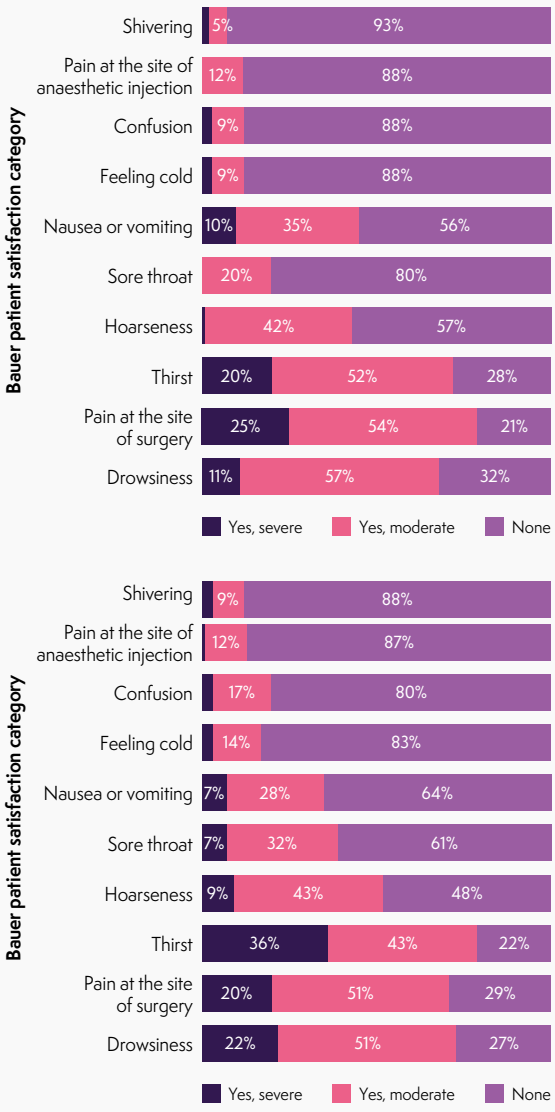

Figure 3.8.1: Patient experience of anaesthetic related discomfort. (top) Bauer patient satisfaction score; (bottom) national data.

Background

Defining patient satisfaction with anaesthesia is difficult. The Sprint National Anaesthesia Project-1 study demonstrated that there was no relationship between satisfaction and patient experience of adverse effects.[2] In other words, a patient could experience severe symptoms but still report being very satisfied with anaesthesia. This is probably due to patient expectation (ie they expect some degree of pain, nausea or thirst after an anaesthetic so when they experience it, it does not impact on their satisfaction).

PQIP postoperative data are helpful to highlight local opportunities for improvement. They can provide a global baseline and a comparator with other hospitals.

Best practice

A suggested aim from our local data would be to reduce to less than 5% the number of patients reporting severe discomfort in the specific category of focus by the time of publication of the next PQIP report.

Suggested data to collect

For our project, we are using pain in recovery from the PQIP database and the day-one Bauer questionnaire. We have found that we needed to set up additional data collection to identify different points at in the patient's journey for interventions. This is because the Bauer questionnaire only reports symptoms experienced at any time in first 24 hours. We have therefore set up additional data collection systems in recovery for:

- severe pain on arrival
- worst pain score in recovery (none, mild, moderate, severe)
- nausea on waking
- highest nausea score in recovery (none, mild, moderate, severe)
- vomiting in recovery.

This will identify whether you need to focus on intraoperative or postoperative interventions. Analysis of your own PQIP data will suggest what additional data you need to collect, which will be dependent on your aim.

Data need to specific and comparable if they are being used on a run chart, so if you have data on different surgical specialties they should be separated. The majority of our PQIP data is from major colorectal surgery.

Our data are presented on monthly run charts showing the percentage of severe responses over time from varying sample sizes. Figures 3.8.2, 3.8.3 and 3.8.4 show data on statistical process control P-charts for severe pain in recovery, severe pain in the first 24 hours and severe nausea in the first 24 hours, respectively. The template for creating these charts is available on the NHSi website.[3] These charts calculate a mean, upper and lower control limits, and automatically apply the rules for special cause variation.

The data are also presented to individual anaesthetists as part of their own quality improvement dashboard. This is for all cases, not just PQIP. We currently do this for our temperature data. We use the department average as a comparator to give the anaesthetist an idea of how they are performing, which can be used to make future decisions about analgesic and antiemetic approaches to colorectal cases.

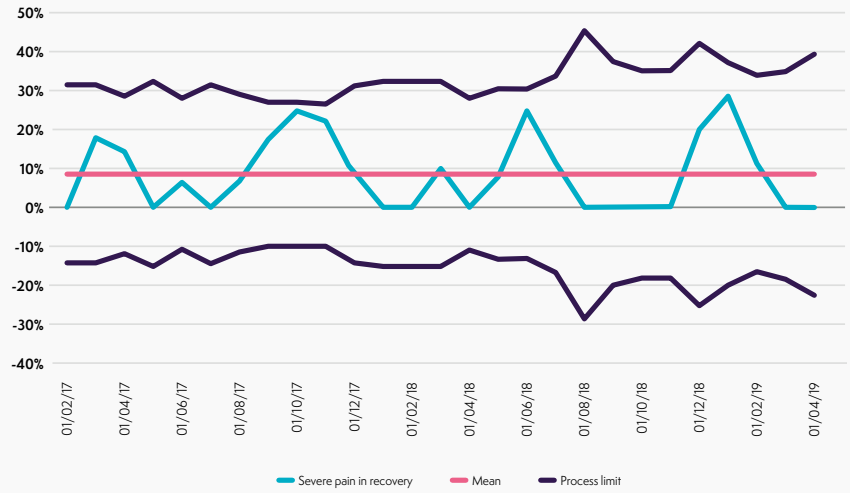

Figure 3.8.2: Severe pain in recovery.

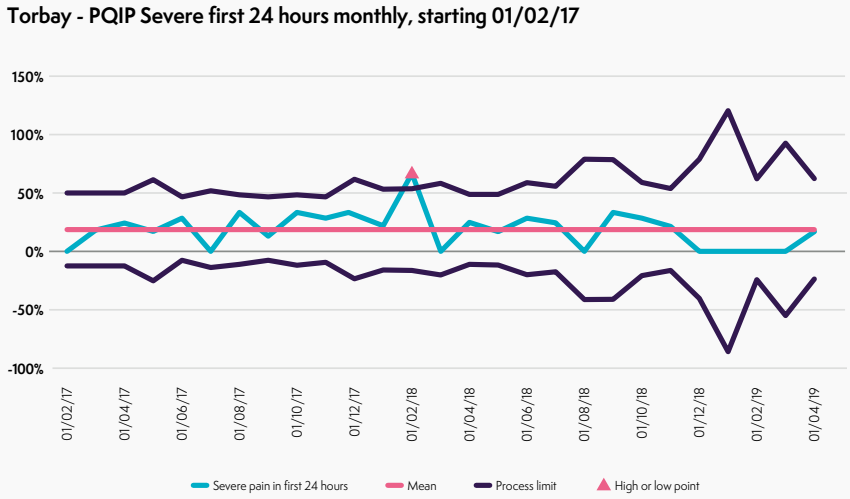

Figure 3.8.3: Severe pain in first 24 hours.

3.8 Patient satisfaction: a quality improvement project worked example

Dr Adam Revill
Torbay and South Devon NHS Foundation Trust

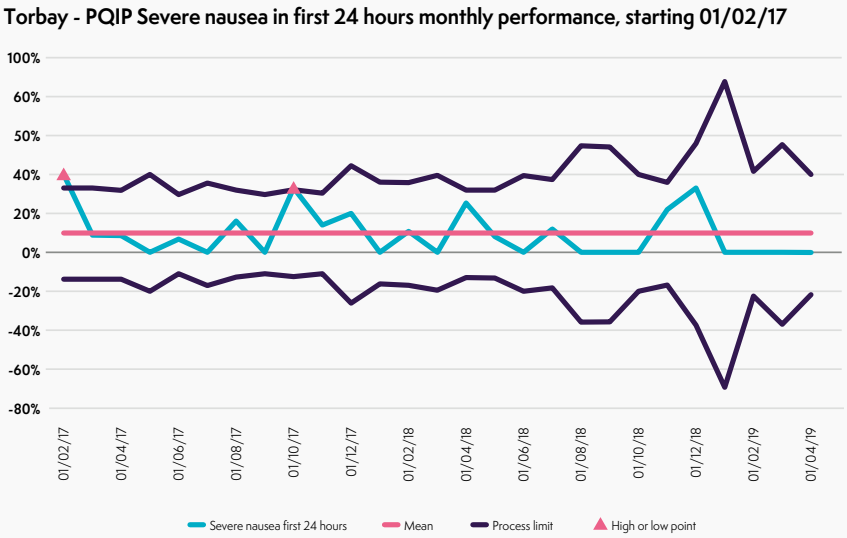

Figure 3.8.4: Severe nausea in first 24 hours.

Quality improvement methodology

Start with a project initiation brief. This might be a local hospital document or you can find them online from websites such as the Institute for Healthcare Improvement. Develop a 'SMART' (specific, measurable, achievable, realistic and, timely) aim.

- Our PQIP team meets every six weeks to review progress on outcome measures. The results are disseminated at the combined surgical and anaesthetic clinical governance meeting every four months.
- Our local data recording on PQIP were found to be inconsistent, so we developed a standardised reporting methodology and disseminated it to the anaesthetic department.
- We have established a guideline of suggested recipes for major colorectal cases to standardise technique and documentation. This was created by finding the best performers in PQIP nationally and combining that information with local expert opinion; this was implemented in March 2019.
- Our main process measures from our data are displayed on statistical process control P-charts, using the charts as the sample size changes from month to month.
- Our process measures include monitoring compliance with the suggested recipes; this is being done in conjunction with the pain team.
- These charts demonstrate natural variation in our process which suggest that we have a stable process. Thus, an intervention that is introduced and is effective will, we hope, demonstrate a positive special cause variation.

Mapping

ACSA standard: 4.2.3.1
Curriculum: PO_BK_02, PO_BK_07, PO_BK_08, PO_BK_14
GPAS 2020: 4.7.1, 4.7.2, 4.7.3, 4.7.4, 4.7.5, 3.7.1, 6.5.31

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3.9 Unplanned critical care admission after elective surgery

Dr Nicholas Owen
GIRFT Fellow

Why do this quality improvement project?

Unplanned admissions to critical care are linked to potentially avoidable postoperative mortality and morbidity. The causes are complex and multifactorial and are likely to be related to a mix of culture and resource in each hospital.

Capturing data effectively on unplanned escalations of care after an elective operation is an essential first step for effective quality improvement to reduce unplanned admissions. Capturing these data at a nationwide administrative dataset level (eg Hospital Episode Statistics, via the critical care minimum dataset) will allow peer to peer comparison of performance as well as shared learning.

Background

Effective elective perioperative care involves patient risk stratification in the preassessment clinic and appropriate allocation of a level 2/3 postoperative bed accordingly. While the evidence is mixed about improved patient outcomes following a planned period of elective level 2/3 care,[1–3] it is well established that an unplanned step-up in care postoperatively is associated with up to a 15-fold increase in mortality compared with those who do not require escalated care (so called 'failure to rescue').[4,5] The most commonly associated comorbidities with failure to rescue are congestive cardiac failure, renal failure and ascites.[6]

Best practice

There is no defined level of acceptable unplanned escalations of care to critical care units after elective surgery. The mean occurrence internationally is around 2.8–3.4% of all patients.[7] Occurrences above 7% may represent a significant deviation worthy of investigation. Improved shared decision making in the preassessment clinic may improve appropriate patient selection. Individualised risk assessment is a key component of shared decision making and should form the basis of decisions on level of care postoperatively; in many hospitals this is done based on predicted 30-day mortality.

Suggested data to collect

1. The following datasets in your hospital, including the nature of admission to level 2/3 (planned vs unplanned and indication for admission). The clinical coding department of your hospital may be able to help you:
   a) Intensive Care National Audit and Research Centre.
   b) Critical care minimum dataset (especially discharge and source locations).
   c) Local departmental level.
2. Baseline audit:
   a) Number of planned level 2/3 admissions following elective surgery (or other enhanced care areas).
   b) Number of unplanned level 2/3 admissions following elective surgery (or other enhanced care areas).
   c) Calculate unplanned admissions as percentage of total.
3. Suggested secondary data collection:
   a) Morbidity and mortality associated with planned and unplanned admissions (eg postoperative morbidity survey, 30-day mortality, reoperation rate).
   b) Presence and operational hours of critical care outreach or equivalent.
   c) Number of nurse-led and anaesthetist-led preassessment clinic sessions.
   d) Perceived hospital level barriers to elective postoperative level 2/3 bed access.
   e) Rate of on-the-day cancellation of elective major surgery because of critical care capacity.

Quality improvement methodology

1. SPC or run charts:

- Unplanned admissions: elective postoperative level 2/3 admissions; as this may be a rare event, this may be a statistical process control t- or g-chart.
- Calls to critical care outreach team.
- Patients seen in preassessment clinic and elective level 2/3 beds planned postoperatively.
- Documentation of predicted risk.

2. Process map the patient journey through the preassessment process to identify the point at which need for higher level care is planned. How is this communicated? What are the admission criteria? What is the booking process? What levels of care are actually available and at which locations? How reliable are the processes, including analysis of when the process fails?
3. Alternative models of care: is the post-anaesthesia care unit somewhere where these beds are sourced and who is responsible for care? Are there models of other enhanced care in patients at intermediate risk who do not need level 2 care but ward care is insufficient?

Mapping

ACSA standards: 1.2.1.2, 1.2.1.3, 1.2.2.1, 4.2.1.1, 4.2.1.2, 4.2.2.1, 4.2.3.1
Curriculum competences: POM_AK_03, POM_AS_05, POM_AS_07, POM_AS_10
CPD matrix codes: 1I01, 1I02, 2A03, 2C07
GPAS 2020: 2.1.1, 2.7.2, 4.1.8, 4.2.17, 4.3.26, 4.3.29, 4.7.5, 6.5.18, 6.5.19, 6.5.20

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4 Emergency anaesthesia

Edited by Andrew Hutchinson
QI editor Marc Wittenberg

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

References

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6. Choosing Wisely UK (www.choosingwisely.co.uk).
7. NHS England. Seven day services clinical standards, September 2017 (https://www.england.nhs.uk/publication/seven-day-services-clinical-standards).

4.2 Theatre provision for emergency surgery

Professor Jaideep J Pandit
Oxford University Hospitals NHS Foundation Trust

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

Dr Carolyn Johnston, St George's University Hospitals NHS Foundation Trust, London
Professor Carol J Peden, Keck Medicine of the University of Southern California, Los Angeles, CA

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

Dr Thomas Munford, East Midlands School of Anaesthesia
Professor Chris G Moran, Nottingham University NHS Trust

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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Dr Jasmeet Soar, North Bristol NHS Trust

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

Dr Sarah Hare, Paul Hayden
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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.

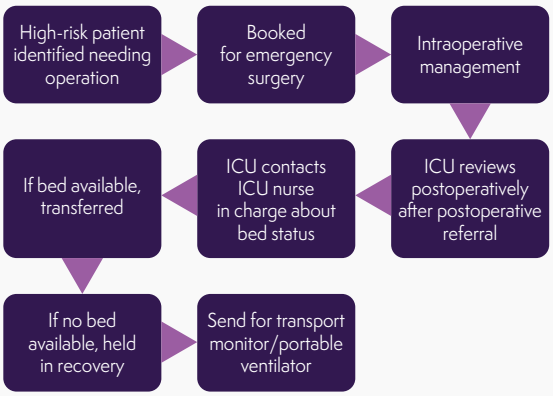

Figure 4.11.2: Process map of referral to critical care for emergency surgical patients.

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

Dr Mark Barley
Nottingham University Hospital NHS Trust

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.

5 Day surgery services

Edited by Dr Kim Russon and Dr Theresa Hinde
QI editor Dr Gethin Pugh

5.1 Optimising your daycase rates

Dr James Nicholas, Yorkshire and the Humber School of Anaesthesia
Dr Kim Russon, Rotherham Foundation Trust

Why do this quality improvement project?

The first of the 10 high-impact changes recommended by the NHS Modernisation agency recommends 'Treat day case surgery (rather than inpatient) as the norm for elective surgery'.[1] It is recommended that daycase surgery should be considered as the default pathway for most surgical procedures. This quality improvement project may result in:

- improved daycase rates
- achieving better best practice tariffs for relevant procedures
- released inpatient beds
- improved patient experience.

Background

There is an ever-increasing demand for elective and urgent surgical procedures, placing significant pressures on resources.[1] Multiple surgical procedures that do not carry a significant risk of postoperative complications should be completed on a daycase basis.[1,2] Patient suitability for daycase surgery should be based on current functional status and stable, well-optimised medical comorbidities rather than age, American Society of Anesthesiologists classification or body mass index (BMI).[3]

Best practice

- The NHS Modernisation Agency recommended that 85% of all surgical procedures performed in a hospital should be as daycase procedures.[1]
- The British Association of Day Surgery (BADS) directory of procedures contains suggested daycase rates for elective and emergency procedures classified by specialty.[4]
- NHS England reviews and publishes best practice tariffs every year with respect to a selection of daycase procures.[5]
- Getting It Right First Time has a focus on daycase procedures.[6]

Suggested data to collect

- The hospital's overall true daycase rate (admitted for surgery and discharged on the same calendar day).
- Review those patient episodes who are admitted to an inpatient ward and have a zero-day length of stay. Were they planned as a day case? Should they or could they have been on a daycase pathway?
- Identify any recurring themes (eg sent to ward due to high BMI but sent home the same day). Act on the findings (eg revise or discard BMI limits).
- Review patient episodes of patients whose surgery could have been a day case but had a one-night stay. Did the patient actually stay overnight or was it recorded after their discharge (ie an error in administrative recording of discharge time)? What was the reason they needed to stay overnight? Would their care have been different and would an overnight stay add (or detract) from their safety or experience?

Quality improvement methodology

Assess current practice

- Are daycase patients treated according to a dedicated daycase pathway?
- Does your hospital have clear protocols for patient selection for daycase surgery and are they followed? How restrictive are they?

Review all surgical procedures suitable for daycase pathways (seek guidance from resources including the BADS directory of procedures) that were completed on an inpatient basis and consider whether there were clinical grounds for an inpatient stay. Consider the questions: 'Would this patient's risk be increased by treatment on a day case pathway?' and 'In what ways would management have been different if the patient had not been admitted as an inpatient?'

Process mapping

Map out pathways for elective procedures looking for areas or processes that are unreliable or duplicated and that could be made more efficient. Areas to consider include patient booking, preoperative assessment, admission, anaesthetic factors, surgical factors, recovery carers and discharge.

Implement change using the plan-do-study-act framework

Improvements in whole systems occur most commonly through the cumulative effect of successive small changes. Consider what changes could be implemented in the patient pathway, formulate an action plan that includes input from all interested parties and assess the effects of these changes. Run charts will aid in visualising which changes have had an impact and which have not.

Worked example

Review of a selection of maxillofacial patient case notes with a zero-day stay by a maxillofacial surgeon and anaesthetic clinical leads for day surgery to identify common reasons for patients being sent to the ward.

Following this review, day surgery suitability criteria were amended, further education for preoperative assessment of staff around suitability for day case was implemented, with discussion and agreement from anaesthetic staff. Surgeons were requested to default to day surgery if the procedure was suitable as a day case and agreement that preoperative team and anaesthetists would confirm medical suitability and initiate any further clarifications required.

Mapping

ACSA standards: 1.1.1.9, 1.2.4.5, 1.4.3.1, 4.2.2.2, 4.2.3.1
Curriculum competences: Annex G pages G-4, 5, 9, 11, 12, 15, 16, Annex E pages E-9, 10, 26
CPD matrix code: 1103, 1105, 3A06
GPAS 2020: 6.3.1, 6.3.8, 6.3.13, 6.3.15, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, 6.5.31, 6.6.1, 6.6.2, 6.6.3

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5.2 Minimising day surgery cancellations/failure to attend

Dr Katie L Miller, Birmingham Children's Hospital
Dr Theresa Hinde, Torbay and South Devon NHS Foundation Trust
Dr Kim Russon, Rotherham Foundation Trust

Why do this quality improvement project?

Maximising theatre use in the daycase surgery setting will increase throughput with a minimal impact on inpatient beds. Minimising on-the-day cancellations can improve patient satisfaction and organisational efficiency.

Background

Theatre use and cancellations can be used as a surrogate for theatre efficiency. Use of the theatre is the actual use of theatre time compared with the potential theatre time available. It can be defined as appropriate theatre time use with a greater amount of time spent on performing procedures and minimising the time in between.[1–3] Theatre use is addressed elsewhere in this compendium (see section 11.3 Theatre use and efficiency). Optimal theatre use should be standard for daycase surgery, owing to the planned nature of the majority of cases. Theatre time cannot be used effectively if patients are cancelled on the day of surgery or fail to attend.

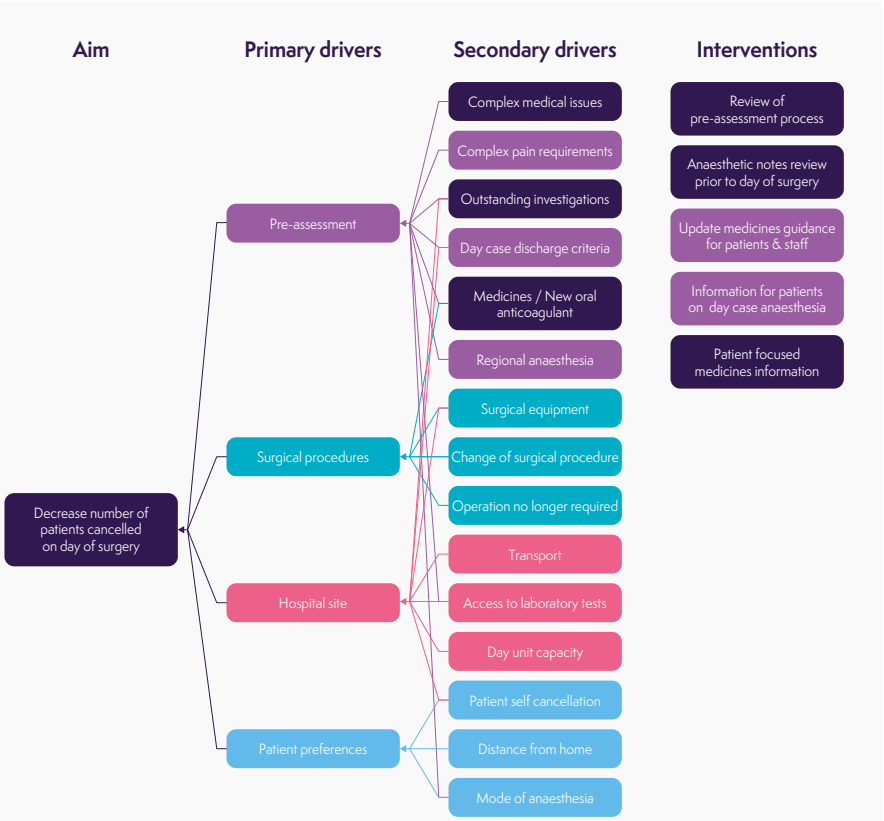

Figure 5.2.1: Driver diagram to improve patient experience and improve cancellation rates in day surgery.

Best practice

Reasons for avoidable cancellation on the day are likely to relate to a component of inadequate preoperative preparation and planning. Best practice should ensure that the following components are delivered satisfactorily:[4,5]

- Educate patients, carers, surgeons and preoperative assessment staff about day surgery facility pathways.
- Identify medical risk factors, optimise the patient's condition and promote health.
- Appropriate and realistic scheduling (patient and surgical factors should be considered).
- Appropriately timed preoperative phone calls to confirm continued suitability in the face of long waiting lists.

Reasons for poor theatre use are often related to scheduling, which is addressed in detail in section 11.3.

Suggested data to collect

- On-the-day daycase cancellations rates and reasons for cancellations.
- Number of inappropriate cases booked for a daycase theatre session (ie cases that do not conform to day-surgery criteria and should not be booked as day surgery).

Quality improvement methodology

Cancelled cases should be reviewed and classified as avoidable or not avoidable. Not avoidable would include, for example, patient illness on the day. Avoidable would include, for example, case or patient not suitable for day surgery. All avoidable cancellations should be reviewed and work plans developed to act on themes (eg patients attending alone with no social support and no one to remain with them overnight). Patient care pathways should be subject to continuous improvement with consideration of all the factors described in Driver Diagram fig 5.2.1.

Mapping

ACSA standards: 1.1.1.9, 1.4.3.1, 4.1.2.1
Curriculum competences: DS_IK_01, DS_IK_02, DS_IK_03, DK_IK_04, DS_AK_02
CPD matrix codes: 1I05, 3A06
GPAS 2020: 6.1.5, 6.2.2, 6.2.3, 6.2.4, 6.2.5, 6.2.9, 6.2.10, 6.4.1, 6.4.5

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5.3 Day surgery within the main theatre setting

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Birmingham Children's Hospital

Why do this quality improvement project?

This project aims to maximise the number of daycase surgeries irrespective of the organisational set-up. Day cases should only be managed through inpatient wards in rare circumstances, as this greatly increases the chances of an unnecessary overnight stay.[1,2]

Background

Daycase surgery rates within the NHS in England continue to rise and reached 84.3% at the end of 2018 for all elective admissions.[3] Ideally, daycase surgery should be carried out in a dedicated daycase unit (including theatres) on the same site as, but separate from, the main inpatient theatres.[4] A suitable alternative would be a dedicated day surgery ward where patients have surgery undertaken in the main theatre suite.[1] Beds spread across the facility do not provide the same efficiencies or indeed good outcomes from a specific daycase unit.[5]

There may be structural barriers to patient flow through the daycase pathway and to external access for patients if an existing healthcare setting is adapted.[4] The patient needs to be booked as a day case, follow the daycase pathway and be managed by the daycase team during their entire stay and not be confused with a 23-hour or a zero-night stay.[6] This minimises the chance of the patient enduring an unnecessary overnight stay, with unplanned admissions on the inpatient ward being 17% compared with 1% on the dedicated day unit at Torbay.[7] Protocol driven, nurse-led discharges are fundamental for successful daycase surgery.[4] Day cases scheduled after a major operation have an increased chance of cancellation.[8] Scheduling day cases at the beginning of the list maximises the time for recovery and time for potential discharge. Appropriate scheduling should maximise the success rate of day case surgery.

Best practice

The Guidelines for the Provision of Anaesthesia Services state that 'There should be a clear day surgery process for all day surgery patients treated within the hospital whether through dedicated facilities, which is the ideal scenario, or through the inpatient operating theatres, which should only be supported if the development of dedicated facilities is either not a viable option or there is insufficient capacity to accommodate all day surgery activity'.[1]

Suggested data to collect

- Proportion of daycase surgeries undertaken on a combined inpatient and daycase theatre list.
- Proportion of daycase patients admitted to an inpatient ward.
- Proportion of daycase patients failing to attend on the day, due to an acute medical condition, patient decision or organisational reasons.
- Cancellation of the procedure on the day because of a pre-existing medical condition, an acute medical condition or an organisational reason.
- Unplanned overnight admission due to surgical, anaesthetic, social or administrative reasons.
- Identifying missed opportunities (eg zero-night stays, one-night stays and 23-hour discharges).
- Comparison of patients outcomes (eg being operated on in dedicated daycase facilities rather than in the main theatre setting).

Quality improvement methodology

- Identify surgeries currently being undertaken in the main theatre setting where the patients have the potential to be day cases.
- Identify and engage stakeholders – this would improve the likelihood of implementing a day surgery pathway.
- Identify barriers to patient flow – this can be helped by drawing a process map of the patient journey from admission to discharge to help to categorise where problems arise.
- Trial the pathway in a small number of patients and see whether the specific outcomes improve inpatient care (eg length of stay).

Implement the daycase pathway to these patients irrespective of the organisational set-up. Ensure that these patients are coded as day cases and that they are discharged from the hospital on the day of surgery.

Mapping

ACSA standards: 1.1.1.9, 4.1.2.1

Curriculum competences: DS_IK_01, DS_IK_02, DS_IK_03, DK_IK_04, DS_AK_02

CPD matrix codes: 1105, 3A06

GPAS 2020: 6.2.2. 6.2.3. 6.2.4. 6.2.5. 6.2.9, 6.2.10, 6.5.13, 6.5.14, 6.5.15

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5.4 Performing emergency ambulatory surgery

Dr Theresa Hinde
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Why do this quality improvement project?

A significant number of emergency cases are urgent but could be performed as day cases in selected patients. The NHS Long Term Plan states that same-day emergency care should be available for surgical patients for 12 hours a day, seven days a week by 2020.[1] This has the advantage of improving patient experience, saving hospital beds and improving access to emergency theatres for life-threatening conditions.

Background

Many organisations already have pathways in place for the treatment of abscesses on a daycase basis. A few hospitals have achieved a complete emergency ambulatory care unit.[2] Other hospitals could offer urgent but minor or intermediate procedures on a daycase basis by using existing day surgery processes. With careful scheduling, urgent cases can be performed via a semi-elective pathway or via standard emergency lists and discharged using day surgery pathways.

Best practice

The British Association of Day Surgery directory of procedures highlights cases suitable for emergency ambulatory surgery.[3]

Suggested data to collect

Patient selection

Consider all patients presenting for minor or intermediate surgical procedures for surgery on a daycase basis. Suitability should be determined by surgical, patient and social factors.

- Evaluate percentage of emergency patients suitable for day case treatment. If they are not suitable, why not?

Timing and location of surgery

Timing of surgery should be the day of presentation if practical, otherwise return on a booked list as soon as possible.

- Percentage of urgent day cases operated on day of presentation.
- Percentage of urgent day cases operated on within 24–48 hours.
- Percentage of patients discharged home on the same day as their surgery.
- Evaluation of reasons behind any admissions to inform improvement.

Location of surgery

Options include:

- dedicated day surgery 'emergency' list (ideally in a day surgery environment)
- inpatient emergency list with discharge via day surgery environment
- a slot on an elective list (ideally in a day surgery environment; eg cancellations).
  - Percentage of patients operated on in each environment to plan resources.

Patient instructions

- Percentage of patients who received clear written instructions regarding date, location of readmission, care instructions for their surgical condition and emergency contact details in the event of deterioration (should be 100%).

List management

- Mixed specialty lists are possible but careful briefing is required.
  - 100% of cases should have a surgical brief.
  - Percentage of lists considered to be appropriately scheduled (eg complex cases first).

Types of surgery

Types of urgent surgery that may be suitable for emergency ambulatory pathways (recommended percentage of emergencies achievable as day cases are given in brackets where available based on national data and expert opinion):[2]

- general surgery and urology:
  - incision and drainage of skin abscess (100%)
  - laparoscopic cholecystectomy (50%)
  - laparoscopic appendicectomy (15%)
- gynaecology:
  - evacuation of retained products of conception (95%)
  - laparoscopic ectopic pregnancy (55%)
- trauma:
  - manipulation of fractures (100%)
  - tendon repair (95%)
  - open reduction internal fixation of wrist (60%)
  - open reduction internal fixation ankle (25%)
- maxillofacial:
  - repair of fractured zygoma (60%)
  - repair of fractured mandible (20%).

Compare local case load achieved to the national data available.

Quality improvement methodology

An organisation-specific ambulatory emergency pathway should exist to ensure that patients are added to an appropriate emergency theatre slot. This needs to be comprehensive and well disseminated, owing to urgency and complexity of the communication required between all stakeholders (including surgeons, anaesthetists, theatre, ward, recovery and administrative staff).

The key to success is a coordinator dedicated to the pathway and surgical hot clinics to facilitate decision making and smooth processes.

Case example

A patient classified as American Society of Anesthesiologists level 1 was awaiting urgent laparoscopic surgery on their index admission. What did we do?

We mapped the patient pathway to evaluate how this patient could be operated on in our day surgery unit and discharged home from there (see Figure 5.4.1 for a similar pathway).

Impact: by developing a coherent emergency day surgery unit pathway we have achieved urgent surgery via our unit in more than 500 patients over a two-year period, improving patient experience, relieving pressure on emergency operating theatre lists and saving bed days.

Mapping

ACSA standards: 1.1.1.9, 1.4.3.1, 4.2.3.2
Curriculum competences: DSBK01–06, DSBK08–10, DSIK01–03, DSHK01

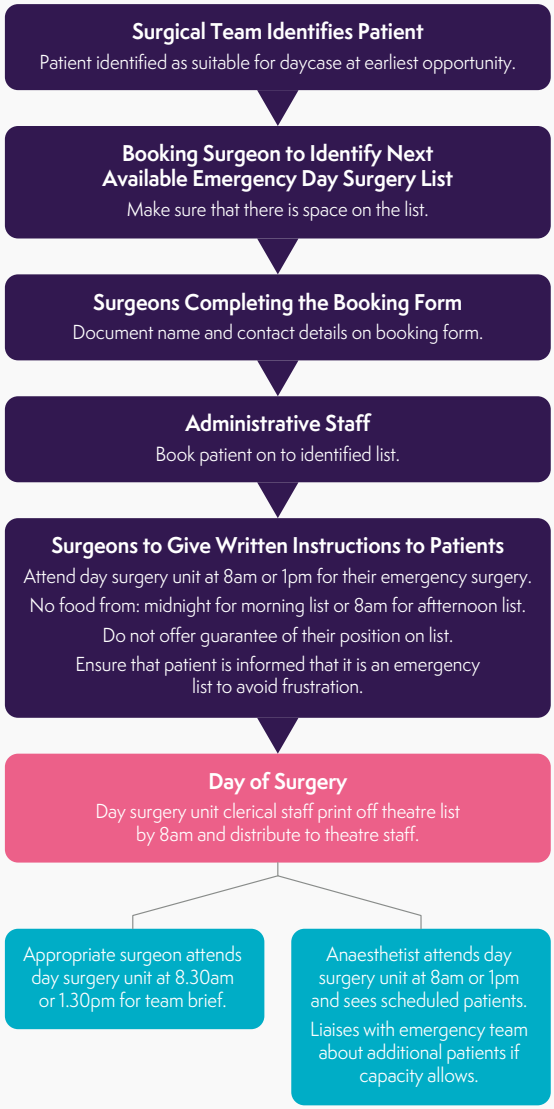

Figure 5.4.1: Emergency day surgery booking process.

CPD matrix codes: 2A07, 3A06
GPAS 2020: 6.3.12, 6.3.13, 6.3.14

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5.5 How effective is your daycase spinal service?

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Rotherham Foundation Trust

Why do this quality improvement project?

Increasing the number of patients who have a daycase spinal can offer benefits such as:

- increasing your day surgery rates by providing an option for patients who may otherwise require an inpatient bed because of medical comorbidities
- improving patient satisfaction by offering choice, improved immediate postoperative pain control, reduced postoperative nausea and vomiting and reduced cognitive impairment in recovery
- improving theatre efficiency by reducing turnaround times
- reducing time needed in recovery in hospital and may also offer the option of bypassing first-stage recovery in some cases.

Background

Spinal anaesthesia is widely accepted for many inpatient procedures and is now becoming the preferred anaesthetic technique for a number of operations that can also be performed as a day case. In many hospitals, daycase procedures are still performed under general anaesthesia despite their suitability for spinal anaesthesia (eg cystoscopy, hysteroscopy, knee arthroscopy, ankle and foot surgery).

The adoption of spinal anaesthesia for day surgical practice in the UK has been slow. This may be due to misperceptions that it will delay postoperative recovery and discharge because of postoperative pain, slow mobilisation or urinary retention. There may also be a feeling of patient reluctance to be awake during their procedure. Patients are increasingly presenting for surgery with complex comorbidities, often associated with ageing and obesity. Use of spinal anaesthesia in day surgery may provide a better clinical pathway for such patients.

Best practice

- Every patient should be provided with the appropriate information and be offered the choice of spinal anaesthesia if appropriate as recommended by the General Medical Council and the RCoA.[1,2]
- Appropriate drugs and spinal anaesthetic dosing for day cases should be used: low-dose local anaesthetic techniques or shorter-acting local anaesthetics.[3–5]
- Postoperative follow-up should include data on postoperative pain control and complications following procedures completed under spinal anaesthesia.[2]

Suggested data to collect

Operational data

- Total number of daycase procedures performed in your unit.
- Total number of daycase procedures that are potentially suitable be to be performed using spinal anaesthesia (eg lower limb surgery, hysteroscopies, cystoscopies, hernias).
- Types of local anaesthetic agents used in day surgery spinal anaesthesia.

Efficiency data

- Time spent in anaesthetic room.
- Time spent in recovery (could be zero if bypass first stage recovery).
- Time elapsed until first eating and drinking from induction of anaesthesia/insertion of spinal.
- Time elapsed until mobilised from induction of anaesthesia/insertion of spinal.
- Time elapsed until discharge from insertion of spinal.

Note that it would be important to compare these data with baseline data for patients undergoing such daycase procedures under general anaesthesia. Timings would thus be taken from induction of general anaesthesia rather than insertion of spinal anaesthetic.

Quality of spinal anaesthesia

- Patient pain scores (define timing, such as on arrival on day surgery ward or recovery room) for sequential patients.
- Number of patients who require additional pain relief prior to discharge.
- Number of patients who develop complications following spinal anaesthesia for daycase procedures attributed to the spinal anaesthetic;* the nature of the complication (such as failure, headache, urinary retention) and the resultant impact on the patient (delayed discharge, unplanned admission or conversion to general anaesthesia).

  * As the numbers are likely to be small when looking at an individual service or list, you may consider recording the number of spinals completed between complications to generate your data. This can be better for rare events.

Quality improvement methodology

- The reasons for lower rates of daycase spinal anaesthesia than expected can be explored using Pareto analysis. This can be useful in helping an improvement team to identify the vital few reasons for low numbers of daycase spinal anaesthesia that are having the biggest influence such as inadequate information prior to surgery, lack of appropriate drugs or dosing, misperceptions of problems. Change ideas can then be directed against the factors that are having the greatest impact on unplanned admissions.
- Identify a list for improvement and target that issue such engaging the surgeon to offer daycase spinal anaesthesia when the patient is listed for surgery or sharing day surgery spinal 'recipes' to the department.
- Improvement can be identified as an increase in the percentage of daycase spinal anaesthetics for a given procedures.
- It may be useful to scope your project to look at a specific subspecialty or procedure with a high suitability to daycase spinal analgesia (eg knee arthroscopy list) and work with that team to test improvements.

Mapping

ACSA standards: 1.1.1.7, 1.1.1.9, 1.4.3.1, 1.4.5.1, 2.1.1.7
Curriculum competences: DS IK 04, DS IS 01, RA IK03,
CPD matrix codes: 3A06, 2G01, 2G02
GPAS 2020: 6.1.2, 6.1.3, 6.2.17, 6.2.20, 6.2.21, 6.3.15, 6.4.1, 6.5.9, 6.5.12, 6.5.25, 6.6.2, 6.9.5

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5.6 Pain relief after day surgery

Dr Rachel Morris
Norfolk and Norwich University Hospitals

Why do this quality improvement project?

To ensure good-quality pain relief for all day case surgery patients, resulting in better patient satisfaction, earlier mobilisation and reducing the number of unplanned admissions.

Background

Postoperative pain is a common cause for extended hospital stay, unanticipated admission and readmission following day surgery.[1] There have been many papers siting the rate of moderate to severe pain in patients at home following day surgery as high as 30%.[2,3] For day surgery to be successful, pain relief should be controllable by the use of a combination of oral pain relief and local anaesthetic techniques.[4] These techniques must not increase the incidence of adverse events such as nausea and vomiting.

Pain relief after day surgery requires a multifaceted approach, with patient involvement being the key component. Patients therefore need to be informed prior to surgery and reminded postoperatively about their pain management. Many patients may experience pain at home, but 30–50% do not take adequate analgesia because of misunderstandings and insufficient information.[5]

Locally produced guidelines are an important part of achieving good-quality pain relief.[6] This is especially true in procedures which are more complex. This includes prophylactic oral analgesia, adequate intraoperative analgesia (allowing quicker recovery time) and appropriate drugs dispensed on discharge following the procedure.

Best practice

The Association of Anaesthetists and the RCoA recommend:

- patient information leaflets (both specific for a procedure and general) describing pain and its management
- prophylactic long-acting oral analgesia
- good-quality intraoperative analgesia
- multimodal analgesia in locally agreed policies
- verbal and written instructions
- appropriate drugs dispensed on discharge following the procedure.

Suggested data to collect

Outcome measures

- Number of patients who have an unplanned admission due to inadequate pain relief.
- Number of patients reporting effective pain relief following day surgery.
- Number of patients readmitted due to inadequate pain relief.

Process measures

- Number of patients who received a patient information leaflet about pain relief.
- Number of procedures with specific analgesia guidelines in day surgery.
- Number of procedures where regional analgesia used.

Patient reported outcome

- Did you feel satisfied with your pain relief postoperatively?
- Were you given postoperative pain relief instructions? If so, did you follow them? If not, why not?
- Were you given verbal and written postoperative instructions? Were they useful?

Quality improvement methodology: case example

Problem: difficulty in patients consistently receiving prophylactic paracetamol.

What did we do?

After stakeholder analysis and consultation, we developed a patient group direction for the nursing staff to administer paracetamol to all daycase patients preoperatively. This was trialled as a small-scale change over one week to see whether it would result in an improvement.

Impact

All patients received paracetamol preoperatively and staff reduced the incidence of paracetamol given via other routes intraoperatively. As part of the project we assessed patient impact. We found that patients became more aware of their pain management strategies. This project also led to decrease in cost associated with the use of perioperative paracetamol.

Mapping

ACSA standards: 1.1.1.9, 1.2.1.3, 1.2.2.1, 1.4.1.2, 1.4.5.1, 1.4.5.2
CPD matrix codes: 1A02, 1D01, 1D02, 2G01
GPAS 2020: 2.9.1, 2.9.4, 6.5.12, 6.5.21, 6.5.22, 6.9.1, 6.9.5, 10.9.3, 11.3.6, 11.7.1

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5.7 The need for a carer at home after day surgery

Dr Rachel Morris
Norfolk and Norwich University Hospitals

Why do this quality improvement project?

To enable day surgery to be offered to as many people as possible, including those that live alone.

Background

According to the King's Fund, the number of available inpatient beds in the NHS has halved over the past 30 years. For many years it has been stipulated that patients who have day surgery require a carer at home for 24 hours after their procedure. However, the Day Surgery Operational Guide 2002 by the Department of Health states that 'Lack of social backup should seldom be a reason to exclude a patient from day surgery'.[1] The Royal College of Anaesthetists Guidelines for the Provision of Anaesthesia Services has challenged the need for a carer for 24 hours: 'A carer may not be essential if there has been a good recovery after brief or non-invasive procedures and where any postoperative haemorrhage is likely to be obvious and controllable with simple pressure'.[2] This, together with the Association of Anaesthetists/British Association of Day Surgery guideline statement, 'Following most procedures under general anaesthetic a responsible adult should escort the patient home and provide support in the first 24 hours' gives some indication that a blanket rule may not be appropriate for all patients.

Owing to standardised discharge criteria, a default for patients who live alone or do not have a carer overnight is to use an inpatient bed. To ensure effective use of inpatient beds and to enable day surgery to be an option for all, patients should be encouraged to find a carer overnight but if they cannot do so then alternatives should be sought.

Hospitals have resolved this issue in a variety of ways:

- For selected procedures, patients return home with an escort but do not have a carer present with them for the full 24 hours.[3]
- A professional carer stays in a consenting patient's home overnight.[4]
- Patient hotels.[4]

Whatever approach is used, an agreed written policy must be in place to enable nurse-led discharge to take place.

Best practice

The Royal College of Anaesthetists Guidelines for the Provision of Anaesthesia Services (GPAS) and guidelines from Association of Anaesthetists and the British Association of Day Surgery.[2,5]

- All patients who have a daycase procedure should be able to go home if it is safe for them to do so.
- All patients require an escort home if they have had general or regional anaesthesia.

Suggested data to collect

It is assumed that all patients meet surgical and anaesthetic criteria for day surgery discharge before embarking on this project.

Operational data

- Patient age.
- Procedure.
- Number of patients who had any problems in the first 24 hours after surgery that required medical attention.
- Number of patients who had any problems in the first 24 hours after surgery that required assistance from their carer to manage daily living.
- Readmission rates for the patients sent home without a carer.

Patient reported outcomes

- Did you feel that you needed a carer with you postoperatively? If so, why?
- Did you have a responsible adult at home with you for the full 24 hours?
- If not, how long did the responsible adult stay with you?
- How long did it take until activities of daily living were performed independently?
- If you had the same or similar surgery again, would you choose to have a carer, and if so why?

Quality improvement methodology: case example from Norfolk and Norwich University Hospital

Problem: patients who live alone and are unable to get a carer require an inpatient bed.

What did we do?

A questionnaire of patients reviewing whether they lived alone; whether they had a carer for 24 hours; which procedures they had; and whether they felt that they required help.

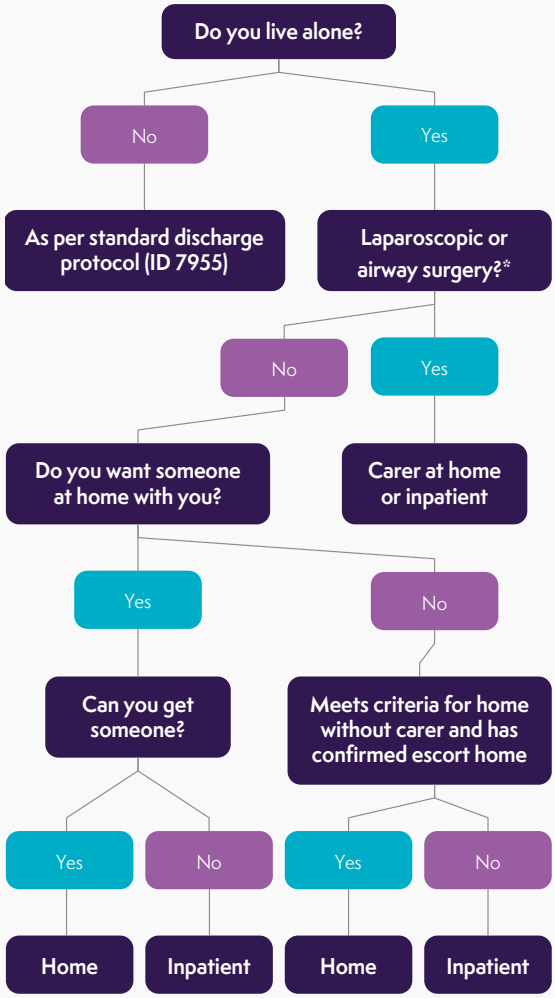
We reviewed the literature and were guided by GPAS. We introduced a 'self-care' pathway (Figure 5.7.1).

Impact

The number of patients requiring inpatient beds decreased and patient satisfaction as a day case increased.

Mapping

ACSA standards: 1.2.1.1, 1.2.1.3, 1.2.1.4, 1.2.2.1, 1.4.4.3, 1.4.3.1, 1.4.5.2
CPD matrix codes: 1I05, 2A03, 3A06
GPAS 2020: 2.9.1, 2.5.29, 5.9.6, 6.5.8, 6.5.25, 6.5.12, 6.9.1, 6.9.5, 7.5.9, 11.3.6



All patients must have a responsible adult escort for the journey home.

*Airway surgery includes nasal and neck procedures and any other surgery that may cause bleeding or swelling around the airway.

Figure 5.7.1: Flow pathway for self-care following surgery.

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5.8 Unplanned hospital admission after day surgery

Dr Lorna McEwan, Sheffield Teaching Hospitals NHS Foundation Trust
Dr Kim Russon, Rotherham Foundation Trust

Why do this quality improvement project?

Unplanned admissions following day surgery can have a negative impact on patient experience. They increase pressure on inpatient beds and may increase costs for organisations due to requiring an overnight stay or loss of a best practice tariff payment.

Background

As the complexity of the procedures routinely being managed as day cases increases, it becomes even more important to regularly assess the reasons for unplanned admissions, to continually improve patient services and organisational efficiency.

Review of unplanned admissions may help to identify areas of improvement such as list planning, identification of high-risk patients during preassessment or management of perioperative complications such as pain, nausea and vomiting.

Quality improvement tools can be used to identify areas for improvement in patient care and experience through identifying such reasons for unplanned admissions following day surgery and testing changes as part of quality improvement projects.

Best practice

Both the RCoA Guidelines for the Provision of Anaesthetic Services and Association of Anaesthetists Day and Short stay surgery recommend regular audit of unplanned overnight admission, unplanned return or readmission to day surgery unit or hospital.[1,2]

Suggested data to collect

Rate of unplanned admissions:

Overall rates

A hospital's overall unplanned admission rate will be influenced by case mix, but the best units, which also undertake very challenging procedures as day cases, are achieving an overall unplanned admission rate of 3%, so this is a realistic target.[3] Units only undertaking minor surgery such as cataracts, dental extractions or hysteroscopies should expect to have unplanned admission rates of less than 1%.

Procedure-specific rates

To enable default to day surgery, a higher procedure-specific rate for complex surgery such as hysterectomies/mastectomies and cholecystectomies may need to be accepted.

The British Association of Day Surgery directory of procedures recommends target daycase rates for over 200 procedures[4]. A reasonable expectation is that, for procedures with very high expected day surgery rates, it will be easier to achieve lower unplanned admission rates such that the following guidance could be followed:

- Procedures with expected daycase rates of over 75% should have an unplanned admission rate of less than 2%.
- Procedures with expected daycase rates of 50–75% should have an unplanned admission rate of less than 5%.
- Procedures with expected daycase rates of less than 50% should have an unplanned admission rate of less than 10%.

Quality improvement methodology

The reasons for unplanned admissions can be explored using Pareto analysis. This can be useful in helping an improvement team to identify the vital few reasons for admission that are having the biggest influence on unplanned admissions, such as inadequate preassessment. Change ideas can then be directed against the factors that are having the greatest impact on unplanned admissions.

- Outcome measure: number of patients who have unplanned admission following day surgical procedure.
- Process measures: these will depend on your change ideas.

Identify an area for improvement and target that issue such as list planning. Change ideas might include that more complex day cases are performed first to allow longer recovery time without the need for overnight admission.

Improvement can be identified as a reduction in the number of unplanned admissions for given procedures using run charts.

It may be useful to scope your project to look at a specific subspecialty or procedure with a high frequency of unplanned admissions and to work with that team to test improvements.

Mapping

ACSA standards: 1.1.1.9, 1.2.1.2, 1.2.4.5, 1.4.3.1, 1.4.5.2, 4.2.2.2, 4.2.3.1
Curriculum competences: Annex G pages G-4, 5, 9, 11, 12, 15, 16, Annex E pages E-9, 10, 26
CPD matrix codes: 1D02, 1I03, 1I05, 3A06
GPAS 2020: 2.5.29, 6.5.9, 6.5.16, 6.5.17, 6.5.18, 6.5.30, 6.5.31, 6.7.1, 6.7.3, 10.7.1

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5.9 Evaluating your day surgery pathway

Dr Theresa Hinde
Torbay and South Devon NHS Foundation Trust

Why do this quality improvement project?

Evaluating and refining each component of your daycase pathways will help to streamline processes improving efficiency, patient safety, patient experience and patient outcomes and provide clear evidence for staff and resource planning.

Background

Specialist nurse-led preassessment teams supported by anaesthetists are recommended to identify patient risk factors, optimise conditions and promote health.[1,2] Patient optimisation is improved by clear communication with primary care. Patients and carers need to have all questions answered and clear expectations. On the day of surgery, well-established administrative, nursing, anaesthetic and surgical pathways facilitate the ultimate aims of safe same day discharge, with minimal adverse effects, excellent patient experience and outcomes.

Best practice

The Association of Anaesthetists provides detailed recommendations for successful daycase surgery.[1] 75% of surgery should be performed as day surgery.[3]

Suggested data to collect

Organisational agreements

- Local agreement and formalised identification on which surgical procedures should default to day surgery pathways.
- Percentage of patients undergoing these procedures who did not access the day surgery pathway and evaluation of reasons why not.

Preoperative assessment

Patients require timely preoperative assessment by a trained nursing team supported by a consultant anaesthetist to identify patient risk factors, optimise conditions and promote health.[1]

Same day 'one-stop' assessment should be achieved in 60% of patients and within two weeks of listing for surgery for the remainder.

- Percentage of patients requiring referral to consultant anaesthetist for further evaluation.
- Availability of evidence-based guidelines to maximise opportunities for patients with common comorbidities (eg diabetes, morbid obesity and sleep apnoea) to be safely treated via a daycase pathway.[1,2]
- Availability of a system to re-evaluate 'long' waiters to avoid cancellations (eg two-week phone call to detect changes in medical conditions).

Information giving

Condition-specific and day surgery specific information is provided in 100% cases (see also section 1.4).

List management

See sections 5.2 and 5.3.

Starvation times

Avoid excessive starvation times. Allow free clear fluids until time of surgery and milk in hot drinks is acceptable up to two hours preoperatively.[4]

- Percentage of patients with free fluids until surgery.
- Percentage of patients starved for more than six hours preoperatively.

In theatre

Surgical and anaesthetic techniques should ensure minimum stress and maximum comfort. Equipment should be available to facilitate these techniques.[1,2,5,6]

- Procedures benefit from standardised anaesthetic techniques and management protocols.
- Perioperative temperature management should be undertaken.
- Protocols for management of postoperative symptoms and prophylaxis should be in place.

Measures

- Pain and postoperative nausea and vomiting scores, time to mobilisation and time to discharge.
- Less than 5% of patients should report severe pain in first 48 hours following surgery.
- Availability of evidence-based standardised guidelines for complex procedures.
- Percentage of patients with temperature measurement higher than 36.0 degrees C pre- and intraoperatively and in recovery.

Recovery

- Dedicated day surgery secondary recovery areas should be provided to facilitate timely discharge.[1,2]

- Evidence-based, up to date protocols should be available for management of pain, postoperative nausea and vomiting, antibiotics, venous thromboembolism prophylaxis and for care of patients after regional anaesthesia.[7]

Discharge

- Discharge should be nurse-led using agreed protocols.[1,2,8] Patient satisfaction should be evaluated (eg postoperative phone call on day 1).

Measures

- Patients and their responsible carer are provided with clear verbal and written information, including troubleshooting, wound and drain care in 100% of cases.
- Protocols for management and evaluation of unscheduled admissions (unplanned admission rate should be less than 2% with less than 0.5% readmission post discharge).
- A 'take-home' copy of the discharge summary should be provided in 100% cases.

Quality improvement methodology

Refining your processes:

- Draw a process map from the time that the patient is booked for surgery in outpatients until they are discharged.
- Look for any duplications, omissions or unreliable steps.
- Can the patient experience be improved (eg minimise starvation and waiting times on day of surgery)?

Introducing new procedures to day surgery:

- Evaluate all steps of the inpatient pathway using process mapping.
- Involve all stakeholders from the outset (theatre staff, surgeons, anaesthetists, recovery staff, administrative team, specialist services). Initially limit involvement to a few colleagues.
- How can each stage in the process be made suitable for a daycase pathway?
- Can you make use of any integrated care links with the community to evaluate and care for your patients most effectively?

Mapping

ACSA standards: 1.1.1.9, 4.1.2.1, 1.4.3.1, 4.2.3.2, 1.2.2.1, 1.4.1.2, 1.4.5.1, 1.4.5.2

Curriculum competences: DSBK01–06, DSBK08–10, DSIK01–03, DSHK01

CPD matrix codes: 2A07, 3A06

GPAS 2020: 6.1.5, 6.1.6, 6.1.7, 6.1.10, 6.2.1, 6.2.4, 6.2.7, 6.2.19, 6.2.20, 6.2.21, 6.2.24, 6.2.26, 6.5.8, 6.5.9, 6.5.10, 6.5.12, 6.5.15, 6.5.16, 6.5.18, 6.5.19, 6.5.21, 6.5.23, 6.5.29, 6.7.1, 6.7.2, 6.9.1, 6.9.4, 6.9.5

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6 Anaesthesia and sedation outside theatre

Edited by Dr Arnab Banerjee
QI editor Dr Sanjiv Chohan

6.1 Anaesthesia in the accident and emergency department

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Why do this quality improvement project?

Providing anaesthetic services in the emergency department can be very challenging, given the remoteness from the theatre suite, the nature of the problem for which anaesthesia is needed and the unfamiliar environment. However, standards of care must be maintained. Teamwork and communication are particularly important in the emergency department, where anaesthetists may work with a number of different teams, including the emergency department team, paramedics and a variety of specialists, on critically ill and injured patients.

Background

In the emergency department, rapid sequence induction of anaesthesia with intubation is often required immediately in severely ill or injured patients. The Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society (NAP4) highlighted several concerns.[1] Most of the events reported in the emergency department were complications of rapid sequence induction. The most common cause appeared to be poor judgement, but poor planning, inadequate provision of skilled staff and equipment, delayed recognition of events and lack of or misinterpretation of capnography were all considered to be important.[1]

The anaesthetist attending the emergency department must be competent to manage a difficult intubation in a timely and effective manner.[2–5] Use of an emergency induction checklist is indicated. Major haemorrhage may also need to be managed, and appropriate equipment and checklists should be available. Anaesthetic services may also be required to help with the provision of analgesia for painful conditions and anaesthesia or sedation for minor ambulatory surgery such as suturing of lacerations, incision and drainage of abscesses and manipulation of fractures and dislocations.[6,7] Standards of anaesthetic care and safety in the emergency department must be the same as those provided in theatre suites. Anaesthetists are also frequently involved in transferring patients to theatre or critical care in the same hospital or to other hospitals. National guidelines for patient transfer should be followed.[8,9]

Best practice

Previous NCEPOD reports, Association of Anaesthetists guidelines and the Royal College of Surgeons report The High-Risk General Surgical Patient have considered that too many decisions in emergency situations are being made by junior trainees.[10] The need for accountability in providing direct or indirect supervision has been recognised.

Suggested data to collect

Standards	Measures
Where sedation is provided by an anaesthetist there is a policy for the provision of this service including all subspecialty areas.	■ 100% presence of a policy surrounding the provision of safe sedation practice.
Nominated consultant anaesthetist responsible for anaesthetic services in the emergency department with links to the hospital's governance programme.	■ 100% presence of a dedicated emergency consultant on anaesthetic rota.
Regular team practice for rapid sequence induction and major trauma management, using case scenarios and simulation with debriefing and discussion, at least every two months.	■ At least 95% compliance with regular team practice and drills using scenarios.

Checklists of what should be available, together with visible algorithms for difficult airway, anaesthetic emergencies and major haemorrhage management in the resuscitation room. A dose calculation chart, formula or other algorithm to establish appropriate doses in children.	■ Percentage presence of checklists for visual aid in the emergency department.
Airway and ventilator equipment availability.	■ At least 95% compliance with checklist.
Presence of capnography during intubation and ventilation including on transfer of patient.	■ Percentage compliance with presence of capnography equipment in the emergency department.
The anaesthetic trauma team members should be of specialty trainee year 3 or above to manage rapid sequence induction and haemorrhage control in major trauma patients, and should attend within five minutes of being called, more than 90% of the time.	■ Percentage compliance with the requirement.
Trainee anaesthetist should be able to obtain senior advice within 3 minutes or direct practical assistance from a senior colleague within 20 minutes, whenever needed.	■ Percentage compliance with the requirement.
For 100% of emergency department rapid sequence induction procedures a trained assistant should be present.	■ Percentage compliance with the requirement measured by the dedicated allocation of trained assistant for the emergency department.
Accurate real-time data is recorded to allow discerning review of emergency department rapid sequence induction and major trauma resuscitation.	■ Percentage compliance needs to be achieved with documentation to comply with legal requirements.
Many of these patients will require interhospital transfer to the regional trauma centre or the operating theatre; this is not without risk.	■ Percentage compliance with local and national guidelines for transfer, together with provision of equipment for safe transfer.

6.1 Anaesthesia in the accident and emergency department

Dr Arnab Banerjee
Royal Liverpool University Hospital

Quality improvement methodology

- Using data collected, see where standards regularly fall short and focus quality improvement work on these areas.
- Form a multidisciplinary stakeholder group to look at the processes which, if improved, will have the most influence on patient outcomes.
- Perform regular multidisciplinary systematic review of critical incidents and near misses, and work as a multidisciplinary team to develop solutions.
- Use sequential plan-do-study-act cycles to make incremental changes to the system. This method allows regular review and feedback and therefore builds learning from ideas that work in each cycle.
- Joint teaching and training is an effective way of sharing examples of good practice and also opening conversations about potential problems and their solution (use of simulation improves team working, communication and decision making and can be effective in changing behaviour).

Mapping

ACSA standards: 1.1.2.2, 1.5.14, 2.1.1.1, 2.2.1.3, 2.2.1.4, 2.4.1.3, 2.5.6.2

GPAS 2020: 5.2.12, 5.4.5, 5.5.38, 5.5.46, 7.3.9, 7.3.10, 7.3.11, 7.2.18, 7.3.32, 7.4.4

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Anaesthesia and sedation outside theatre

6.2 Remote site anaesthesia

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Why do this quality improvement project?

As the number of diagnostic and therapeutic procedures performed outside the theatre environment increases, anaesthetists are becoming more involved in providing remote-site anaesthesia and sedation. Developing safe practice guidelines will allow high-quality patient care to be delivered wherever the location.

Background

The RCoA defines a remote site as being away from the main theatre suite and anaesthetic department where help may not be readily available. Potential risks in the remote site include unfamiliarity with the isolated environment, the equipment, team and assistance available, and the procedure being carried out. Additionally, problems with communication pose further challenges in calling for senior help in a timely manner.

Best practice

The same standards of monitoring should be provided as if the patient is in the main operating theatres,[1] as stated in the RCoA guidance Anaesthetic Services in Remote Sites and Guidelines for the Provision of Anaesthesia Services in the Non-theatre Environment.[2,3]

Suggested data to collect

Standard met versus not met

Standards	Measures
A clinical lead for anaesthesia in the non-theatre environment should be appointed.	■ Presence of a clinical lead for remote site anaesthesia. Evidence of involvement in developing the service, training and revalidation of staff, maintaining safety standards and carrying out audit.
All institutions where sedation is practised should have a sedation committee, with a nominated lead for sedation.	■ Presence of a sedation committee and sedation lead.
Full resuscitation facilities should be available in all remote sites providing anaesthetic services including a defibrillator, suction, oxygen, airway devices and a means of providing ventilation.	■ % of remote sites around the Trust with the above equipment immediately available.
All remote sites providing anaesthetic services have standardised equipment. Where standardisation is not possible, all staff should be provided with regular formalised anaesthetic equipment training sessions.	■ % of remote sites with standardised equipment. There is a record of individual staff receiving regular training where equipment is not standardised.
A full range of emergency drugs including drugs to treat rare situations and specific reversal agents, such as dantrolene, intralipid, naloxone, sugammadex and flumazenil, should be available.	■ Immediate availability of above drugs in 100% of remote locations. ■ Dantrolene and Intralipid are located in a designated area and an in-date supply maintained.
All local anaesthetic solutions should be stored separately from intravenous infusions to reduce risk of wrong route administration.	■ 100% of remote sites with local anaesthetics stored separately from intravenous solutions.

Requires measurement on regular basis	
All anaesthetists should be fully familiarised with remote areas prior to undertaking anaesthetic procedures in that location.	■ % of anaesthetists with a record of covering remote sites at Trust Induction.
Wherever possible anaesthesia in remote sites should be provided by appropriately experienced consultants.	■ % of elective and emergent remote site cases performed by Consultants vs Trainees or Specialty Doctors.
Mandatory monitoring as per Association of Anaesthetists guidelines, which includes end-tidal CO2 according to level of sedation/anaesthesia. Peripheral nerve stimulator must be used where muscle relaxants are given. Depth of anaesthesia monitoring is recommended when using total intravenous anaesthesia with neuromuscular blockade.	■ 100% of cases of sedation and anaesthesia have the appropriate level of monitoring.
A dedicated and fully trained anaesthetic assistant should be available at all times.	■ A suitable assistant is present at 100% of cases of remote site sedation/anaesthesia.
A team-based safety briefing should take place prior to commencing any procedures, including WHO checklist and VTE assessment where indicated.	■ Team brief and completion of a safety check list in 100% of cases.
Expert recovery care is required after general anaesthesia or deep sedation.	■ 100% of cases are recovered by appropriately qualified recovery staff in the remote site or theatres recovery after general anaesthesia or deep sedation.
It is essential to have documentation of the anaesthetic procedures and patient monitoring used.	■ An anaesthetic record has been filled out in 100% of cases.

6.2 Remote site anaesthesia

Dr Sindy Lee
St Georges School of Anaesthesia

Quality improvement methodology

- Identify which standards consistently fail to be achieved. This can be done using a snapshot audit to point to where standards are slipping. This will form the basis of any project.
- Where standards have not been reached, engage relevant stakeholders (eg endoscopy, recovery and radiology staff), as well as budget holders such as service managers, in identifying the factors involved and areas for change. Different methods to illustrate where interventions can lead to improvements include constructing process maps and cause-and-effect diagrams.
- A driver diagram can be constructed to plan the improvement work.
- Use sequential plan-do-study-act cycles to gradually make incremental changes to the system. This allows regular review and feedback of changes and learning can build on ideas that work in each cycle.

Mapping

ACSA standards: 2.1.1.2, 2.2.1.3, 2.2.1.4
Curriculum competences: RR_HAB_02, RR_HAB_03, RR_HAB_04, RR_HAB_05, RR_HS_01, DI_HK_01, DI_HS_01, DI_HS_02
CPD matrix codes: 2A08, 3100, 2A10
GPAS 2020: 7.1.1, 7.1.2, 7.1.3, 7.1.5, 7.2.3, 7.2.9, 7.2.10, 7.2.13, 7.2.16, 7.2.18, 7.2.19, 7.2.22, 7.4.1, 7.5.14

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Anaesthesia and sedation outside theatre

6.3 Sedation competency

Dr Ben Blackman
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Why do this quality improvement project?

Sedation for a variety of procedures is common in multiple areas of the hospital; often in remote sites, performed by professionals of various specialties. Ensuring that practitioners are competent and maintain nationally approved standards is foundational for safe sedation.

Background

Historically, sedation has carried large risks; a 1995 prospective audit of 14,149 gastroscopies found a 30-day mortality of 1 : 2000 and morbidity of 1 : 200, with sedation as a significant contributor to these poor outcomes.[1] More recently, a prospective audit of 368,208 endoscopies demonstrated more reassuring results, with a mortality of 1 : 24,500 and 1 : 10,000 suffering major complications.[2] This improvement is arguably down to large changes in sedation practice and governance, spearheaded by national level guidance such as the Academy of Medical Royal Colleges' guidance on safe sedation practice.[3]

Best practice

Chief among this report's recommendations is to ensure that formal training and competence standards are met by all practitioners who administer sedation.[3] Sedation now features highly in the RCoA curriculum at all levels (see Mapping below), although it has only done so since 2010.[4] Other specialties have implemented their own guidelines and frameworks for training in liaison with the RCoA, for example in emergency medicine and dentistry.[5,6]

Suggested data to collect

Assessing sedation-related governance

- Formal training and assessment of competency in sedation.[3]
- An anaesthetic 'sedation lead' and anaesthetic representation on the hospital's sedation committee.[3]
- Policies for provision of anaesthetist-led and non-anaesthetist sedation.
- Carry out an audit of sedation and its complications.[3] Auditable outcomes should include number of procedures performed by each operator, unplanned admissions and operations within eight days of procedure, 30-day mortality, use of flumazenil, use of naloxone, need for ventilation, sustained drop in O_2 saturation less than 90%.[3]
- Presence of a sedation team with 'a role analogous to a pain team, with the aim of improving clinical standards, clinical effectiveness and the quality of patient care in procedural sedation'.[3]

Assessing practice and knowledge to gauge competency of practitioners

Knowledge of:

- depth of sedation[3]
- preassessment, fasting[3]
- pharmacology, choice of technique, multiple drugs, titration to effect, extremes of age, antagonist drugs[3]
- monitoring, capnography, supplementary oxygen[3]
- documentation, record keeping, discharge.[3]

Assessing infrastructure for sedation

While not strictly competency-related, this would be sensible to assess (eg there is little sense in practitioners being competent in use of capnography if it is not available).

- Availability of oxygen, capnography monitoring and emergency drugs flumazenil and naloxone, guidelines for anaesthetic emergencies and resuscitation equipment in all areas where sedation may occur.[3]
- Adequate staffing for sedation, including presence of an operating department assistant for all anaesthetist-led sedation.
- The availability of a designated and appropriately equipped recovery area following sedation and the use of discharge criteria.[3]

Quality improvement methodology

Sedation-related governance

- Assess with a checklist what governance exists (sedation lead, sedation committee with anaesthetic representative, policy, sedation team).
- Assess with a questionnaire or interviews how formal training is done (among anaesthetists or indeed among other sedating specialties) and whether there is scope and enthusiasm to add training outside of portfolio-based activities.

Practice and knowledge

The above questionnaire can also be used as a test of knowledge and attitudes to identify deficiencies. Strategies to remedy knowledge gaps could include:

- teaching and training with assessment of competencies
- team rehearsal of management of sedation-related emergencies.[3]

Sedation infrastructure

- Assess with a checklist the infrastructure and equipment available in areas where sedation occurs.
- The presence of appropriate staffing could be included in the above audit and attitudes towards this assessed in the questionnaire or interviews.
- The team rehearsal above could include in-situ simulation that may identify infrastructure challenges to timely management of emergencies.

Mapping

ACSA standards: 1.3.1.1, 1.3.1.2, 1.4.4.3, 1.1.2.4, 1.3.16, 1.2.1.1, 1.2.1.4, 2.1.1.2, 1.4.1.1, 1.1.2.5, 2.2.1.4, 2.3.1.1, 2.5.1.3, 2.5.4.1

Curriculum competences: Basic CS_BK_01 to CS_BK_13; CS_BS_01 to CS_BS_05 (Annex B pages 68–70)

Intermediate: CS_IS_0 to CS_IS_03, CS_IK_01 to CK_IK_07 (Annex C pages 42–43)

Higher: CS_HK_01, CS_HS_01 to CS_HS_05 (Annex D page 30)

CPD matrix codes: 2A10, 2D06

GPAS 2020: 7.1.1, 7.1.2, 7.1.3, 7.1.5, 7.2.3, 7.2.9, 7.2.10, 7.2.13, 7.2.16, 7.2.18, 7.4.2, 7.4.3, 7.4.5, 7.4.6, 7.5.3, 7.5.10, 7.5.11, 7.5.12, 7.5.13, 7.5.14

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6.4 Sedation and anaesthesia in endoscopy

Dr Anuradha Sharma
West Middlesex Hospital

Why do this quality improvement project?

Sedation for endoscopy is becoming increasingly challenging as procedures become more complex and patients present with increasing comorbidities. For these procedures the sedation is delivered by both anaesthetists and non-anaesthetists using a variety of agents. Endoscopy suites are often remote and isolated in location, from main operating theatre and recovery facilities. The aim of this project is to ensure that patients receiving sedation or general anaesthesia for endoscopy are cared for to the same standards as those that have their procedures in the theatre complex.

Background

Sedation is defined as a drug-induced depression of conscious level, with the aim of providing analgesia, anxiolysis and potentially amnesia for the patient. The types of procedure and the variety of patients with increasing comorbidities who undergo endoscopy present specific challenged to anaesthetists that provide sedation and general anaesthetic in endoscopy suite.

Doctors or practitioners who deliver sedation must be aware of how to assess a patient pre-procedure:

- history of sleep apnoea
- history of drug allergies and current medications, which may interact with sedation
- previous anaesthetic history
- fasting time
- airway assessment and risks of aspiration.

Monitoring, emergency equipment, staffing and recovery facilities must be standardised to all other operating theatre areas as guided by the RCoA and British Society of Gastroenterology (BSG).[1–4]

Best practice

Three key guidelines have been published which advise best practice and minimum standard recommendations:

- Guidelines for the Provision of Anaesthesia Services in the Non-theatre Environment.[1]
- Guidance for the use of propofol sedation in adult patients undergoing endoscopic retrograde cholangiopancreatography (ERCP) and other complex upper gastrointestinal endoscopic procedures (RCoA and BSG).[2]
- Guidelines for sedation and anaesthesia in gastrointestinal endoscopy (American Society for Gastrointestinal Endoscopy).[3]

Suggested data to collect

Standards	Measures
Patient preoperative assessment	
All patients should undergo preoperative assessment, which includes the five key points mentioned above.	■ Percentage of patients who undergo this evaluation and by whom (staff grade, specialty).
There is a specific chart to record the preoperative assessment and sedation.	■ Percentage of patients with this information documented in a specific chart.
There is a workflow to refer patients who are deemed at higher risk following preassessment (eg anaesthesia, intensive care).	■ Percentage of appropriate/trigger patients referred.
There is a hospital sedation policy which has been updated in the last two years.	

Minimum equipment, monitoring and environment	
The endoscopy unit is self-contained, including recovery facilities.	■ Are all minimum standard equipment and monitoring available (eg piped oxygen and suction in all areas, full resuscitation equipment and drugs, tilting trolleys, airway rescue/management trolley), Procedure for checking and maintaining records for the equipment.
Minimum staff training	
Lead clinician appointed.	■ For the hospital or specialty.
Appropriately trained and qualified staff working in recovery or management of patients undergoing sedation.	■ Percentage of staff in the unit and per patient.
Regular technical and non-technical skills training for all staff.	■ Evidence of percentage of staff trained.
Standardised training for staff delivering sedation.	■ Evidence of training and updates.
Patient outcomes.	■ Percentage of procedures abandoned resulting from complications arising from sedation (under- or over-sedated). ■ Use of reversal agents (naloxone, flumazenil). ■ Percentage of cases in recovery requiring unplanned medical management (airway, other). ■ Patients requiring unplanned admission to hospital, as a result of sedation or recovery complications. The reason for admission documented. ■ Use of World Health Organization (WHO) checklist; percentage of cases for which the WHO checklist is completed (see also section 2.1).

6.4 Sedation and anaesthesia in endoscopy

Dr Anuradha Sharma
West Middlesex Hospital

Quality improvement methodology

- Form a stakeholder group and identify standards that are consistently not met. What are the barriers to implementation of these standards?
- Locally identified problems are likely to be powerful drivers (eg instances of critical equipment non-availability or patient complications) and to improve learning and compliance these problems should be reviewed and discussed by all members of the multidisciplinary team. Repeated focused measurements in key problem areas are more likely to lead to patient focused improvement and culture change than wholescale audits.

Mapping

ACSA standards: 1.1.1.8, 1.1.2.4, 1.1.2.5, 1.2.1.1, 1.3.1.1, 1.3.1.2, 1.3.1.3, 1.3.1.6, 1.4.1.1, 1.4.4.1, 1.4.4.3, 2.1.1.2, 2.2.1.4, 2.3.1.1, 2.5.1.3, 4.1.2.1, 4.2.2.1

GPAS 2020: 7.1.1, 7.1.2, 7.1.3, 7.1.5, 7.2.6, 7.2.8, 7.2.10, 7.2.12, 7.2.13, 7.2.17, 7.3.17, 7.3.42, 7.3.43, 7.3.44, 7.4.2, 7.4.3, 7.4.5, 7.5.7, 7.5.9, 7.5.13

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Anaesthesia and sedation outside theatre

6.5 Use of capnography outside operating theatres

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Why do this quality improvement project?

Patients commonly receive procedural sedation and anaesthesia outside the operating theatres in places such as radiology, endoscopy, the emergency department and on the intensive care unit. Capnography allows early detection of oesophageal intubation and inadvertent displacement or disconnection of airway devices and therefore potentially reduces the mortality and morbidity associated with these airway complications.[1]

Despite Association of Anaesthetists (AABGI) recommendations for the use of capnography in all patients who are anaesthetised or moderately or deeply sedated, regardless of their location, uptake is still not universal in all clinical areas.[1,2]

Background

The fourth National Audit Project (NAP4) identified that the absence, or failure of interpretation of capnography, contributed to over 70% of deaths from airway complications on the intensive care unit and 50% of deaths in the emergency department.[3]

The Resuscitation Council (UK) 2015 guidelines recommend that waveform capnography must be used to confirm and continually monitor tracheal tube placement in cardiac arrest and may be used to monitor cardiopulmonary resuscitation quality and can indicate return of spontaneous circulation.[4]

Best practice

- Association of Anaesthetists 2011 Safety statement on the use of capnography outside of the operating theatre.[1]
- AABGI 2015 Recommendations for standards of monitoring during anaesthesia and recovery.[2]
- Resus Council (UK) 2015 guidelines.[4]

Suggested data to collect

Standards	Measures
Continuous waveform capnography must be available for all patients undergoing general anaesthesia and moderate or deep sedation outside of operating theatres.	■ Percentage of patients that capnography is used for during general anaesthesia and moderate/deep sedation.
Continuous capnography must be used for all patients being transferred within the hospital with a tracheal tube or supraglottic airway in place.	■ Percentage of patients that have capnography during transfer.
Continuous capnography should be readily available in recovery for patients who have undergone anaesthesia, moderate or deep sedation, and used in high-risk cases.	■ Number of capnography modules available in recovery and, if not, reasons why it is not immediately available.
In recovery, if patients remain intubated or have their airways maintained with a supraglottic or other similar airway device, continuous capnography should be used until patient has recovered fully.	■ Percentage of patients that have continuous capnography, if they required continued airway support.
Continuous capnography should be used for all patients undergoing advanced life support.	■ Percentage availability and ease of access to capnography.

Quality improvement methodology

Audit the percentage use of capnography in clinical areas outside of theatres as outlined above. For example, if three of five patients on a radiology list receiving deep sedation had capnography monitoring then capnography use is 60% and standards are not met.

- Interview staff providing care to patients undergoing anaesthesia or sedation in these areas to understand the reasons why capnography may not be in use (eg lack of availability of equipment or unaware of recommendations).
- Construct process maps, cause and effect diagrams to explore in further detail the factors leading to capnography not being used. This will allow areas for change to be identified. A driver diagram can then be constructed to help define areas for improvement and plan improvement work.
- Reviewing reporting tools such as Datix, root cause analyses of critical incidents and cases reported in mortality and morbidity meetings will be useful to identify whether any patient harm has occurred from failure to use or inappropriate interpretation of capnography.
- Depending on the findings from local incidents, the aim of the project may include:
  - taking to zero the number of events where patients come to harm from a lack of capnography use
  - delivering consistent use of capnography where indicated.
- Sequential plan-do-study-act cycles monitored with run charts, aiming to increase capnography use over time.

Mapping

ACSA standards: 1.1.1.4, 1.4.1.1, 1.4.5.2, 2.1.1.2
Curriculum competences: Annex B (PC_BK_71, DI_BS_01), Annex C (PK_IK_15)
CPD matrix codes: 1A03, 1B04, 2C05, 3A07
GPAS 2020: 7.2.10, 4.2.11, 4.2.12

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2. Association of Anaesthetists of Great Britain and Ireland. Recommendations for Standards of Monitoring during Anaesthesia and Recovery. London: AAGBI; 2015 (https://anaesthetists.org/Home/Resources-publications/Guidelines/Standards-of-monitoring-during-anaesthesia-and-recovery).
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6.6 Anaesthesia and sedation in the radiology department

Dr James Watts
East Lancashire NHS Teaching Hospitals Trust

Why do this quality improvement project?

Non-theatre areas such as the radiology department have unique hazards which must be considered as part of continuing anaesthetic risk assessments. The aim should always be to maintain and improve patient safety by implementing, maintaining and improving the application of best practices. There should be a local committee reporting to a named hospital board member, which ensures that practice is appropriate for relevant procedures (eg hospital sedation committee). Any serious adverse incident should be subjected to a root cause analysis to ensure that appropriate quality improvement and learning points are identified and disseminated.

The radiology department is often sited away from the operating theatre suite and so practitioners must be able to work independently without immediate help. All drugs and equipment for safe anaesthesia should be present, as well as a skilled assistant. Consideration must be made to where patients are to be recovered; will they for example need transfer back to the main recovery area?[1]

Background

Procedures and interventions are being increasingly performed outside the theatre environment because they involve specialist equipment, which may be unavailable elsewhere (eg magnetic resonance imaging, MRI). The expectation is that much of this work should be performed on an outpatient or daycase basis.

Advances in practice mean that this workload is becoming increasingly challenging both in terms of technique and patient complexity. The patient may require anaesthesia or sedation performed by an anaesthetist for a variety of reasons including comfort, length of procedure and patient- or technique-related factors. The anaesthetist must therefore have the ability to provide both safe anaesthetic or sedation interventions for the patient and to provide optimum operating conditions for the interventionist within the confines of an alien environment. Particular hazards will be related to patients at extremes of age, children and patients of high American Society of Anesthesiologists (ASA) grade.

Procedures may be elective or emergency in nature and can involve specific intervention related risks (eg allergy to radiographic dye) or environmental hazards (eg radiation exposure, access to patients, poor lighting) which must be considered within the normal risk assessment process. Such procedures will include MRI, computed tomography and guided procedures, as well as angiography and associated interventions.[2]

Best practice

Patients undergoing such procedures must be managed to the same standards of practice that would be expected in an operating theatre environment, irrespective as to whether sedation or anaesthesia is being administered by the anaesthetist.[5–10]

Suggested data to collect

Outcome measures

Outcome measures are measures which aim to improve outcome and experience for patients. In areas where anaesthesia or sedation is being delivered outside the operating theatre environment, the facilities and equipment available must reflect that which is available in the operating theatre. This audit can be performed when such a clinical area is first opened and may be repeated at locally determined intervals to ensure that facilities have been maintained to an appropriate standard.

These checks will include:

- the availability of adequate oxygen supply (preferably piped)
- the adequacy of lighting
- Association of Anaesthetists standard monitoring, including capnography, is available. In relation to MRI, all monitoring equipment must be MRI compatible and appropriately secured
- emergency drug and anaesthetic equipment trolleys are immediately available and anaesthetic emergency drugs such as dantrolene, sugammadex are available within five minutes
- the availability of a trained dedicated anaesthetic assistant

- dedicated areas equipped to appropriate Association of Anaesthetists and Guidelines for the Provision of Anaesthetic Services (GPAS) standards for pre-procedure assessment and post-procedure recovery
- appropriate personal protective equipment is available (eg lead coats, ear protectors)

Other local requirements may be identified, which can be included on this list.

Organisational systems

Organisational systems exist to embed processes that enhance patient safety. Carry out an annual review of service need and performance, including:

- total number of cases performed per annum under sedation and anaesthesia as a percentage of all cases performed with breakdown of cases performed by specialty and patient demographic (age, ASA grade etc)
- percentage of such sessions which have an anaesthetist assigned to them with regular and continuing experience in this field (standard 100%)
- anaesthetic staff assigned to these lists have regular sessions working in these environments and perform a regular number of cases per annum
- percentage of cases abandoned, patients experiencing complications or having unplanned admission, with learning factors and trends identified
- breakdown of cases performed by specialty, and patient demographic (age, ASA grade etc)
- percentage of patients who recover in a facility complying with Association of Anaesthetists and GPAS standards.

Process measures

Process measures concern monitoring of the conduct of anaesthesia and sedation. The conduct of anaesthesia or sedation must adhere to standards established in Association of Anaesthetists and other guidance.

- Percentage of planned emergency and elective sessions for which a list of patients and procedures is available.
- Percentage of patients who have an assessment by the anaesthetist prior to anaesthesia/sedation with a discussion of consent recorded.
- Percentage of times that 'five steps to safer surgery' is fully applied in full (brief, sign in, time out, sign out, debrief).[11]
- Percentage of patients with an anaesthetic chart completed.
- Percentage of patients undergoing sedation with an assessment of conscious level during the procedure recorded.
- Percentage of patients who have had full Association of Anaesthetists monitoring standards applied (with exceptions recorded).
- Percentage of occurrence of critical events:
  - use of flumazenil reversal for following midazolam
  - unexpected progression from sedation to anaesthesia
  - unexpected emergency (anaphylaxis, cardiac arrest etc).
- Percentage of patients intended to be discharged who are unplanned admissions.

Quality improvement methodology

Process mapping the patient pathway for both emergency and elective procedures may help to identify specific local issues to be addressed. The quality improvement team should include anaesthetists, representatives from specialties performing procedures (surgeons, radiologists, gastroenterologists etc), theatre staff and radiographers. This should lead to a coherent understanding of the barriers to best practice and how they can be circumvented. Illustrating such challenges in a driver diagram or similar methodology will help to draw together the improvement project structure. Other smaller projects can be regularly performed to look at individual elements of patient care.

Case examples

Review a number of 'operating lists' for procedures carried out under anaesthesia or sedation in the radiology department with regards to documentation of 'five steps to safer surgery'.[11]

Survey of anaesthetists and theatre and radiology suite staff with regards to knowledge of particular hazards and safety practices within the radiology department (eg what personal protective equipment is required). This could be repeated following educational interventions and monitored using the plan-do-study-act cycle methodology.

Review a selection of anaesthetic charts of patients who have undergone such procedures.

6.6 Anaesthesia and sedation in the radiology department

Dr James Watts
East Lancashire NHS Teaching Hospitals Trust

Mapping

ACSA standards: 1.1.2.4, 1.1.2.1, 1.2.1.1, 1.3.1.1, 1.3.1.2, 2.1.1.1, 2.1.1.2, 1.3.1.5, 1.4.1.1, 1.4.4.3, 1.1.2.5, 2.1.1.2, 2.1.1.11, 2.1.1.4, 2.1.1.3, 2.2.1.4, 2.3.1.1, 1.3.1.3, 1.3.1.4, 2.5.1.3, 2.1.1.14

Curriculum competences: DI_HK_01, DI_HS_02, CS_HK_01, CS_HS_01, CS_HS_02, CS_HS_03, CS_HS_04

CPD matrix codes: 1A02, (1A03), (2A10), (3A07)

GPAS 2020: 7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6, 7.2.3, 7.2.4, 7.2.8, 7.2.9, 7.2.10, 7.2.11, 7.2.12, 2.2.15, 7.2.16, 7.2.17, 7.2.18, 7.2.19, 7.2.23, 7.2.24, 7.2.25, 7.2.27, 7.3.4, 7.3.6, 7.3.7, 7.3.15, 7.3.17, 7.3.19, 7.3.21, 7.3.22, 7.3.23, 7.3.25, 7.3.26, 7.4.1, 7.4.4, 7.4.5, 7.5.4, 7.5.6, 7.5.8, 7.5.9, 7.5.10, 7.5.11, 7.5.12, 7.5.13, 7.5.14, 7.7.4

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Anaesthesia and sedation outside theatre

6.7 Cardioversion

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Why do this quality improvement project?

This project aims to ensure that the same standards of care are applied whether cardioversion is carried out as a planned or emergency procedure.

Background

Cardioversion is carried out as both a planned and unplanned procedure. Patients requiring cardioversion often have multisystem disease, and those patients requiring emergency cardioversion will have unstable haemodynamic parameters.

Cardioversion requires either sedation or very brief general anaesthesia. For elective procedures, patients are preassessed and attention should be paid to the underlying rhythm. Atrial fibrillation has a high incidence of atrial thrombi and systemic anticoagulation for elective cardioversion should be followed as per local and national guidelines.[1,2]

Atrial fibrillation is the most common cardiac arrythmia managed in acute medicine. It comprises 10% of all UK emergency admissions, is the most frequently encountered arrythmia in the intensive care unit (up to 46% in septic shock) and can range from 25% to 60% following cardiac surgery.

Cardioversion may be needed urgently to treat arrythmias causing significant cardiovascular compromise often in remote and unfamiliar surroundings. Anaesthesia for cardioversion can pose unique challenges when undertaken in the emergency department, wards, the intensive care unit or theatres and requires a flexible and individualised approach. The role of the anaesthetist is to oversee all clinical and procedural aspects to ensure the best patient outcomes, as well as ensuring at all times the safety of the team. This relies on a good clinical setup, efficient communication and the presence of the appropriate skilled personnel.[5]

Best practice

The Resuscitation Council (UK) outlines principals of safe conduct of external direct current cardioversion and the Association of Anaesthetists standards of monitoring apply wherever the procedure is undertaken, including the availability of capnography.[3,4] Recommendations for anticoagulation are described in the 2016 European Society of Cardiology guidelines on cardioversion and in the National Institute for Health and Care Excellence guidance on the management of atrial fibrillation.[1,2]

Suggested data to collect

Standards	Measures
All elective patients should undergo a pre-procedure assessment to ensure suitability for the procedure and to avoid on-the-day cancellations.	■ Percentage of patients who do not have a preassessment documented. ■ Percentage of on-the-day cancellations and reasons.
Review the current local guidelines available.	■ When were the local guidelines produced and what is timeframe for update? ■ Review how the current guidelines match the actual setup and facilities.
What is the governance structure to ensure safe provision of anaesthesia for cardioversion?	■ Is there a lead for anaesthesia in remote site? ■ Is there an equivalent lead from the cardiology department and resuscitation departments? ■ How are critical incidents and near misses reviewed and the learning disseminated from them (eg combined cardiology/anaesthesia governance day)?

Equipment availability.	■ Percentage of cases that have capnography available. ■ Percentage availability of minimum recommended monitoring. ■ Percentage biphasic cardioverter with external pacing facility available. ■ Percentage airway kit availability and immediate access to resuscitation drugs. ■ Percentage of trained personnel who is responsible for cardioversion.
World Health Organization (WHO) check list use compliance.	■ Percentage of cases that have WHO surgical safety checklist use documented.
All clinical areas have standardised resources for emergency external direct current cardioversion.	

Quality improvement methodology

Form a stakeholder group to identify a recurring problem (eg on-the-day cancellations to improve compliance by all members of the multidisciplinary team).

- Have a brainstorming session involving all members of multidisciplinary team to design a pre-procedure checklist.
- Use of an electronic pro forma would allow easier documentation and data collection which can be used to plan interventions.
- Introduction of any intervention should be done on a small scale to see whether a change results in improvement.
- Use of in-situ simulations to help identify infrastructure problems and inform what interventions are likely to result in positive change.

Mapping

ACSA standards: 1.2.1.4, 1.3.1.3, 1.3.2.1, 2.1.1.5, 2.1.1.6

GPAS 2020: 2.5.17, 3.2.18, 3.2.30, 7.2.17, 7.3.34, 7.5.1, 7.7.4

Curriculum competences: Annex B page B-55, Annex C page C-13, C-53

CPD matrix code: 2A08

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6.8 Provision of anaesthesia in magnetic resonance imaging

Dr Lauren Oswald
The Christie NHS Foundation Trust

Why do this quality improvement project?

Anaesthetists are increasingly requested to provide anaesthesia or sedation in the magnetic resonance imaging (MRI) suite. This typically remote area presents unique challenges. The quality of care provided to patients in the MRI suite should not differ from that provided in the main operating theatre environment. Safety is reliant on appropriate patient selection, clinical leadership, staff training and education and risk mitigating practices.[1] Engagement in quality improvement in this area should appeal to individuals with an interest in remote site anaesthetic practice and anyone expected to deliver (or supervise) anaesthesia services for the MRI suite.

Background

Anaesthesia for MRI is an evolving area. Recent developments include increases in magnetic field strength, improved compatibility of implantable medical devices and the advancement of interventional MRI.[1] Movement during scanning distorts the final image and scanning time is long compared with computed tomography. The aim of anaesthesia is to obtain immobility while maintaining safety.[2] Anaesthetic technique ranges from sedation to general anaesthesia. Scanning time varies but may take several hours. Specific risks include:

- remote site practice
- lack of access to patient during scan
- high magnetic field (projectiles)
- current induction (dysrhythmias, muscle spasms, interference with electrocardiogram monitoring)
- radiofrequency energy (burns)
- changes to programming of implanted medical devices (eg shunts)
- MRI contrast use (allergic reactions, renal injury)
- loud acoustic noise (hearing damage)
- potential harm to the unborn fetus
- helium escape (from emergency 'quench' procedures).

Best practice

The Association of Anaesthetists has published guidelines on the safe provision of anaesthesia in MRI areas.[1] The Medicines and Healthcare products Regulatory Agency has provided guidelines on MRI safety.[3]

Suggested data to collect

Standards	Measures
A modified World Health Organization (WHO) surgical safety checklist is completed for all patients requiring MRI under anaesthesia; the patient and all staff have an MRI safety and exclusion questionnaire completed before entering the magnetic field.	■ Percentage completion of modified WHO safety checklist. ■ Percentage of patients and staff with MRI safety and exclusion questionnaire completed before entering the magnetic field.
The lead anaesthetist is senior, ideally a consultant, and accompanied by a trained anaesthetic assistant; inexperienced staff unfamiliar with the magnetic resonance environment should not manage a patient in this environment, particularly out of hours.	■ Grade of the most senior anaesthetist present. ■ Qualification and training of the anaesthetic assistant present. ■ Time of scan (does staffing seniority change out of hours?) ■ Percentage of anaesthetists with the responsibility for providing anaesthesia for MRI (including out-of-hours cover) who have been orientated to the area.

All staff required to provide anaesthesia in the MRI suite should be trained on the anaesthetic equipment in this area and the challenges of working in this unique environment, which is different from elsewhere in the hospital.	■ Conduct an anonymised questionnaire regarding magnetic resonance safe, conditional and unsafe equipment, including restrictions in equipment location according to Gauss line.
There is standardised and specialised equipment for the management of difficult airways reliably available within five minutes in every area where anaesthesia is given.	■ Time taken to bring adult and paediatric difficult airway equipment to the MRI suite.
All staff are familiar with emergency evacuation (eg in the event of cardiac arrest) and quench procedures; in the event of an adverse incident, the patient is removed from the scanning room without delay; a tipping trolley and immediate access to an anaesthetic area is available.	■ Timed extraction drills using simulation.

Quality improvement methodology

Checklists

Review your department's modified WHO checklist for use in the MRI suite. Are all five stages reliably completed? Could the content be improved upon? If one is not currently in use, develop one using existing guidance on checklists.

Process mapping

Review the journey of a critical care patient from the intensive care unit to the MRI suite and back. Were there any stages at which safety and efficiency could be improved? Were checks completed at appropriate stages? Were there any delays? Explore these areas to guide which may require improvement.

6.8 Provision of anaesthesia in magnetic resonance imaging

Dr Lauren Oswald
The Christie NHS Foundation Trust

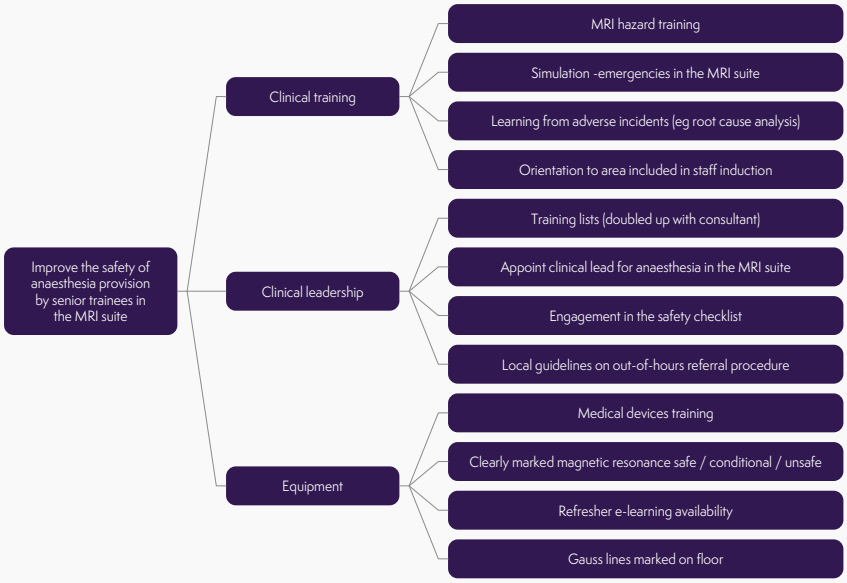

Figure 6.8.1: Example driver diagram to improve the safety of anaesthesia provision by senior trainees in the magnetic resonance imaging (MRI) suite.

Driver diagrams

Figure 6.8.1 shows an example of a driver diagram for improving the safety of anaesthesia provision by senior trainees in the MRI suite.

Mapping

ACSA standards: 1.1.2.1, 2.1.1.5, 2.1.1.14
Curriculum competences: DI BK 01, 02, 03, 04, 05, DI BS 01, 02; DI IK 01, 02, 03, 04, DI IS 01, DI HK 01, DI HS 01, 02
CPD matrix code: 3A15
GPAS 2020: 7.1.1, 7.2.3, 7.2.16, 7.2.17, 7.2.19, 7.3.34, 7.3.35, 7.3.36, 7.4.4, 8.8.4

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Anaesthesia and sedation outside theatre

6.9 Provision of anaesthesia for cardiac catheterisation

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Dr Vivek Sharma, St George's University Hospitals NHS Foundation Trust, London

Why do this quality improvement project?

The growing number and complexity of cardiac interventional procedures is attributed to the rise in adults surviving with congenital heart conditions and cardiovascular disease related to ageing. This makes anaesthetic involvement integral and essential to support services in the cardiac catheterisation laboratory (CCL). Anaesthesia involvement is expected to expand even further in the future. This document outlines general practical aspects and suggestions for quality improvement.

Background

The UK National Institute for Cardiovascular Outcomes Research 2016/2017, in the National Cardiac Audit report, highlights considerable variation in performance between centres undertaking interventional procedures.[1] The report recommends optimising local quality improvement initiatives to drive improvement in service and outcomes.

The provision of anaesthesia in the CCL should not differ from provision of anaesthesia in the theatre suite but presents its own unique challenges.[2–4]

- CCL may be an isolated and unfamiliar environment, not uncommonly, with limited access to help, equipment and drugs.
- Communication between the anaesthetist and cardiologists needs to be in real time and is facilitated by dual screens, microphone speaker and consoles visible from the control station.
- Radiation exposure is frequent and appropriate shielding with lead aprons, thyroid collar, acrylic stands and, if available, leaded glasses must be used for radiation protection. Procedures under general anaesthesia may allow the anaesthetist to position themselves at an acceptable distance away from exposure to radiation.

Best practice

- The RCoA Guidelines for the Provision of Anaesthetic Services 2019 for cardiothoracic procedures in chapter 18 and broadly in non-theatre environment in chapter 7 describe special requirements for CCL.[2,3] Association of Anaesthetists standards of monitoring apply.[5]

Suggested data to collect

Standards	Measures
Pre-procedure	
Use of British Cardiovascular Society safety checklist for CCL.[6]	■ Percentage of cases that use the checklist.
Availability of equipment.	■ Line and circuit extensions. ■ Depth of anaesthesia monitoring. ■ Infusion pumps. ■ Warming devices. ■ Urinary catheter for prolonged cases. ■ Availability of personal protective equipment including thyroid shields and dosimeter badges.
Intra-procedure	
Use of antibiotics during insertion of implantable devices.	■ Percentage of appropriate timely use of antibiotics.

Monitoring of contrast load.	■ Percentage of patients that develop contrast-induced nephropathy and identify a baseline for local organisation.
Availability of temperature monitoring equipment and warming devices.	■ Percentage of patients who have intraoperative temperature monitoring. ■ Number of warming devices availability. ■ Percentage of patients with body temperatures below 36.6 degrees C in recovery. ■ Availability of temperature measurement in recovery. ■ Availability of warming devices in recovery areas.
Post-procedure	
Post procedural destination should be discussed at the start of case.	■ Reasons for delay in accessing recovery facilities.
A plan for surgery, if it is deemed necessary, should be available at the start of each procedure.	
Emergency percutaneous coronary intervention (PCI)	
Use of wide-bore gastric tubes and fluoroscopic confirmation of tube during the procedure.	■ Percentage of patients where gastric tube failed to be identified in correct position and remedial actions that were taken.
There should be a pathway for post-procedure destination for all the patients following emergency PCI.	
There should be a local guideline in centres without in-house cardiac surgical support, to facilitate unplanned 'transfer out' to the nearest specialist centre in life-threatening emergencies.	

6.9 Provision of anaesthesia for cardiac catheterisation

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Quality improvement methodology

- Involving stakeholders from cardiology, radiology and anaesthesia departments is more likely to have a lasting and positive change in outcomes than isolated decision making.
- Identify the trend of contrast-induced nephropathy at your centre. Awareness of its incidence can help to modify peri-procedure hydration and contrast doses. What are the local protocols in following-up patients with known renal impairment post-procedure? How are these patients highlighted to community services?
- Use of in-situ simulation can help to identify problems with infrastructure and focus on particular areas of improvement (eg declaring major haemorrhage, cardiac arrest).
- Using combined governance meetings to discuss near misses and critical events. Patient focus should feature highly when driving any new quality improvement intervention and is essential for any chance of success. Suggestions might be to tackle areas where there have been problems noticed by any of the above stakeholders as they are likely to be two-way in nature.

Mapping

ACSA: 1.3.1.3, 1.3.2.1, 1.4.1.1
GPAS 2020: 7.1.1, 7.2.3, 7.2.8, 7.2.10, 7.2.16, 7.2.17, 7.2.18, 7.2.19, 7.3.22, 7.3.23, 7.3.26, 7.4.2, 7.4.3, 7.4.4, 7.5.1, 7.2, 18.7.3, 18.7.4, 18.7.5

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7 Obstetric practice

Edited by Dr Nuala Lucas
QI editor Dr Carolyn Johnston

7.1 Information for mothers about analgesia and anaesthesia during delivery

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Why do this quality improvement project?

The antenatal period is a potentially stressful time and patients are given a lot of information from different healthcare professionals (general practitioners, midwives, obstetricians, anaesthetists) and other organisations (eg National Childbirth Trust, local support groups). There is a large amount of information in the public domain (especially on the internet) with varying quality, no quality assurance and not all written by professionals or evidence based.

There are many different languages spoken across the UK therefore having English language leaflets only may not be sufficient in some areas. Empowering women to make informed decisions about analgesia and anaesthesia during their delivery is more achievable if good quality information is provided antenatally.

Best practice

- Antenatal classes led by professionals should be available to all pregnant women.
- Written information on analgesia and anaesthesia:
  - should be written and approved by the anaesthetic department
  - should be easy to understand with the use of visuals and bullet points.
- If the local department writes an information leaflet on analgesia and anaesthesia, mothers' representatives should be involved in the design and review by a multiprofessional panel should occur. Emphasis should be put on how the information is presented to suit the needs of mothers (eg layout, balance between words and figures, language used).
- Information should be available to all patients from the early antenatal period.
- Information should be available in other languages for non-English speaking patients. Translations should be via professional approved translators and in a format that is in accordance with hospital policy. Local data on maternity demographics should be used to determine which languages are most commonly spoken in the local area.
- Information leaflets should be kept up to date, with set review dates.
- Trained interpreters should be used and should be easily available.
- Any explanation or information given should be documented in the patient's notes.
- Feedback should be obtained from patients about the information received and improvements made if needed.
- Depending on local resources, hospital departments can consider the use of technology to deliver information to patients (eg electronic leaflets, hospital web pages, smart phone apps, QR codes).
- Consider incorporating information into patient's handheld notes (paper or electronic) for easy access.

Suggested data to collect

Standards	Measures
Information made available to women in the early antenatal period about availability of neuraxial analgesia and anaesthetic services in their chosen location of delivery.	■ Percentage of women in the early antenatal period receiving information about neuraxial analgesia and anaesthetic services in their chosen location of delivery.
Every unit should provide, in early pregnancy, advice about pain relief and anaesthesia during labour and delivery. An anaesthetist should be involved in preparing this information and should approve the final version.	■ Availability of anaesthetist-approved information on pain relief and anaesthesia during labour and delivery. ■ Percentage of women receiving this written information.
Information should be made available to non-English-speaking women in their native languages.	■ Availability of translated information for non-English speaking women (at least the top three languages of the local demographic should be available).

Hospitals should ensure that the mother's need for information in other languages should be assessed and recorded during antenatal care so that interpreting services can be planned for.	■ Patient's preferred language to be recorded in 100% patients. ■ Percentage of non-English-speaking women receiving written information on analgesia and anaesthesia in their language.
Interpreting services should be made available for non-English-speaking women, with particular attention paid to how quickly such services can be mobilised and their availability out of hours. This can be part of the standards set by the maternity unit.	■ Availability of an appropriate interpreter, with particular attention to availability out of hours. ■ Percentage of non-English-speaking women where an interpreter is available during delivery. ■ Percentage of interpretation as face to face or via telephone.

Quality improvement methodology

- Co-design or co-production of leaflets: working with local Maternity Voices Partnership or patient groups to produce leaflets together.
- Measurement of patient understanding in real time through the peripartum pathway (eg in patient diaries and real-time feedback).
- Act on feedback by changing information provided and measuring impact in rapid plan-do-study-act cycles in conjunction with mothers and their families.

Mapping

ACSA standards: 3.1.1.2, 3.2.2.3, 3.1.2.1

Curriculum competences: OB_BS_02, OB_IS_02, OB_HS_11, OB_HS_13

GPAS 2020: 2.1.3, 2.9.1, 2.9.2, 2.9.3, 2.9.4, 2.9.5, 2.9.6, 2.9.7, 2.3.2, 2.3.33, 3.9.1, 3.9.2, 4.9.2, 9.9.1, 9.9.2, 9.9.3, 9.9.4, 9.9.5, 9.9.6, 9.9.7, 9.9.8, 9.9.9, 9.9.12, 2.9.8, 5.9.2, 5.9.3, 2.9.12, 2.9.13

Further reading

Birthrights. Women's experiences (http://www.birthrights.org.uk/category/womens-experiences).

National Institute for Health and Care Excellence. Pain Relief in Labour. NICE Pathways. London: NICE; 2017 (https://pathways.nice.org.uk/pathways/intrapartum-care/pain-relief-in-labour).

National Maternity Review. Better Births: Improving Outcomes of Maternity Services in England: A Five Year Forward View for Maternity Care. London: NHS England; 2016 (https://www.england.nhs.uk/publication/better-births-improving-outcomes-of-maternity-services-in-england-a-five-year-forward-view-for-maternity-care).

Royal College of Anaesthetists. Guidelines for the Provision of Anaesthetic Services Chapter 9: Guidelines for the Provision of Anaesthesia Services for an Obstetric Population 2019. London: RCoA; 2019 (https://www.rcoa.ac.uk/gpas/chapter-9).

7.2 Anaesthetic care for women who are obese during pregnancy

Dr Nazima Hoque, Imperial School of Anaesthesia
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Why do this quality improvement project?

Around one in five pregnant women in the UK is obese. Obstetric anaesthetists have a key role in the care of this patient group as there is an increased requirement for anaesthesia during labour and birth due to the higher rate of operative deliveries.

Obstetric anaesthetists also have an important role within multidisciplinary teams to manage the associated health complications that obesity brings for both mother and baby.

In addition to the increased rates of caesarean section and postpartum haemorrhage, obesity is a risk factor for many anaesthesia-related complications and has been identified as a significant risk factor for anaesthesia-related maternal mortality. Identifying these women early in their pregnancies, suggesting weight management strategies and managing the risk factors that obesity brings will improve patient care and outcomes.

Background

Obesity in pregnancy is usually defined as a body mass index (BMI) of 30 kg/m² or more at the first antenatal consultation.

The 2014-16 Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries Across the UK review into maternal deaths reported that 37% of women who died were obese (BMI greater than 30 kg/m²) and 20% were overweight (BMI 25–29 kg/m²).[1]

A study of UK Obstetric Surveillance System data showed that 25% of maternal cardiac arrests were related to anaesthesia and, of these, 75% of the women were obese.[2]

Anaesthesia-related issues in the obese include an increased rate of needing to resite an epidural, higher gastric volumes, difficulties with airway management, desaturation and postoperative atelectasis. The increased difficulties associated with the provision of general and regional anaesthesia in the obese can lead to an increased decision-to-delivery time in women who require a category 1 or 2 caesarean section.[3]

Best practice

The most recent Royal College of Obstetricians and Gynaecologists (RCOG) guideline, published in November 2018, covers recommended interventions for the care of women with obesity prior to conception, during and after pregnancy.[3]

Suggested data to collect

According to the RCOG guideline, data to collect for obstetric anaesthesia-related quality improvement projects are as follows:

- 100% patients should have booking height, weight and BMI recorded in the maternity handheld notes and electronic patient information system. All women should also be reweighed in the third trimester.
- An appropriately sized cuff should be used for blood pressure measurements taken at the booking visit and all subsequent antenatal consultations. The cuff size used should be documented in the medical records.
- 100% of women with a booking BMI of 30 kg/m² or greater should receive information about anaesthesia and analgesia.
- 100% of women with a booking BMI of 40 kg/m² or greater have an antenatal anaesthetic review by a senior obstetric anaesthetist and plan documented in the notes.
- The duty anaesthetist should be informed when women with a BMI of 40 kg/m² or greater are admitted to the labour ward.
- Anaesthesia for women with a booking BMI of 40 kg/m² or greater who have operative vaginal delivery or caesarean section should be provided by an anaesthetist at specialty trainee level 6 or above, or with equivalent experience in a non-training post.
- Maternity units have accessible multidisciplinary guidelines for care of pregnant women with a booking BMI of 35 kg/m² or greater.

Quality improvement methodology

- Multidisciplinary simulation of the anaesthesia and operative care of a morbidly obese patient should be undertaken at regular intervals. Is equipment easy to access and instructions for use clear (eg moving and handling equipment, blood pressure cuffs, long regional needles, ultrasound)?
- Draw a process map of the antenatal care of a woman with a high BMI. Are the guidelines clear and accessible at every point? Involve the multidisciplinary team to discuss and understand different perspectives. At which point is it pragmatic to make a plan for delivery and are the lines of communication and escalation clear?
- Is the information given to patients helpful in providing information and encouraging behaviour change to adopt a healthier diet and activity goals?
- Co-design information with patients and consult with other professionals with expertise (eg maternal medicine or bariatric teams).

Mapping

ACSA standards: 1.1.3.4, 1.7.1.1, 4.2.2.2
Curriculum competences: OB_HS_13
CPD matrix codes: 1E05, 2B01, 2B03, 3A09, 3B00
GPAS 2020: 3.3.4, 3.3.5, 3.3.6, 3.3.7, 9.2.48, 9.3.8, 9.3.9, 9.3.10

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7.3 Response times for the provision of intrapartum analgesia and anaesthesia

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Why do this quality improvement project?

Improving timely accessibility to an anaesthetist and theatre services in the case of urgent caesarean section is important and likely to influence outcomes for the mother and/or baby.[1–3] This is particularly true in the case of category 1 caesareans, where there is an immediate threat to the life of the woman or the fetus, and category 2 caesareans, where there is maternal or fetal compromise that is not immediately life threatening.[4,5]

In the case of labouring women requiring regional analgesia, minimising delays in providing a timely anaesthetic service will improve patients' experience and satisfaction with their care.

Background

Approximately 60% of women require intrapartum anaesthetic intervention, with around 25% delivering by caesarean section.[6] While maternal mortality rates in the UK are low, improvements have plateaued in recent years (albeit on the background of a more complex patient population).[1] The 2016 MBRRACE-UK report noted that there was an increasing number of comments about staffing–workload balance issues, which had had an impact on women's deaths.[1] Guidance from several bodies is available to quantify levels of staffing and suggested standards to be met at a local level, whether it be anaesthetic services in caesarean section, emergencies such as maternal haemorrhage or the provision of labour analgesia.[1,6,7] As stated in the latest Guidelines for the Provision of Anaesthesia Services for obstetric services from the RCoA, 'it is not possible to identify all women or babies who are at risk of rapid deterioration, but we need to be able to respond appropriately and safely in the event of an emergency'.[6]

Best practice

Caesarean section

The optimal decision to delivery interval in the presence of fetal distress remains controversial. The diagnosis of fetal distress in labour is imprecise. The widely quoted 30-minute decision to delivery interval lacks a firm evidence base and carries its own problems if used as a strict guideline for all individuals.[4] However, the National Institute for Health and Care Excellence states that 30 minutes should be the audit standard for category 1 caesareans and 75 minutes the audit standard for category 2 caesareans.[8]

Maternal emergencies

Life-threatening maternal emergencies such as massive blood loss requires a rapid response to minimise maternal and fetal harm. Specifically, any woman with suspected placenta praevia or accreta should be reviewed antenatally by a consultant anaesthetist, with risks and treatment options discussed and a plan agreed including for emergency delivery.[1] A consultant anaesthetist should be present for elective delivery and, if delivery is unexpected and out of hours, consultant anaesthetic staff should be alerted and should attend as soon as possible.[1] All units are required to have escalation policies for periods of high activity, including a plan to obtain more and senior anaesthetic assistance.[1]

Regional analgesia during labour

Obstetric units should be able to provide regional analgesia on request at all times and the response time should not normally exceed 30 minutes and must be within one hour, barring exceptional circumstances.[6]

Suggested data to collect

Caesarean section

Outcomes

- Percentage of category 1 caesarean sections with decision to delivery interval less than 30 minutes.
- Percentage of category 2 caesareans with decision to delivery interval less than 75 minutes.
- Percentage of women with placenta accreta with consultant anaesthetist present at delivery.
- Presence of escalation plan for periods of high activity, neonatal outcome measures (Apgar scores, cord gas results).

Process

- Time between obstetrician decision and anaesthetist being informed.
- Time to open theatre/obtain theatre staff.
- Time patient arrives in theatre.
- Time anaesthesia commenced.
- Anaesthetic technique used.
- Anaesthesia ready time.
- Surgical start time ('knife to skin'), time of delivery.
- Reasons for delay with any part of the above.

Balancing

- Accuracy and completeness of clinical documentation.
- Implications for anaesthetic services in the rest of the hospital.

Labour regional analgesia

Outcomes

- Percentage of time to delivery of neuraxial analgesia less than 30 minutes following request.
- Percentage of time to delivery of neuraxial analgesia 30-60 minutes following request.
- Percentage of time to delivery of neuraxial analgesia over 60 minutes following requests.
- Time to effective analgesia (see section 7.4).

Process

- Source of request.
- Time between request and anaesthetist being informed.
- Time of day requested.
- Anaesthetic staffing levels.
- Concurrent anaesthetic work including emergencies.
- Provision of escalation policy for periods of high demand.
- Availability of blood results in women with coagulopathies.
- Stage of labour.

Balancing

- Need to call in extra anaesthetic assistance.

Quality improvement methodology

Draw a process map of the time to accessing theatre in an emergency. Walk the complete process steps for the time from decision to anaesthesia or analgesia. Identify 'waste' (especially in communication processes) and interview staff and patients. Think about where staffing levels delay anaesthetic services and the scope for reorganising them. Is the department equipped for unexpected high-volume work? Undertake desktop tests of the system in different conditions: do staffing levels meet demands at all times (day, night, weekends, public holidays etc)?

Think about times when the system fails to meet demand. What is the impact of that failure and what can you add into your protocols to mitigate it? Are there clear lines of escalation that non-anaesthetic staff can follow to contact another tier or senior anaesthetist? (See section 11.8.) Identify change ideas.

Mapping

ACSA standards: 1.1.1.1, 1.5.2.5, 1.5.1.3, 1.7.2.1, 1.7.2.2, 1.7.2.5, 1.7.2.6, 1.7.2.7, 1.7.3.1, 2.5.1.1, 2.5.2.2, 4.1.0.4
Curriculum competences: OB_HS_13
CPD matrix codes: 2B01–03, 2B05
GPAS 2020: 3.4.6, 9.1.2, 9.1.3, 9.1.4, 9.1.5, 9.1.6, 9.1.14, 9.1.15, 9.1.16, 9.1.18, 9.1.19, 9.2.35, 9.5.9, 9.5.10, 9.5.12, 9.5.15, 9.5.27

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7.4 Regional analgesia during labour

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Why do this quality improvement project?

Regional blockade (epidural or combined spinal and epidural) provides the most effective analgesia for labour.[1] Regional analgesia for labour can be evaluated by considering procedural aspects, adverse effects and complications and the quality of analgesia assessed during labour or retrospectively.

A definition of a failed regional block for labour analgesia has been proposed, including:[2]

- lack of adequate pain relief by 45 minutes after start of placement
- inadvertent dural puncture
- resite or abandoning this form of analgesia during labour
- maternal dissatisfaction with analgesia at follow-up.

This definition has been used to evaluate training.[3]

Background

There is a higher failure rate of neuraxial analgesia in labour than in the non-obstetric population. Reasons include the use of low concentrations of local anaesthetics, anxiety and anatomical differences.[4] Risk factors for failure include occipitoposterior presentation of the fetus, radicular pain during insertion, inadequate analgesia following the first dose and duration of analgesia above six hours or less than one hour.[5]

The need to resite an epidural, one of the components of the definition of failure, has been associated with longer time to perform the block, breakthrough pain, prolonged induction of labour, venous puncture, shivering and, unsurprisingly, caesarean section.[6]

The incidence of accidental dural puncture is 1.0-1.2% and resiting because of poor analgesia or unilateral block is 13.1%.[7,8] A patient satisfaction score of 98% was found even when the epidural was resited more than once,[8] although inadequate pain relief 45 minutes after starting to insert the epidural has been shown to correlate with dissatisfaction.[9] Induction of labour, the need for anaesthetist-administered top-ups and raised body mass index (BMI) were also found to be associated with maternal dissatisfaction.[10]

Best practice

Standards for the provision of labour analgesia have been defined by the National Institute for Health and Care Excellence and the RCoA:[11–13]

- more than 85% blocks successful.
- resites during labour less than 15%.
- accidental dural puncture rate less than 1%.[7,8]
- satisfaction at follow-up greater than 98%.[8]
- adequate analgesia at 45 minutes after start of procedure over 88%.[8]

Suggested data to collect

- Descriptive data: anaesthetist identity and grade; date and time of procedure; procedure (combined spinal-epidural or epidural); position; and patient details: BMI; parity; cervical dilatation; presentation; induction of labour.
- Adequacy of analgesia at 45 minutes (assessed by asking whether the woman is satisfied with her pain relief).
- Accidental dural puncture.
- Insertion abandoned or sited by another anaesthetist.

At follow-up:

- Block resited in labour.
- Patient satisfaction (excellent, satisfactory, unsatisfactory, no benefit at all).
- Low-pressure headache (typical of post-dural puncture headache) or other complications (see section 7.10).

Quality improvement methodology

Draw a process map of the time taken to achieve satisfactory analgesia. An indicative high level process map is shown in Figure 7.4.1. What steps in the pathway can be made shorter or simpler? For example, what would be the impact of earlier provision of information when the patient is contemplating an epidural or help when preparing the patient and epidural trolley for insertion?

Examine your maternity follow-up data for common features of poor satisfaction or epidural resites. This could include using statistical process control charts for any special cause variation or Pareto charts. Target any improvement ideas at the most common causes of failure.

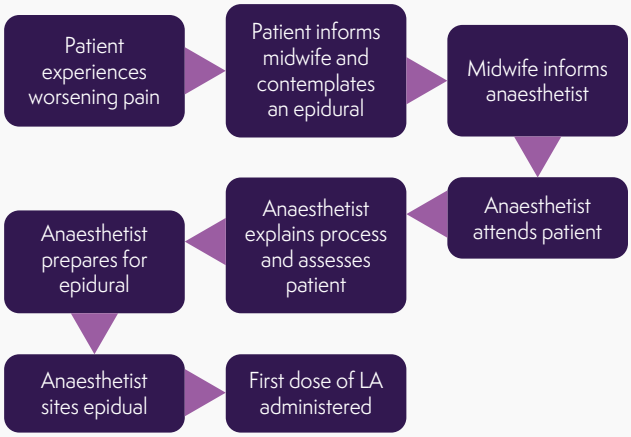

Figure 7.4.1: An indicative high level process map of the time taken to achieve satisfactory analgesia.

Mapping

ACSA standards: 1.7.2.1, 1.7.2.2, 1.7.2.7
Curriculum competences: OB_HS_13
GPAS 2020: 9.5.4, 9.5.5, 9.5.10, 9.5.11, 9.5.12, 9.5.14, 9.7.3, 11.2.1, 11.2.3

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7.5 Airway and intubation problems during obstetric general anaesthesia

Dr Julie Kuzhively, Dr Robin Russell, John Radcliffe Hospital, Oxford

Why do this quality improvement project?

Airway problems during obstetric general anaesthesia are more common than in the non-obstetric population and remain an important cause of morbidity and mortality.[1] National guidelines from the Obstetric Anaesthetists' Association (OAA) and Difficult Airway Society (DAS) on the management of difficult and failed intubation in obstetrics have been published.[2] Adherence to these guidelines should lead to improvements in airway management and better outcomes for both mothers and babies.

Background

In the obstetric population, general anaesthesia is often provided in emergent scenarios or as a second option when neuraxial anaesthesia has failed.[3] It has been estimated that the incidence of failed intubation in obstetrics is approximately 1 : 390.[1] Difficulty with airway management arises from the physiological changes of pregnancy, the urgency of delivery and relative inexperience of staff.[2] Increasing rates of obesity add to concerns regarding airway management. If not managed appropriately, airway difficulties can lead to significant complications including aspiration of stomach contents, accidental awareness, hypoxic cerebral injury and cardiac arrest.[4]

In 2015, joint OAA/DAS guidelines were published on the management of difficult and failed intubation in obstetrics.[2] These guidelines covered planning a safe technique, managing failed intubation and the 'can't intubate, can't oxygenate' scenario. In addition, the guidelines addressed whether surgery should proceed or the mother be awakened and how to manage these two options. There were also sections on debriefing, follow-up and teaching.

Best practice

- OAA/DAS guidelines for the management of difficult and failed tracheal intubation, 2015.[2]
- Royal College of Anaesthetists guidelines for the provision of anaesthetic services for an obstetric population, 2019.[5]
- Royal College of Anaesthetists Anaesthesia Clinical Services Accreditation.
- Royal College of Obstetricians and Gynaecologists. Each Baby Counts, 2018.[6]

Suggested data to collect

Standards	Measures
All cases of general anaesthesia in obstetrics should be reviewed.	■ The total number and proportion of general anaesthetics, the degree of urgency, the experience of staff involved in their care and the time of the procedure should be collected. The proportion in whom difficulty or failure with intubation occurred should be calculated.
All pregnant women who receive general anaesthesia should undergo preoperative assessment.	■ Percentage of women for whom there was documented preassessment; percentage of women for whom there was a documented airway assessment; percentage of women for whom an airway plan was documented; percentage of women with known airway issues who were assessed during pregnancy.
Necessary equipment for difficult airway management should be immediately available for all obstetric general anaesthesia cases.	■ Availability of various sizes of laryngoscope, including those with short handles and different blades; availability of bougie; video laryngoscope; fibre optic bronchoscope; second-generation supraglottic airway devices (eg Proseal laryngeal mask airway, i-gel); equipment for front of neck access; and capnography.

The management of all cases of failed intubation should be systematically reviewed.	■ Case note review should consider anaesthetic plan, use of antacid prophylaxis, patient positioning, pre-oxygenation, performance of World Health Organization (WHO) surgical safety checklist with documentation of airway plan, delivery of appropriate doses of anaesthetic drugs, use of cricoid pressure, laryngoscopic view, selection of appropriately sized tracheal tube, adherence to OAA/DAS guidelines, escalation of care and availability of senior anaesthetic assistance, whether patient was awakened or surgery continued, outcomes for mother and baby, documentation of events, debriefing of staff involved and patient follow-up.
Serous incident reviews involving cases of difficult or failed intubation should have anaesthetic representation.	■ Number of serious incident reviews involving general anaesthesia in which an anaesthetist was invited to participate.
In cases of difficult or failed intubation, information regarding events should be recorded in the case notes and given to the patient and her general practitioner.	■ Percentage of cases in which adequate documentation is recorded in the case notes and information is given to the patient and her general practitioner.

Quality improvement methodology

Risk assessment

- Review anaesthetic records for cases of general anaesthesia and look for details of airway assessment and plan.
- Is there a specific part of the anaesthetic chart for airway assessment and planning?
- Does the chart request specific details on anaesthetic grade and supervision, anaesthetic assistants, checking of equipment, administration of antacid prophylaxis and performance of WHO checklist?
- Is there an easy to access a clear guide or checklist for managing anticipated and unanticipated difficult airways in maternity, which highlights the importance of human factors?

Risk management

- Review anaesthetic record for airway management.
- Is there documentation of positioning, pre-oxygenation, drug administration, time to laryngoscopy, equipment used, view of larynx, ease of intubation (if performed), use of extra equipment, call for help, declaration of failed intubation and subsequent airway management?
- In cases of failed intubation, did surgery continue under general anaesthesia using an alternative airway device?
- Were there any maternal complications?
- Was neonatal outcome recorded?

Case review

- Were all members of the anaesthetic team supported after the case and was time made to discuss the case and learn lessons from events?
- Check the case notes to see whether the patient was seen after surgery to discuss events and given appropriate debriefing and support. Was she given information that would help with future anaesthetics?
- Was the patient's general practitioner informed?
- In the event of an investigation, was an anaesthetist invited to participate?

Simulation

- The management of difficult and failed intubation in obstetrics should be a topic in obstetric 'skills and drills' or other multidisciplinary simulation teaching.
- Teams should walk through the steps needed to access guidelines and collect equipment.
- Is information and equipment readily available?
- Are lines of escalation clearly signposted and functional?

7.5 Airway and intubation problems during obstetric general anaesthesia

Dr Julie Kuzhively, Dr Robin Russell, John Radcliffe Hospital, Oxford

Mapping

ACSA standards: 1.1.1.1, 1.1.3.4, 2.1.1.1, 2.5.2.1, 2.5.2.2, 2.5.3.1, 2.5.3.2, 2.5.1.3, 4.2.1.1, 4.2.1.2, 4.2.2.1, 4.2.2.2, 2.5.6.2, 4.3.2.1, 2.1.2.2

Curriculum competences:
Core: OB_BK_10, OB_BS_07
Higher: OB_HS_08, OB_HS_13

CPD matrix codes: 1C01, 1C02, 2B02

GPAS 2020: 3.2.14, 3.2.18, 3.2.20, 3.4.2, 3.3.6, 3.5.18, 5.2.27, 9.2.11, 9.2.31, 9.3.10, 9.4.6, 9.4.7, 9.5.21, 9.7.6

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5. Royal College of Anaesthetists. Guidelines for the Provision of Anaesthetic Services Chapter 9: Guidelines for the Provision of Anaesthesia Services for an Obstetric Population. London: RCoA; 2019 (https://www.rcoa.ac.uk/gpas/chapter-9).
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7.6 Caesarean section anaesthesia: technique and failure rate

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Why do this quality improvement project?

Emergency anaesthesia for caesarean section may have to be achieved very rapidly and carries significant risks.

Background

Regional anaesthesia is preferred for caesarean section because of the lower risk of maternal and neonatal morbidity. Most women opt for regional anaesthesia when they have a choice, although very occasionally some women prefer general anaesthesia. In some patients, regional anaesthesia may be contraindicated, but most use of general anaesthesia relates to emergency caesarean section and a perceived lack of time to establish regional anaesthesia.

Best practice

Caesarean section	Category (%)		
	4	2-3	1
Carried out with regional anaesthesia	> 95	> 85	> 50
Regional to general anaesthesia conversion	< 1	< 5	< 15

Other suggested outcomes that might be monitored include:

- compliance with a 30-minute decision to delivery interval for category 1 caesarean sections
- rate of pain during caesarean sections carried out with regional anaesthesia for different urgency categories.[1]

Suggested data to collect

Caesarean section numbers, including urgency, using the four-point scale.[1] NHS Digital provides data for the number of elective and emergency section carried out with regional anaesthesia.[2] Currently, these figures cannot be relied on because of inaccurate returns at the hospital level. While they may become a useful resource in the future, we suggest that units use their own baseline figures.

- Type of anaesthesia (general anaesthetic); all regional anaesthesia; epidural top-up; spinal; combined spinal-epidural; other, according to urgency of the type of caesarean section.
- Regional anaesthesia failure – conversion to general anaesthesia for a case where regional anaesthesia has been started (a needle was inserted into the back or a drug given down an epidural catheter for the purpose of surgery).

Quality improvement methodology

The aim of the quality improvement project should be formulated by comparing baseline data with the standards above. This will help to identify issues that should be the focus of quality improvement projects.

Through exploring problem areas and issues with obstetric and midwifery staff, a driver diagram can be created to help define areas and projects for improvement (eg anaesthetic staff numbers and availability; antenatal anaesthetic consultation, cooperation by obstetric staff with the use of regional anaesthesia for category 2 and 1 caesarean section, identification of poorly functioning labour epidurals, assessment of regional block before surgery).

Draw a process map and/or simulate a category 1 caesarean section carried out under regional anaesthesia. Is there a clear guideline to follow, compatible with human factors? Could the process be made quicker or safer with better design?

Mapping

ACSA standards: 1.5.1.3, 1.7.2.5, 1.7.3.1, 1.5.0.3, 4.1.2.1, 2.6.5.1, 1.7.2.1, 1.7.2.2

Curriculum competences: OB_AK_02, OB_AK_04

CPD matrix codes: 2B01, 02, 03, 04, 05

GPAS 2020: 1.5.14, 3.2.14, 3.2.18, 3.2.20, 3.4.2, 3.3.6, 3.5.18, 5.2.27, 5.5.19, 9.1.2, 9.1.6, 9.1.14, 9.1.15, 9.1.16, 9.1.18, 9.2.11, 9.2.31, 9.2.35, 9.3.10, 9.4.6, 9.4.7, 9.5.4, 9.5.5, 9.5.11, 9.5.18, 9.5.21, 9.5.27, 9.7.3, 9.7.61.

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7.7 Pain relief after caesarean section

Dr Sarah Armstrong
Frimley Health NHS Foundation Trust

Why do this quality improvement project?

It is suggested that the global caesarean section rate has doubled since 2000 and it is estimated that worldwide almost 30 million caesarean sections are performed annually.[1] Postoperative pain therefore affects millions of women each year. Strategies to reduce post-caesarean pain will improve patient experience, maternal wellbeing and allow mothers to care for their newborn babies effectively.

Background

Adequate pain relief after caesarean section is important to reduce morbidity, improve patient experience and facilitate maternal bonding with the neonate. New mothers with severe acute pain have a significantly increased risk of developing chronic pain syndromes and postpartum depression.[2] The provision of adequate analgesia must be balanced against maternal adverse effects and the risk of drug transference to the neonate through breastfeeding.

Analgesia after caesarean section may be provided through a variety of methods and routes. Simple analgesia with paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) may be supplemented with opioids as needed. Opioids may be given intrathecally, epidurally, intravenously or orally. Although effective, opioids also have significant adverse effects including pruritus, nausea, vomiting, sedation and, rarely, respiratory depression.[3]

Best practice

There is little definitive evidence available to define appropriate achievable parameters in best practice for the provision of post-caesarean analgesia. Maternal satisfaction is not necessarily compromised by imperfect analgesia, and visual analogue and verbal rating scores to measure pain are not uniformly used.

The National Institute for Health and Care Excellence guidance for caesarean section recommends:[4]

- Pregnant women having a caesarean should be given information on different types of post-caesarean analgesia so that analgesia best suited to their needs can be offered.
- Women should be offered diamorphine (0.3-0.4 mg intrathecally or 2.5-5 mg epidurally) if regional anaesthesia is chosen.
- If there are no contraindications, paracetamol and NSAIDs should be added postoperatively.
- Women receiving or who have received opioids should have a minimum hourly observation of respiratory rate, sedation and pain scores, and should be prescribed an antiemetic and a laxative.
- Documented hourly observations of respiratory rate, sedation and pain scores in those who have received opioids should continue for 12 hours for intrathecal diamorphine and for 24 hours for intrathecal morphine. Those receiving epidural opioids or patient-controlled analgesia (PCA) with opioids should be monitored throughout treatment and for at least two hours after discontinuation of treatment.
- Women receiving opioids should be prescribed an anti-emetic and a laxative regularly.

Guidelines for the Provision of Anaesthetic Services recommend:[5]

- PCA equipment should be available for postoperative pain relief.
- Staff operating the equipment should be trained in its use and how to look after women using it.

Suggested data to collect

- What information is given to women preoperatively about pain relief options?
- What is patient satisfaction with pain management on day 1 postoperatively?
- What percentage of women are given opioids via the intrathecal or epidural route during or after caesarean section?
- What percentage of women undergoing caesarean section under general anaesthesia receive alternative methods of pain relief (eg transverse abdominis plane blocks), local infiltration or PCA opioids?
- What percentage of women receive regular paracetamol and NSAIDs post-caesarean?
- Are women monitored appropriately and for the correct length of time postoperatively?
- What access to PCA equipment is there for women post-caesarean and are staff in the postnatal areas appropriately trained to use and monitor the equipment?
- How frequently do adverse effects occur and what are they?

Quality improvement methodology

- Process mapping – look at the whole patient journey from decision to caesarean section through to the first postoperative day, looking at the methods of analgesia given, their efficacy and quality improvement opportunities. What steps do not work as intended? What steps are part of the process on paper but do not happen on the ward? What are the barriers and opportunities for improvement? Discuss with other key team members.
- Create an affinity or fishbone diagram for each area of concern. What are the barriers to women receiving effective analgesia after caesarean section? For example, why don't women receive a regular pain assessment? Factors to consider could be patient, clinician, organisational and other factors.
- Benchmark performance. Drive quality improvement by defining a clear aim, providing clear messaging and easy to follow guidelines. For example: 'All women undergoing caesarean section should receive regular NSAIDs postoperatively unless there is a clear contraindication'.
- Involve patients in developing any change ideas. Could patients take a more active role in their own pain relief, with clearer information to reassure and encourage them?

Mapping

ACSA standards: 1.4.4.2, 1.7.1.1, 1.2.2.1, 1.4.5.1, 2.1.1.13
Curriculum competences: OB_BS_10, OB_HS_07
CPD matrix codes: 2B02, 2B03
GPAS 2020: 2.9.3, 2.9.4, 2.9.5, 4.2.18, 9.2.48, 9.2.12, 9.2.15, 9.2.16, 9.9.1, 9.9.3, 9.5.5, 9.2.48, 11.2.1, 11.9.1

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7.8 Monitoring of obstetric patients in recovery and receiving enhanced maternity care

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Dr Nuala Lucas, Northwick Park Hospital, London

Why do this quality improvement project?

Adequate monitoring of postoperative and unwell obstetric patients is a key component of safe patient care. It helps facilitate early identification of deterioration and complications, and so appropriate management can be instituted, and harm can be avoided.

Background

Increasing maternal age, comorbidities and the incidence of obesity have all contributed to growing numbers of women who become unwell around the time of childbirth in recent years.[1] Obstetric units must have appropriate recovery and support facilities to enable safe monitoring and management of these patients, as well as those who need to be recovered from operative procedures. A key component of this is having adequate numbers of staff who have appropriate training and experience in these environments. Failure to identify the deteriorating or unwell patient is a common feature of cases of maternal death and serious morbidity. This has been highlighted in the most recent MBRRACE report, where failure to identify postpartum haemorrhage in recovery contributed to significant morbidity in these patients.

Best practice

There are a number of national publications that provide guidance on best practice in recovery and care of the sick obstetric patient.[2–5] 'Care of the critically ill woman in childbirth: enhanced maternal care,' was published in 2018 and makes recommendations relevant for the care of a pregnant or recently pregnant, acutely unwell woman.[6] The document acknowledges that while women who become acutely ill during pregnancy, labour and the postnatal period should have immediate access to the same standard of support as other patients, there are different models to deliver this care.

'Care of the critically ill woman in childbirth; enhanced maternal care' provides guidelines for standards of monitoring for women receiving enhanced maternity care. The RCoA 'Guidelines for the provision of anaesthesia services for an obstetric population 2019' also highlight the standards that should be adhered to regarding recovery monitoring and care. The common themes among these guidelines are

- Adequate numbers of staff who have had appropriate training. Minimum staff to patient ratios of 2:1, and 1:1 for those recovering from general anaesthesia. Staff trained in the recovery of patients and with Intermediate life support training within the last 1 year.
- Monitoring of appropriate parameters and documentation on early warning charts. Early warning system modified for obstetrics should be used in the care of all women presenting to acute care services who are pregnant or within 42 days of having given birth. Observations should be documented every 15 minutes for the first hour and then at 30-minute intervals for the following two hours unless otherwise stipulated.
- Adequate handover of patients with handover supported by tools such as 'situation, background, assessment, recommendation' (SBAR) and SAFE.[7,8]
- There should be local policies for the escalation of the deteriorating patient and for discharge from recovery.

Suggested data to collect

Prospective or retrospective data collection over at least a one-month period of the following factors.

Staffing

- The percentage of patients who are looked after by recovery staff on a 2:1 or where appropriate a 1:1 basis. Review rotas to ascertain the numbers of staff on each shift with up to date immediate life support training and those who have had general recovery training.

Monitoring

- The proportion of patients who have complete documentation of locally agreed recovery documentation/early warning score charts.
- The proportion of patients who have documentation about obstetric specific parameters including resolution of sensorimotor blockade after neuraxial anaesthesia, blood loss from wound, vagina or drain and urinary output, while in the recovery area.

Handover

- The percentage of patients who have documentation of handover on arrival in recovery.
- The use of handover tools such as SBAR or SAFE.

Policies

- The existence and accessibility of policies and protocols for discharge from recovery and escalation in the case of a deteriorating patient.
- The proportion of staff who can identify how to access these policies.

Data collection

- Serious incidents involving patients in recovery or receiving enhanced maternity care recorded and reviewed on a monthly basis, with learning points disseminated to all staff involved in the care of these women.
- Data collection covers patients admitted in normal working and 'out of hours' periods.

Quality improvement methods

- If guidelines are not being followed, go 'back to the floor' to look for reasons why. Are staff well trained and have adequate time? Are they familiar with the guidelines and their importance? Are the guidelines clear and easy to action? Consider using a behaviour change framework such as applied behaviour change or COM-B (capability, opportunity, motivation and behaviour) to look at the barriers for staff following the correct policy.
- Draw a process map of the detection and escalation of a deteriorating patient in recovery. Is all equipment easy to access? Are lines of communication clear and roles and responsibilities well defined?
- Use multidisciplinary simulation to train staff in the practical and logistic issues around patient transfer and managing a deteriorating patient.
- What is the patient view of their stay in recovery and enhanced maternity care? Patient interviews and co design can improve processes, especially where care transfers exist: patients are the only group who see the whole process from end to end.

Mapping

ACSA standards: 1.3.1.7, 1.3.1.5, 1.4.1.1, 1.4.2.1, 1.4.2.2, 1.4.2.3, 1.4.2.4, 1.4.4.1, 1.5.1.3, 1.5.4.3, 1.7.2.4, 2.1.1.5

Curriculum competences: OB_BK_16, OB_BS_11, OB_BS_12, OB_BK_17, OB_IS_11, OB_HS_06

CPD matrix codes: 2A04, 2B02, 2B03, 2B05, 2B06, 3B00

GPAS 2020: 4.1.1, 4.2.2, 4.2.5, 4.2.11, 4.2.17, 4.4.3, 4.4.4, 9.1.27, 9.1.28, 9.3.2, 11.4.2

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1. Knight M et al., MBRRACE-UK. Saving Lives, Improving Mothers' Care: Lessons Learned to Inform Maternity Care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2014–16. Oxford: National Perinatal Epidemiology Unit; 2018 (https://www.npeu.ox.ac.uk/mbrrace-uk/reports).
3. Royal College of Anaesthetists. Guidelines for the Provision of Anaesthetic Services Chapter 9: Guidelines for the Provision of Anaesthesia Services for an Obstetric Population. London: RCoA; 2019 (https://www.rcoa.ac.uk/gpas/chapter-9).
5. Association of Anaesthetists of Great Britain and Ireland. Recommendations for Standards of Monitoring during Anaesthesia and Recovery. London: AAGBI; 2015 (https://anaesthetists.org/Home/Resources-publications/Guidelines/Standards-of-monitoring-during-anaesthesia-and-recovery).
7. NHS Improvement. SBAR communication tool: situation, background, assessment, recommendation (https://improvement.nhs.uk/resources/sbar-communication-tool).
8. NHS Improvement. SAFE SBAR checklist (https://improvement.nhs.uk/resources/safe-sbara-handover-aide-memoire-from-anaesthetics-to-recovery-in-a-paediatric-setting).

7.9 Timely anaesthetic involvement in the care of high-risk and critically ill women

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Why do this quality improvement project?

Care of women with complex medical or obstetric needs and those who are critically ill require the care of a multidisciplinary team, of which the obstetric anaesthetist is an essential member. Complex patients may include women with relevant medical conditions, such as cardiac, respiratory, neurological or haematological disorders, raised body mass index (BMI), significant mental health issues, hypertension, sepsis or those at risk of major haemorrhage.

Background

Maternal deaths from non-obstetric causes have been higher than those from direct complications of pregnancy for many decades. In 2018, an increase in indirect deaths was reported. The single most common cause of death was cardiac disease and two-thirds of women who die have significant comorbidities.[1]

Reports from the Confidential Enquiry into Maternal Deaths have repeatedly highlighted the need for multidisciplinary involvement in the care of high-risk and critically ill women. Guidelines from the National Institute for Health and Care Excellence published in 2019 recommend the timely antenatal involvement of anaesthetists in planning care for women with medical conditions and those with obstetric complications, as well as for women with a high BMI.[2]

The joint guideline on enhanced maternity care of critically ill women makes recommendations specifying the disciplines that should be involved, regardless of location. The skillset of those caring for critically ill women is described.[3]

Best practice

- All units should have antenatal and intrapartum guidelines for the management of high-risk pregnancies, including those in women with raised BMI, and for transfer to intensive care.
- All women with significant medical or obstetric conditions should be seen by a senior obstetric anaesthetist antenatally to have their care planned by a multidisciplinary team.
- All women with high-risk pregnancies or at risk of deterioration should be seen by a senior obstetric anaesthetist and an obstetrician on delivery suite.
- All women with a raised BMI (over 40 kg/m²) should be seen by an anaesthetist antenatally.
- Critically ill women should:
  - receive the level of care required, regardless of location
  - be cared for by nurses and midwives with the required training and experience
  - have early consultant anaesthetic involvement in their care and liaison with intensive care.

Suggested data to collect

- Percentage of at-risk pregnancies with a management plan drawn up antenatally with anaesthetic input.
- Percentage of women with significant pregnancy-induced hypertension in labour with regional analgesia (if not contraindicated).
- Percentage of women with significant hypertension seen by an anaesthetist within one hour of arriving on the delivery suite.
- For units that provide level 2 care, evidence that there is at least one midwife per shift with the required training and competencies.
- Percentage of women with a BMI over 40 kg/m² seen by an anaesthetist antenatally with a care plan.
- Percentage of women with sepsis requiring fluid resuscitation seen by an anaesthetist within one hour of the diagnosis.
- Percentage of cases of haemorrhage of more than 1.5 litres where the anaesthetist was involved.

Quality improvement methodology

- Draw a process map of the detection and initial management of the deteriorating patient and simulate or walk through the pathway. Is the information on what to do and who to contact clear and accessible?
- Consider co-designing multidisciplinary team processes with patients and relatives. How do patients experience the antenatal planning of a high-risk pregnancy?
- Draw a driver diagram for good intrapartum care of high-risk pregnancies (a sample driver diagram is shown in Figure 7.9.1).

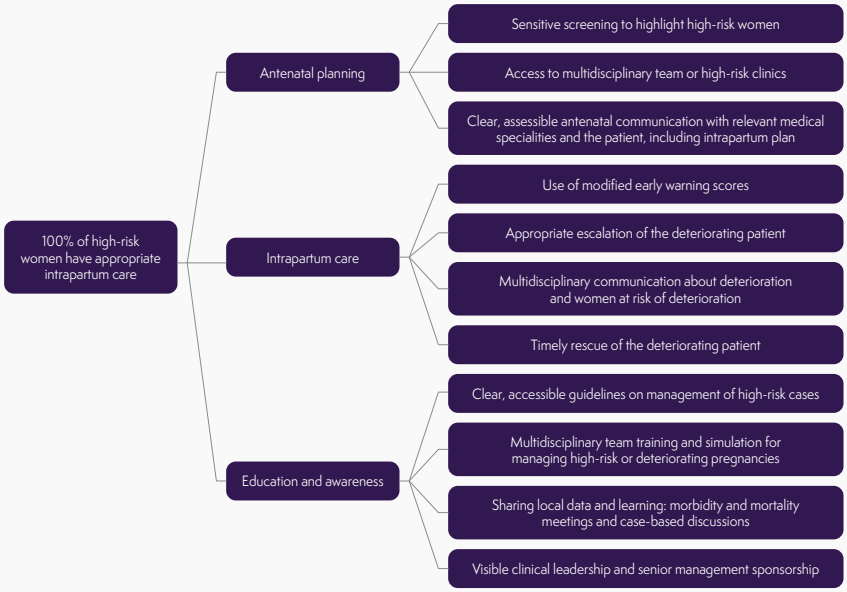

Figure 7.9.1: Example driver diagram for good intrapartumcare of high-risk pregnancies.

Mapping

ACSA standards: 1.1.1.1, 1.2.1.3, 1.3.1.7, 1.4.3.2, 1.7.1.1, 1.7.2.3, 1.7.2.4, 1.7.2.6

GPAS 2020: 5.2.12, 7.3.13, 9.1.5, 9.2.39, 9.2.40, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.5.31, 9.7.2

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7.10 Postnatal obstetric anaesthetic adverse effects and complications

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Why do this quality improvement project?

Obstetric anaesthesia forms a large part of the anaesthetic workload in most hospitals. While most cases pass uneventfully this is not universal, and it is important to have robust mechanisms for follow-up and recognition and management of potential complications of both neuraxial and general anaesthesia. In some cases, complications may be severe and may not manifest until after the woman has gone home.

Background

Anaesthetists are involved in the care of approximately 60% of women during labour and delivery, and obstetric cases account for 45% of all neuraxial blocks performed.[1] Significant postnatal complications of neuraxial procedures include:

- Postdural puncture headache (PDPH) following either accidental dural puncture with an epidural needle or spinal anaesthesia. Rates of accidental dural puncture with an epidural needle are estimated to be 0.19–3.6%,[2,3] with approximately 60% of these women developing PDPH.[3] Estimated rates of PDPH following spinal anaesthesia using narrow-gauge atraumatic needles are 0.14–1.5%.[3] Various treatments for PDPH, including an epidural blood patch, may be required.[4]
- Neurological complications can be divided into neuropraxia (1 : 3,000 temporary to 1 : 15,000 permanent);[1] space-occupying lesions including epidural abscess (0.2–3.7 : 100,000) or haematoma,[5] which may lead to compressive symptoms; infection such as meningitis (1.5 : 10,000);[1] and chemical damage from inappropriate drug administration. Despite their severity, many units do not have guidelines for the management of postnatal neurological complications.[6]
- Although rates of general anaesthesia in obstetrics are declining, the 2014 Fifth National Audit Project (NAP5) on accidental awareness under general anaesthesia highlighted obstetrics as an area of particularly high risk for awareness (1 : 670 cases of caesarean section vs 1 : 19,000 overall or 1 : 8,000 cases where neuromuscular blockade was used).[7] The rate of failed intubation is also higher for obstetric patients than in the general population, at 1 : 390 for all obstetric general anaesthetic cases and 1 : 443 for caesarean section,[8] and should be monitored (see section 7.5). There are other recognised adverse effects associated with general anaesthesia such as shivering, sore throat, nausea and vomiting, muscle pains, damage to lips and teeth, aspiration of stomach contents and allergic reactions.[9]

Best practice

- Management of immediate complications of neuraxial and general anaesthesia should follow local guidelines.[10]
- All women receiving an obstetric anaesthetic intervention should be followed-up, and written information should be given on when and how to seek help if complications arise.[11]
- Management of PDPH and neurological complications should follow national and local guidelines.[4,10]

Suggested data to collect

Standards	Measures
All women who receive neuraxial blocks and general anaesthesia during labour and delivery should be reviewed.	■ Percentage of women receiving neuraxial and general anaesthesia who are reviewed by a member of the anaesthetic team on the first day mobilising after delivery.
Women who receive neuraxial analgesia or anaesthesia should be given written information about when and how to seek help if complications arise.	■ Percentage of women who received written information on complications.
Woman with postnatal headache suggestive of PDPH must be reviewed urgently, in a time frame in line with local guidelines.	■ Number of women who were not reviewed by an anaesthetist within 24 hours of developing PDPH. This is an Obstetric Anaesthetists' Association standard, so reasons for failure to review should be captured.
Women with PDPH should be reviewed daily until hospital discharge or until symptoms resolve in line with Obstetric Anaesthetists' Association standards.	■ Percentage of women followed-up daily until symptoms resolve or until hospital discharge. Reasons for failure to follow-up should be collected.
Women in whom the dura is punctured with an epidural needle or who suffer from PDPH must receive suitable follow-up information.	■ Percentage of women receiving information on 'red-flag' symptoms and who to contact should they occur.
Women reporting neurological symptoms following neuraxial block must be reviewed urgently by an anaesthetist.	■ Percentage of women reporting neurological symptoms who are reviewed by a member of the anaesthetic team urgently – in a time frame in line with local guidelines.
Adverse effects resulting from general anaesthesia should be recorded.	■ Rates of difficult and failed intubation, accidental awareness, shivering, sore throat, nausea and vomiting, muscle pains, damage to lips and teeth, aspiration of stomach contents and allergic reactions should be recorded.
Whenever a complication of neuraxial or general anaesthesia is detected the woman's general practitioner and community midwife should be notified.	■ Percentage of cases where the woman's general practitioner and community midwife have been informed of anaesthetic-related issues.

7.10 Postnatal obstetric anaesthetic adverse effects and complications

Dr Helen Brambley, Dr Robin Russell
John Radcliffe Hospital, Oxford

Quality improvement methodology

- Draw a process map for follow-up of women receiving anaesthetic intervention and escalation in the event of a complication. Are criteria for escalation clear and accessible to all postnatal staff and patients? Are there any prompts that can be used to ensure this is not overlooked (eg checklist in anaesthetic charts)? Under what circumstances are women not reviewed and how can this be improved (eg telephone follow-up or starting follow-up visits earlier in the day)?
- Design patient information sheets about complications of neuraxial blocks with patients to ensure that they are clear and accessible.
- Incidence of PDPH: the unit should have a robust mechanism for recording all neuraxial procedures and the incidence of accidental dural puncture and PDPH. Is the incidence of PDPH reviewed on a regular basis? Are reasons for failure and potential areas for improvement discussed and acted upon?
- Management of PDPH and neurological complications: does the unit have guidelines on the management of PDPH and neurological complications that are clear and easily accessible? Are there clear criteria for escalation that have been agreed with other specialties (eg radiology and neurology)? Consider a checklist or other prompts to ensure that all necessary steps are taken in a timely fashion.
- Analyse cases of PDPH and neurological injury for common features and learning. Present cases to anaesthetic and obstetric teams to share learning and discuss potential improvements. Were any cases handled particularly well and what are the learning points from these cases?
- Management of complications following general anaesthesia: are there clear guidelines for following-up women after general anaesthesia? If accidental awareness is reported, is there a mechanism for appropriate follow-up? Are midwifery and community midwifery staff clear about how to report anaesthesia-related concerns raised by women (awareness may not be reported until after anaesthetic follow-up or after discharge). Map out a potential case with community colleagues and test feedback mechanisms.

Mapping

ACSA standards: 3.1.2.1, 1.7.1.2, 1.1.1.7, 1.7.2.6, 1.4.4.2,
Curriculum competences: OB_BK_12, OB_BK_15, OB_IK_07, OB_IS_05, OB_IS_08, OB_AK_04
CPD matrix codes: 2802, 2803, 2804
GPAS 2020: 9.5.4, 9.5.5, 9.7.3, 9.7.6

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11. Royal College of Anaesthetists. Guidelines for the Provision of Anaesthetic Services Chapter 9: Guidelines for the Provision of Anaesthesia Services for an Obstetric Population. London: RCoA; 2019 (https://www.rcoa.ac.uk/gpas/chapter-9).

7.11 New beginnings: A Case study using patient experience-based co-design to improve services

Dr Emma Evans, Dr Carolyn Johnston, Dr Andrew Tan
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St. George's Hospital started its 'New beginnings' project with the aim of improving women's experiences of giving birth in the operating theatre. They used the established Experience Based Co-Design method, supported by the Point of Care Foundation, a charity working in this methodology.[1] This tool takes improvers through a defined set of steps designed to capture both patients' and staff experience of care.

Following several observation events to understand the environment and guide the interviews, the groups were interviewed on camera. Once these films and interviews had been reviewed by the project team and thematically analysed, short edited films were screened to the staff and patients separately, then as a combined group to discuss their findings and agree areas for improvement. By involving an emotional mapping exercise, the project team were able to understand where the most important areas were for patients and staff.

Dr Andrew Tan, from the staff project team said, 'Using this method was a fantastic way to get staff talking about what really happens day to day and what their experience of care actually is. By looking at their frustrations it was easy to realise they were much the same as patients' experiences and frustrations at their care.'

The participants jointly decided on a number of themes for improvement: personalising the process of having a baby in theatre by addressing small touches (like using parents' names, dignity, birth plans), improving the information available to women before they come to the operating theatre about birth and the environment itself. Many other smaller changes have been made, such as improving the physical environment in theatres, reducing routine fasting times and improving skin-to-skin contact rates on the operating table. Dr Emma Evans from the project team said, 'Perhaps the most important change is that staff are now talking about women's experience. An operative birth is still a birth, and the whole team are working together to make that magical.'

Mapping

ACSA standards: 3.1.1.1, 3.1.1.2, 3.1.2.1, 4.2.1.2, 4.2.2.2
GPAS 2020: 9.5.3, 5.5.65, 9.7.2, 9.9.13

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8 Paediatrics

Edited by Dr Mary Lane
QI editor Dr Carolyn Johnston

8.1 Preoperative information for children and their families

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Why do this improvement project?

Perioperative anxiety affects 75% children undergoing surgery. It has direct links with worsened postoperative outcomes, emergence delirium and post-hospital behavioural changes lasting days to weeks.[1–3] Preoperative family-centred behavioural preparation has been shown to reduce preoperative anxiety, opioid consumption and length of postoperative stay.[1,5]

Background

Lower socioeconomic class, parental anxiety, impulsive and temperamental personality traits and negative healthcare experiences have been shown to increase risk of preoperative anxiety.[5] Children and their families may be concerned about the anaesthetic, the procedure, complications and postoperative pain.[4] We can reduce anxiety by providing good-quality age-specific preoperative information with sufficient time to process the information. This may enable coping skills develop that improve children's perioperative experience and reduce long-term psychological effects.[1] Children desire detailed information before surgery, especially those aged seven years and older,[6] and require tailored resources to meet their needs.

Best practice

Preoperative preparation should be patient centred and provided in a variety of forms including written/leaflets, videos, educational programmes, social media platforms such as Facebook, websites, apps and podcasts, complementing face-to-face preoperative clinics and telephone consultations. Written information alone is the least effective form of preparation.[7] Older children need more comprehensive information about their surgery and should be included in decisions.[6] Younger children (two to six years) benefit from simple procedural event information with sensory descriptions.[3] Many children in UK hospitals meet health play specialists at the preoperative visit and on the day of surgery.

Innovative anxiety management solutions include virtual tours with animations, which can be done away from the hospital. These methods have been shown to reduce anxiety, answer questions, raise issues for discussion and avoid unnecessary investigations and cancellations.[6]

A virtual reality smartphone app delivered preoperatively can prepare children and their parents for surgery to reduce their anxiety levels (eg Little Journey from Little Sparks Hospital).[8]

Best practice example and resources

- Association of Paediatric Anaesthetists and RCoA leaflets for children.[10]
- Association of Paediatric Anaesthetists Paediatric Perioperative Medicine Group.[11]
- Association of Paediatric Anaesthetists and RCoA videos for children.[12]
- 'A Little Deep Sleep: A Family Guide to Anaesthetics' video.[13]
- Examples of national and international websites.[14]
- Bristol Royal Hospital for Children interactive website with a video on the perioperative journey.[15]

Suggested data to collect

Understanding where you are as a team

- Start with a review of the preoperative materials available to your families through letters to parents, leaflets, website and social media. How can they access these materials? Do your webpage, leaflets and patient letters have QR codes or links to these resources?
- Is the information age appropriate? Is the information specific to your healthcare setting?
- Review emergency admission pathways for information given to families on starvation times, what to bring, how to prepare their child. How do they access this information?
- Do you have health play specialists available at preoperative sessions and on the day of surgery?

Measuring the effectiveness of your information

- Perform a parent/carer survey on how anxious they are feeling, assessed through tools such as the Amsterdam Preoperative Anxiety and Information Scale (Figure 8.1.1).[9]
  - How satisfied they are with the preoperative preparation?
  - What did they find useful and which methods did they use to prepare their child?

Appendix The Amsterdam preoperative anxiety and information scale (APAIS)

	Not at all	1	2	3	4	5	Extremely
1. I am worried about the anesthetic							
2. The anesthetic is on my mind continually							
3. I would like to know as much as possible about the anesthetic							
4. I am worried about the procedure							
5. The procedure is on my mind continually							
6. I would like to know as much as possible about the procedure							

The subscales

Anesthesia-related anxiety	Sum A = 1 + 2
Surgery-related anxiety	Sum S = 4 + 5
Information desire component	= 3 + 6
Combined anxiety component	Sum C = A + S (1 + 2 + 4 + 5)

Figure 8.1.1: The Amsterdam preopreative anxiety and information scale.

- Survey the children on what information they used before their operation and which elements they found useful.
  - What is the process for cancellation on day of surgery due to a failure in the preoperative assessment?
  - Could children and parents co-design new or improved information resources with you?

Mapping

ACSA standards: 1.2.5, 1.6.1.6
Curriculum competences: PA_BK_02, PA_BK_17
CPD matrix codes: IF01, 2D02
GPAS 2020: 2.1.3, 2.3.1,2.3.2,2.3.14, 2.3.15, 2.7.2, 2.9.1, 2.9.3, 2.9.4. 10.2.7, 10.5.11,10.9.11, 10.9.1, 10.9.2, 10.9.5

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8.2 Premedication and anxiolysis in children

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Why do this quality improvement project?

Reducing anxiety in children of all ages is an important component of perioperative medicine. Induction of anaesthesia can be stressful for children and parents. This may have on going negative psychological effects on all aspects of current and continuing care.

Background

Over half of children undergoing surgery experience anxiety during induction of anaesthesia. The consequences of anxiety are costly to the patient and family, the anaesthetist and the institution. The patient suffers from adverse psychological, metabolic and physiological effects including increased postoperative pain, nausea and vomiting and prolonged recovery. The psychological effects may continue past the postoperative period. Children between one and five years of age are at the highest risk.[1,2] Therapeutic holding and restraint should only be used as a last resort when deemed in the child's best interest and by professionals trained to provide restraint.

Best practice

All staff members who are involved with the perioperative care of children undergoing anaesthesia should be trained to identify and manage anxiety in children.[3] Topical anaesthesia should be applied before intravenous induction.

Non-pharmacological therapies such as behavioural interventions should be available and employed where appropriate, including:

- play therapists
- distraction therapy
- child friendly environment
- age appropriate tablet game apps
- virtual reality.[4]

Pharmacological strategies with sedative premedication include:

- midazolam orally 0.5-0.75 mg/kg (maximum 20 mg) 30-60 minutes before induction or sublingually 0.3 mg/kg 20 minutes prior to induction
- dexmedetomidine 2 µg/kg orally or intranasal 30-45 minutes prior to induction
- clonidine 1-5 µg/kg
- ketamine orally 5 mg/kg, intramuscularly 4-8 mg/kg or intravenously 1-2 mg/kg.

Suggested data to collect

Standards	Measures
An assessment of preoperative anxiety should be documented and a clear anaesthetic plan agreed upon prior to surgery.	■ Percentage of children with documented anaesthetic plan.
Preoperative anaesthetic clinics should provide non-pharmacological strategies to manage anxiety in children.	■ Availability of play therapists, distraction therapy, child-friendly environment, age appropriate tablet game apps, virtual reality.
Children who are assessed and require a premedication should be reassessed prior to induction of anaesthesia for effect.	■ Percentage of patients who do not cry or appear distressed at induction.

Therapeutic holding and restraint should only be used as a last resort when deemed in the child's best interest and by professionals trained to provide restraint.	■ Percentage of patients who are restrained at induction and the follow-up they receive.
Children for intravenous induction should have topical anaesthesia applied prior to anaesthesia.	■ Percentage of children who have intravenous induction planned with topical anaesthesia applied at the appropriate time.

Quality improvement methodology

Risk assessment

- Draw out a process map from the preassessment to the postoperative care including accuracy of assessment and outcome.
- Include anaesthetists name and grade, patient age, parental presence, planned route of induction, non-pharmacological strategies employed, application of topical anaesthesia and duration, sedative premedication: drug, dose, route and time relative to induction, assessment of child's response to induction.

Perioperative anxiety

- Look at the process map of a patient from admission to postoperative care ward. Look for parts where the process it could be made more robust or streamlined. Look at cases which fail the required standard where there any common features in these cases which you can improve.

Mapping

ACSA standard: 1.6.1.1
Curriculum competence: PA_BK_12
CPD matrix codes: 2A03, 2D02, 2D06, 3D00
GPAS 2020: 2.3.1, 2.3.5, 10.2.7, 10.2,8, 10.2.9, 10.2.18

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8.3 Paediatric sedation

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Why do this quality improvement project?

The number of diagnostic and minor surgical procedures performed on paediatric patients outside the traditional operating room setting continues to increase. These procedures should be conducted to the same standard as theatre cases.[1] Carrying out a quality improvement project in this field can help to highlight areas for improvement and challenge the anaesthesia department to develop a framework that supports and regulates the safe delivery of paediatric sedation.

Background

There are four common different types of procedures: dentistry, painful procedures in the emergency department, therapeutic procedures and diagnostic procedures (eg gastrointestinal endoscopy and painless imaging). A wide range of sedation techniques is available. Ineffective sedation causes distress and additional cost (related to repeat procedures). Practitioners need to know how to deliver effective sedation and be able to manage the complications of airway obstruction and cardiorespiratory depression. If sedation is performed without an anaesthetist present, the professionals should adhere to the guidelines of their own colleges and the Academy of Medical Royal Colleges. The National Institute for Health and Care Excellence (NICE) advocates the creation of a national registry for paediatric sedation.[2,3]

Best practice

- RCoA Guidelines for the Provision of Paediatric Anaesthesia Services 2019, chapter 10 section 5.20.[1,4]
- Anaesthesia Clinical Services Accreditation 2019 guidelines.[5] Where sedation is provided by an anaesthetist there is a policy for the provision of this service including all subspecialty areas and the specifications of the facilities provided, including paediatrics. A copy of the policy should be provided.
- The NICE guideline covers all types of effective sedation, including specialist techniques and recommends a framework of training to use them safely.[2,3]
- The Scottish Intercollegiate Guideline Network Guideline published in 2004 concentrating on safe moderate sedation techniques but did not advise on techniques that caused deep sedation or risked anaesthesia. This guideline has been withdrawn as new evidence has emerged that means the guideline no longer represents best practice. SIGN does not have any plans to produce a new guideline on this topic at present.

Suggested data to collect

- Drugs used and doses administered.
- Any airway interventions required during procedure and reason for them.
- Incidence of abandoning procedure due to failure of sedation technique.
- Incidence of admission required due to a need for advanced airway interventions.
- From NICE Guideline 112:[3]
  - Adequacy of pre-sedation assessment, including seeking specialist advice if needed.
  - The appropriateness of the chosen sedation technique.
  - The theoretical and practical training of the person delivering the sedation.
  - The training of sedation personnel in relevant resuscitation techniques.
  - Availability of sedation equipment, resuscitation equipment, monitoring equipment and appropriate drugs.
  - Person delivering sedation and trained assistant present throughout the procedure.
  - Adequate documentation, including patient/carer information, consent information, contemporaneous documentation of the sedation and physiological recordings.
  - The success or otherwise of the sedation including complications, highlighting airway intervention.

Quality improvement methodology

- Is there a limited pool of those undertaking paediatric sedation and how do you ensure that skills are up to date?
- Is there learning you can take from how sedation services are set up in other departments in the hospital or from elsewhere? Do you share learning from incidents across sedation services in the hospital?
- Team rehearsal using in-situ simulation will help identify any logistical and training issue with providing safe sedation. Are their aids available, designed with human factors in mind, for common complications?
- What information is available to patients about their sedation? Is it age appropriate and designed with patients (see section 8.1)?

Mapping

ACSA standard: 1.1.1.4
Curriculum competence: PA_AS_03
CPD matrix codes: 2D06, 1A02
GPAS 2020: 3.1–3.5, 7.1.3, 7.2.3, 7.2.9, 7.2.10, 7.3.4, 7.3.6, 7.3.7, 7.3.14, 7.3.42, 7.5.11, 7.5.13, 10.5.20

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8.4 Perioperative temperature control in children

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Why do this quality improvement project?

Thermoregulation is known to be disrupted in the perioperative period and maintaining normothermia is well known to be an important part of patient care to reduce postoperative complications.

Background

Hypothermia is associated with prolonged recovery, increased oxygen consumption and shivering, decreased platelet function and consequent blood loss, increased risk of surgical wound infection and impairment of drug metabolism.[1–5]

Basal metabolic heat production is reduced 20–30% under anaesthesia and central thermoregulation is inhibited.

Children lose more through conduction and radiation than adults as they have less insulating fat and a higher surface area to volume ratio. Neonates and premature babies undergoing major surgery, such as bowel resection, can have considerable third-space losses and are especially at risk of hypothermia.

Best practice

The Association of Anaesthetists advises that body temperature monitoring must be available in paediatrics and used when appropriate.[6] The National Institute for Health and Care Excellence guidelines stress the importance of informing parents and carers of the need for children to stay warm.[7]

The RCoA Guidelines for the Provision of Anaesthesia Services (GPAS)[8] and the Anaesthesia Clinical Services Accreditation (ACSA) standards highlight the importance of monitoring and maintaining theatre temperature, especially in neonates.[9]

Suggested data to collect

Standards	Measures
All children should have a preoperative temperature recorded in the hour before going to theatre, and measured at a site that is a direct estimate (ie accurate to within 0.5 degrees C of direct core measurement; the best sites are sublingual or axilla) or indirect estimate (ie reading produced by thermometer after correction factor has been applied, eg infrared tympanic, temporal or forehead).	■ Core temperature preoperatively and time of last reading before going to theatre. ■ Site used for temperature recording. ■ Type of measuring device used.
All children should have their temperature recorded at the beginning and end of surgery (and intermittently for procedures lasting longer than 30 minutes).	■ Temperature at start and end of surgery. ■ Frequency of temperature measurements. ■ Method of temperature measurement.
All children should have a temperature documented on arrival in recovery.	■ Percentage of children who arrive in the recovery area with temperature in the range 36-37 degrees C. ■ Document method of temperature measurement on arrival into recovery.

All children having surgery lasting more than 30 minutes should have active warming (mattress or blanket). Inditherm mattresses and forced-air blowers are particularly effective theatre warming devices.[2]	■ Percentage of children having surgery lasting more than 30 minutes who have active warming. ■ Document type of warming devices used in theatre (including fluid warmer). ■ Document temperature at beginning and end of surgery and duration of surgery. ■ Document method of temperature measurement.
Devices for monitoring and maintaining or raising the temperature of the patient should be available throughout the perioperative pathway including control of theatre temperature (ACSA 1.3.2.2).	■ Availability and visibility of devices on the ward, in theatre and in recovery. ■ Whether the devices are in working order.[7]
Equipment for warming fluids, patient warming devices and equipment for measuring temperature should be readily available in all areas where children and neonates are anaesthetised and in recovery areas (GPAS 10.2.1, 10.3.5; ACSA 2.2.3.2).[8]	■ Itemise all types of warming equipment that are present in theatre, recovery, magnetic resonance imaging and emergency departments, and anywhere else where children are anaesthetised. ■ Document what is used to record temperature in each site.
Theatre temperature should be capable of regulation to at least 23 degrees C and up to 28 degrees C (GPAS 10.3.4) where neonatal surgery is performed. There should be accurate thermostatic controls that permit rapid changes in temperature (GPAS 10.2.6).	■ Percentage of neonates having surgery in a theatre that can regulate ambient temperature to 28 degrees C.
Patients and their carers should be informed that staying warm before surgery will lower the risk of postoperative complications. Particular attention should be paid to the comfort of those with communication difficulties before, during and after surgery.[9]	■ Percentage of parents/carers who receive any information about the importance of maintaining temperature perioperatively. ■ For all, document patient age and weight, operation and duration of anaesthesia.

8.4 Perioperative temperature control in children

Dr Judith A Nolan
Bristol Royal Children's Hospital

Quality improvement methodology

- Identify one or two key goals (eg how and when temperature is measured at each stage of patient pathway: pre-, intra- and postoperative; percentage of children having surgery lasting longer than 30 minutes who are actively warmed (and compare findings at beginning and end of a six-month period).
- Identify steps in the patient pathway where issues might arise that would impact on achieving a goal (eg lack of awareness of staff, lack of availability of monitoring or warming devices, unexpected prolonged surgery without adequate warming, overzealous warming without temperature monitoring). Where are the key points that an intervention can take place (pre-, intra- or postoperatively)?
- Consider using a driver diagram:
  - environmental-related: ward, theatre or recovery-related factors (eg poor air conditioning, faulty thermostats)
  - people related: awareness, training, time
  - equipment related: availability of measuring or warming devices.

Mapping

ACSA standard: 2.1.1.19
Curriculum competences: PA_IK_06, PA_IS_05, PB_IK_36
CPD matrix codes: 1A01 (physiology), 2D02
GPAS 2020: 10.2.1, 10.2.6, 10.3.4, 10.3.5

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8.5 Postoperative vomiting in children

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Why do this improvement project?

Postoperative vomiting has an incidence of 13-42% in paediatric studies, which is double the occurrence in adults.[1,2] The consequences of postoperative vomiting are costly to the family and the patient with psychological, metabolic and physiological disturbances. There may be negative surgical effects such as wound dehiscence or immobility. Postoperative vomiting causes delays in discharges and accounts for 2% of unanticipated hospital admissions.[3–5]

Background

Clinicians should use a risk stratification strategy (the Postoperative Vomiting in Children score, POVOC, or the Vomiting in the Postoperative Period, VPOP) to identify baseline risk and initiate measures to reduce preventable factors and administer prophylaxis or treatment appropriately.[6,7]

Modifiable risk factors

- Patient-related: anxiety (level 2– evidence).
- Anaesthesia-related:
  - anticholinesterases (level 2– evidence)
  - volatile anaesthetic agents including nitrous oxide (level 1++ evidence)
  - opiates (level 1+ evidence)
  - dehydration (level 1+ evidence).
- Surgery-related: painful procedures that have a high opioid requirement.

Recommendations for preventing postoperative vomiting

- Children should be assessed using the risk scores to determine pharmacological treatment and reduce modifiable factors where appropriate.
- Decrease baseline risk:
  - regional anaesthesia as an opiate sparing technique
  - maintain good hydration.

Best practice

The Association of Paediatric Anaesthetists has produced guidelines on the prevention of postoperative vomiting in children in 2016.[8]

Suggested data to collect

Standards	Measures
All children should have documentation of risk assessment.	■ Proportion of children who have documented risk assessment using either a risk stratification tool (POVOC or VPOP).
All children should have documentation of anticipation of postoperative vomiting and treatment plan.	■ Documentation of treatment plan discussed with patient.
All staff should have knowledge of Association of Anaesthetists 2016 guidance.	■ Percentage of staff with knowledge of the guidance and its contents.
All staff prescribing anti-emetics should know the dose and appropriate drug for the prophylaxis and treatment of postoperative vomiting.	■ Percentage of drug and dosage given as per guidance.

Incidence of postoperative vomiting in the postoperative period at an institution.	■ As above.
Institutions should have documentation of the number of rescue treatment anti-emetic doses given.	■ Percentage of rescue treatment anti-emetic doses given.
Institutions should use opioid sparing techniques where appropriate.	■ Documentation of use and indication of opioid sparing techniques.
Institutions should have documentation of unplanned admission rates due to postoperative vomiting.	■ Percentage of unplanned admissions due to postoperative vomiting.

Quality improvement methodology

Risk assessment

- Draw out a process map from the time of preassessing child to the time discharged from recovery. Which members of staff are most reliable at calculating risk? Do they have any lessons to share with their peers?

Administration of appropriate anti-emetics for prevention and treatment

- Look at the process map for a child undergoing anaesthesia from admission to being discharged from recovery. Look for parts where the process is not taking place or where it could be made more unified. Identify which groups of children are not meeting the standards and identify common features that can be improved.

Mapping

ACSA standard: 1.4.1.2
GPAS 2020: 2.3.11, 2.3.14, 4.2.18, 6.4.5, 6.5.30, 6.7.1, 10.3.32, 10.5.19, 10.9.2
Curriculum competence: PA_BK_07
CPD matrix code: 2DO2

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8.6 Implementing thromboprophylaxis in paediatric surgical patients

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Why do this quality improvement project?

Venous thromboembolic disease (VTE) is a preventable cause of morbidity and mortality. More than 80% of paediatric VTE occurs in children with one or more risk factors. The Association of Paediatric Anaesthetists collated and reviewed the available evidence and published the Clinical Practice Guidance on the Prevention of Perioperative Thromboembolism in Paediatric Patients in 2017.[1] Awareness and implementation of national guidance is variable, quality improvement projects can serve to increase familiarity with guidance, ensure best practice and drive procurement of necessary equipment.

Background

The need for evidence-based thromboprophylaxis in adults is now widely accepted. There are few areas of strong evidence to guide practice in the paediatric population. The Canadian registry of VTE in paediatric practice estimated the incidence to be 5.3/10,000 patients.[2] A more recent, single-centre study in Australia reported 8/10,000 patients.[3] Both of these studies recorded symptomatic VTE only, so may have underestimated the true incidence. There are two peaks in incidence of VTE – infants less than two years old and adolescence. Central venous catheters are the most common risk factor for paediatric VTE. Most children do not require VTE prophylaxis, and routine prophylaxis is not recommended for young children.

In adolescence, not only does the physiology of the coagulation system mature but additional risk factors become relevant (eg smoking, obesity, the estrogen-containing oral contraceptive pill). The Association of Paediatric Anaesthetists (APAGBI) guidance highlights some key points regarding risk assessment and methods of VTE prophylaxis. This focuses largely on adolescents (13 years and above).

Best practice

- The recommendations made in the APAGBI Clinical Practice Guidance Prevention of Perioperative Thromboembolism in Paediatric Patients are suggested as best practice.[1]
- Key recommendations include early mobilisation, optimal hydration and timely removal of central venous catheters.

Suggested data to collect

Inclusion criteria: age 13 years and over undergoing anaesthesia for surgery or radiology.

Data:

- weight
- presence of risk factors
- length of surgery
- method(s) of thromboprophylaxis used (none, antiembolism stockings, intermittent pneumatic devices, pharmacological)
- contraindications to thromboprophylaxis.

Quality Improvement methodology

Compliance with the guideline should be measured and run charts may be used to drive improvement.[1]

Case example

A survey was carried out among the anaesthetists at our institution, to establish the level of awareness of both local and APABGI guidance and to determine if there were any problems instituting prophylaxis, such as the availability of equipment. A data collection was then carried out over five days to assess compliance with the current APAGBI guidance.

Barriers to best practice were identified, including confusion surrounding current guidance and equipment not being standardised nor readily available at all times. Following this, local guidance was simplified and posters with the new guidance were displayed in the relevant clinical areas. Education sessions were also delivered.

Only below-knee antiembolism stockings are now available. With the introduction of an electronic patient record a prompt has been built into the theatre checklist to ensure compliance. The findings have driven the procurement of intermittent pneumatic devices for every theatre. This resulted in greater awareness and compliance with guidelines and improved patient safety.

Mapping

ASCA standard: 1.2.1.5

Curriculum competences: Higher Level Training Annex D PA_HS_01

CPD matrix codes: 1E05; 2D02

GPAS 2020: 2.3.32, 2.5.17, 2.5.19, 2.5.55, 2.7.2

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8.7 Postoperative pain management in children

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Why do this quality improvement project?

Children should receive adequate pain relief following surgery to reduce complications associated with pain. Parents are often responsible for their child's postoperative care, including pain management. Giving clear information to parents about postoperative pain management is important to ensure optimal comfort for every child.

Background

Pain is a common experience following surgery and is often poorly managed in children both in hospital and at home following ambulatory surgery.[1,2] It is most severe in the first 24-72 hours but can persist for weeks. The presence of acute pain can lead to several long-term consequences, including risk of developing persistent postsurgical pain and sensitisation to nociceptive stimulus from subsequent procedures.

Children rely on their parents/carers to give them medication to relieve pain. Barriers to effective pain management identified by parents include: fear regarding the addictive nature of analgesic medications and concerns regarding their adverse effects.[3] Effective postoperative pain management requires good communication between the child, parents/carers and the healthcare team. It is recommended that postoperative analgesia is planned and discussed prior to surgery with the paediatric anaesthetist responsible for initiating the plan.[4] A Delphi process completed by paediatric pain and quality improvement experts in Canada identified indicators for poorly managed postoperative pain.[5] These included: parents not being or feeling involved in the decision making about their child's pain management and a lack of documentation in the medical records regarding pain management.[5]

Further recommendations are that clearly presented information be given to patients and their families regarding assessing pain and the administration of analgesia at home.[4] Evidence suggests that parents have greater understanding if they have information regarding pain management prior to surgery (often in the form of a leaflet), and that this can decrease parental anxiety and increase satisfaction.[6,7]

Best practice

Methods of postoperative pain management should be discussed with the patient and their family and written information given to them. This should be recorded on the anaesthetic record.

Suggested data to collect

Standards	Measures
Methods of postoperative pain management should be discussed with the patient and their family.	■ Use patient feedback and surveys. The Association of Anaesthetists children and families questionnaire includes the question 'Did you get clear instructions about how to management any pain or other problems at home?' (https://www.apagbi.org.uk/professionals/professional-standards/peer-review).
Written information should be available for patients and their family.	■ Are there separate leaflets that discuss administration of simple analgesia, stronger oral analgesia such as morphine, regional analgesia and central neuraxial blockade (caudal, epidural analgesia) and patient or nurse controlled analgesia?

These leaflets should be available in different formats and include essential information about postoperative analgesia.	■ The quality of the information leaflets should be evaluated to include: on paper and online, include step down analgesic plan, describe how further supplies of analgesia can be obtained, include contact information for advice on pain management, including a telephone number.
The discussion about the postoperative pain management plan with the patients and parents/carers should be documented on the anaesthetic chart.	■ Review of anaesthetic preassessment medical records for paediatric cases to establish whether the postoperative analgesia plan discussed with parents has been documented.

Quality improvement methodology

In the preparation and planning stage, it is important to meet with parents and carers. This allows discovery of what they would like included and how they would like to be able to access them (for example, in-person, online or paper). Focus groups can discuss this and review available information leaflets for clarity of message and language. Resulting information can be used to adapt leaflets to ensure they include key information. In the implementing change stage, parents and caregivers should play a key role, ensuring information produced is reviewed feeding back into further development.

Simple survey data from patients and parents/carers can clarify what information they recall receiving, alongside audit data regarding documentation of a postoperative analgesia plan in anaesthetic preassessment records. A group of stakeholders involved in paediatric preassessment can should:

- set a time specific, measurable, improvement aim. For example, > 90% of anaesthetic charts should include a postoperative analgesia plan
- decide on specific changes that could lead to this improvement. For example, redesign anaesthetic preassessment charts to include a prompt to record discussions regarding the postoperative analgesia plan.

Mapping

ACSA standard: 1.4.5.1

GPAS 2020: 10.2.15, 10.2.16, 10.3.31, 10.3.35, 10.5.19, 10.5.6, 10.9.11, 10.9.2, 10.9.3, 10.9.4

Curriculum competences: P1_BK_07, P1_BK_11, PM_BK_02, PM_BK_03, PM_AK_26, PM_AS_26

CPD matrix code: 2D05

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9 Intensive care medicine

Edited by Dr Irfan Chaudry
QI editor Dr Adam Revill

9.1 Delirium assessment and management for critical care

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Why do this quality improvement project?

The management of delirium is an important and challenging facet of therapy when dealing with critically ill patients. Delirium has been shown to be an independent predictor of increased mortality at six months and longer length of stay in patients who are ventilated in intensive care.[1] It is also associated with increased length of hospital stay and may predispose patients to prolonged neuropsychological disturbances after they leave intensive care.[2,3] These factors contribute to the higher intensive care and hospital costs attributed to patients with delirium.[4]

Background

Delirium has been defined as 'an acute, reversible organic mental syndrome with disorders of attention and cognitive function, increased or decreased psychomotor activity and a disordered sleep-wake cycle'. It is commonly found in the critically ill, with a reported incidence of 15-80%.[1,2,5,6]

Best practice

- Identify the at-risk population; maintain a high index of suspicion for delirium.
- Use a standard sedation policy and a sedation scoring system (locally developed or based on national guidelines).[7]
- Use a delirium screening tool (eg the Confusion Assessment Method for the intensive care unit, CAM-ICU) in all patients throughout their critical care stay, in addition to other routine monitoring such as sedation and pain scores.
- Use of a delirium management bundle.[7]
- Prevention is better than cure. Use non-pharmacological and pharmacological interventions as appropriate.

Suggested data to collect

- Patient characteristics, including pre-morbid health, cognitive function and frailty.
- Compliance to the use of a local policy for the management of pain, agitation and delirium.
- Type of delirium screening tool used and frequency of documentation of the presence or absence of delirium in patient records.
- Evidence that CAM-ICU or other delirium screening tool is performed and recorded at the agreed frequency.
- Documentation of the episodes of delirium in patient records.
- Documentation of actions taken based on the delirium assessment tool results.
- Methods of intervention – pharmacological and non-pharmacological.
- Compliance with the use of the delirium management bundle.
- Sleep quality as measured by a subjective (Richmond Campbell Sleep Questionnaire)[8] or objective (polysomnography) methods.

Quality improvement methodology

- Incidence of delirium as defined by the number of patients who are delirious out of the total patients on the unit at any point in time. This can be reported as run charts as per the data.
- Collected from the screening tool used and documentation in patient notes. This could be reported on a monthly or quarterly basis.
- Number of episodes of delirium in individual patients during their stay on the unit.
- Audit tool for the non-pharmacological and pharmacological methods used to prevent and treat delirium.
- Audit methodology to assess sleep patterns of patients and its impact on the incidence of delirium.
- Audit data with regards to the morbidity and mortality outcomes in patients with delirium; duration of mechanical ventilation; length of stay on ICU; length of stay in the hospital; death.
- Follow-up of patients post-discharge from the unit/hospital: 30 days, 90 days, 6 months, 1 year. Multidisciplinary team and patient groups should discuss impact and measures to reduce the incidence of delirium and improve patient quality of life post-discharge.

Mapping

GPAS 2020: 2.3.20, 2.5.19, 3.3.2, 4.3.23, 5.3.8, 10.9.2, 16.9.4
GPICS 2019: 4.12

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9.2 Venous thromboprophylaxis on the critical care unit

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Why do this quality improvement project?

Venous thromboembolism (VTE), which includes phenomena such as deep vein thrombosis (DVT) and pulmonary embolus, can affect any branch of the venous system. It is estimated that the incidence of VTE in patients of European origin is similar to that of stroke. VTE is relatively common and is associated with reduced survival and substantial healthcare costs.[1] Thirty per cent of patients who have experienced a VTE can expect to have a recurrence within 10 years. Adjusted mean predicted costs for patients with VTE are approximately 2.5 times higher for hospitalised patients than for those with a diagnosis of active cancer.

It is estimated that up to one in four hospital inpatients judged to be at risk will develop a DVT, with patients on the critical care unit (CCU) being at particular risk. Without appropriate preventative measures, the incidence of VTE can be as high as 50%. Pulmonary embolus is the third most common cause of death in patients after day 1.[1–3] Ensuring that acknowledged preventative measures are effectively and consistently implemented will increase patient safety and improve patient experience by reducing occurrence, morbidity and length of stay, and may also reduce costs and free up resources.

Background

While there may be some degree of hereditary influence on the incidence of VTE, clot formation is generally associated with circumstances that increase blood coagulability, impair blood flow and cause inflammation of the endothelium. Patients who are on the CCU may be at particular risk and may also experience VTE associated with indwelling devices (eg central venous catheter). The National Institute for Health and Care Excellence (NICE) and other authorities have therefore made specific evidence-based recommendations regarding VTE prophylaxis in the CCU population to reduce the risks of VTE formation.[4,5]

Best practice

- All hospital inpatients should undergo a VTE risk assessment on admission and then again on first consultant review or within 24 hours.
- Once classified into high or low risk, patients should receive appropriate prophylaxis, which will include compression stockings, mechanical compression devices and low molecular weight heparin (LMWH). There are separate recommendations related to patients with specific conditions (eg spinal injury, stroke).
- NICE also recommends that patients admitted to CCU undergo a separate VTE/bleeding risk assessment on admission to the unit and at least daily thereafter.[4,5]
- LMWH should be standard prophylaxis for patients admitted to CCU and should be commenced within 24 hours of admission if not contraindicated.[3] Exceptions include, but are not limited to, patients fully anticoagulated by other means, patients with heparin allergy or reactions (heparin-induced thrombocytopenia) and active bleeding. Where exceptions to standard prophylaxis have occurred, the reasons for them should be clearly recorded in the notes to avoid confusion. LMWH prophylaxis should continue for at least seven days. Patients in the last days of life do not require VTE prophylaxis.[4]
- Compression stockings are not recommended for CCU patients because of problems with skin viability and circulation, although other mechanical compression devices may be indicated in some patients if pharmacological prophylaxis is not possible. Mechanical prophylaxis should continue until 'normal mobility' has resumed.

Suggested data to collect

- All inpatients having a VTE assessment completed on admission to hospital and at 24 hours or first consultant review.
- All patients admitted to CCU having a separate VTE/bleeding assessment performed with a daily assessment performed thereafter.

- All patients admitted to CCU are commenced on LMWH prophylaxis or an alternative if LMWH is contraindicated.
- LMWH is prescribed and given within 24 hours of admission unless contraindicated.
- LMWH is continued for at least seven days.
- Platelet count is monitored regularly for heparin-induced thrombocytopenia if LMWH is prescribed (100%).
- If mechanical prophylaxis is deemed to be appropriate, it is started on admission to CCU and continued until normal mobility has been resumed.
- Where there has been an exception to standard prophylaxis, it is recorded clearly in the records.
- If regional anaesthesia has been administered, LMWH dose is timed to minimise the risk of complications such as epidural haematoma in relation to insertion and removal of catheter (100%).
- Patients in the last days of life are not given DVT prophylaxis. Where it is administered, it is reviewed on a daily basis.
- On discharge from critical care, the continued requirement for thromboprophylaxis is assessed, with consideration of continuing risk factors.

Quality improvement methodology

- The hospital should have a mechanism for capturing VTE incidents across its hospitals. Specific quality improvement projects can be tailored to CCU practice using NICE audit tools.[4]
- A simple retrospective analysis of the records of all patients on the CCU during a particular time period will produce repeated snapshots of current practice. Prospective and contemporaneous data collection may identify and address non-compliant practice.
- Exceptions to best practice should be identified and analysed for learning points.
- If educational and practice development events are held, this analysis could be used with plan-do-study-act methodology to see whether compliance with best practice recommendations is improved and maintained. Run charts can clearly demonstrate the effectiveness or otherwise of interventions on compliance.

Mapping

ACSA standards: 1.1.1.3, 1.2.1.4, 1.2.1.6
Curriculum competences: OA_BK_09, POM_BK_09, POM_BK_33, PR_BK_48, 4.1
CPD matrix codes: 1A01, 1A02, 1E05, 2C01, 3Coo (1A03) (2A10) (3A07)
GPAS 2020: 2.5.17
GPICS 2019: 4.12

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9.3 Glycaemic control in critical illness

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Why do this quality improvement project?

Hyperglycaemia associated with critical illness is a commonly observed phenomenon in critical care. Diabetes is also one of the most common medical comorbidities in our UK population. We know that critically ill medical and surgical patients who are hyperglycaemic have a higher mortality rate than those who are normoglycaemic.[1,2]

Background

Hyperglycaemia in critical illness (also called stress hyperglycaemia) is a consequence of insulin resistance coupled with increased cortisol, catecholamines, glucagon, growth hormone, gluconeogenesis and glycogenolysis.[3,4] There is a wealth of evidence from many different patient populations which demonstrates that hyperglycaemia is associated with poor clinical outcomes in critically ill patients.

Best practice

Most clinicians accept that prevention of uncontrolled hyperglycaemia is desirable. However, the optimal blood glucose range is controversial and, as yet, there are no current fixed national standards or guidelines. What we do know is that, in mixed adult populations of critically ill medical and surgical patients, hyperglycaemia is associated with poor clinical outcomes,[1,2] yet tight glucose control (4.4-6.1 mmol/l) using intensive insulin therapy is thought to have no mortality benefit and a significant increased frequency of hypoglycaemia.[5] Therefore, an aim of maintaining a more liberal target blood glucose level of 7.5-10 mmol/l is encouraged.[6,7] This range avoids marked hyperglycaemia, while minimising the risks of hypoglycaemia.

Based upon the available evidence, the best practice for general adult intensive care would appear to be that:

- hyperglycaemia is defined as a blood glucose level greater than 10 mmol/l
- the routine use of intravenous fluids containing glucose is minimised
- insulin should be administered when blood glucose levels are persistently elevated (greater than 10 mmol/l for over six hours)
- short-acting insulin should be used and delivered to target blood glucose levels of 7.5–10 mmol/l
- if intravenous insulin therapy is required, the patient must also be receiving some form of carbohydrate intake (either enterally fed, total parenteral nutrition or intravenous dextrose)
- if intravenous insulin is delivered through a peripheral cannula then we recommend running intravenous insulin and dextrose together to prevent inadvertent hypo/hyperglycaemia if a cannula fails
- careful monitoring of blood glucose is essential to achieve glycaemic control while avoiding the potential harmful effects of hypoglycaemia.

Suggested data to collect

- Percentage of critical care patients who have their blood sugars measured and documented at least four times per day.
- Percentage of people in whom a variable rate intravenous insulin infusion is initiated when indicated.
- Percentage of patients who receive hourly monitoring of blood glucose levels once started on intravenous insulin.
- Percentage of time that patients on a variable rate insulin infusion have their blood glucose levels kept between 7.5-10 mmol/l.
- Percentage of patients that are on a variable rate insulin infusion in critical care that have an appropriate documented handover upon transfer to different ward or medical area.
- Percentage of patients that suffer hypoglycaemia less than 4.0 mmol/l while receiving insulin therapy.

Quality improvement methodology

Correct identification and prescribing of variable rate intravenous infusion of insulin in patients with hyperglycaemia

- What is the most reliable point to prescribe variable rate intravenous infusion of insulin (VRIII) and by whom?
- Can the prescription be standardised or preprinted to minimise prescribing errors?
- How can the plan be communicated most accurately throughout their critical care stay?
- How can the plan for termination of VRIII or the switch to another form of insulin be communicated to and carried out accurately by the nursing staff?

Correct monitoring of blood glucose:

- Look at the documented blood glucose levels from admission to discharge from critical care.
- Look for parts where the glucose monitoring is often missed or fails to meet the recommended frequency standard. Are there any patterns? Which members of staff are present at this point? How can they be prompted to measure glucose appropriately?

Compliance with set blood glucose targets

- Was hyperglycaemia correctly identified and managed? Consider adding to checklist of daily goals process. Consider use of measurement and run charts to inform compliance levels with set targets.

Mapping

Curriculum competences: PA_IK_14, PB_IK_10, PB_IK_15, PB_IK_38, NA_IK_20, PA_IS_07, PM_BS_02, PM_IS_02, PM_IS_03
FICM curriculum 2019 competences: 4.1, 4.8, 4.9
CPD matrix codes: 2C03, 2CO4

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9.4 Management of acute respiratory distress syndrome in adults

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Why do this quality improvement project?

Acute respiratory distress syndrome (ARDS) is a common, life-threatening condition for which many management strategies have been trialled. Ensuring that those treatment approaches with strongly supportive evidence are applied – and that those now known to be harmful, are avoided – will ensure the best outcomes for patients.

Background

ARDS was first described in 1967, and its modern definition is the result of decades of international collaboration and refinement.[1] It is characterised by acute onset inflammation and bilateral pulmonary infiltrates not fully explained by cardiac failure or fluid overload. It may be a consequence of both pulmonary and non-pulmonary primary pathologies and therefore occurs in a wide patient population. The Berlin criteria enable both diagnosis and classification of severity based on the extent of hypoxaemia (PaO2 : FiO2 ratio); mild, moderate and severe ARDS correspond with a mortality of 27%, 32% and 45%, respectively.[2]

Best practice

ARDS has been the subject of a wide variety of randomised controlled trials, systematic reviews and meta-analyses. The ARDSNet paper of 2000 was the first to demonstrate the significant mortality benefit of low tidal volume ventilation (LTVV) and limitation of plateau airway pressures and this has now long been considered the standard of care.[3]

The Faculty of Intensive Care Medicine (FICM) and Intensive Care Society (ICS) Guideline Development Group has produced specific recommendations for the treatment of adults with ARDS.[4] The Guidelines for the Provision of Intensive Care Services (GPICS) are in alignment with these recommendations.[5]

The FICM/ICS guideline contains a figure dividing ARDS management strategies according to the severity (mild, moderate or severe, as per the Berlin criteria) at which it suggests they are implemented. Patients with any degree of ARDS should be subject to LTVV and a conservative fluid strategy. Moderate ARDS should be managed with higher positive end expiratory pressure, neuromuscular blocking agents for the first 48 hours, and/or prone positioning for at least 12 hours a day. In severe ARDS, referral to a severe respiratory failure centre is recommended if certain criteria are met, for consideration of superspecialist techniques such as extracorporeal membrane oxygenation or extracorporeal carbon dioxide removal. Other treatments studied and not recommended are high-frequency oscillatory ventilation, corticosteroids and inhaled vasodilators.

Suggested data to collect

Standards	Measures
More than 95% of patients must have an accurate height measured on admission, to calculate ideal body weight and appropriate tidal volumes.	■ Measurement of height.
Over 95% of patients with or at risk of ARDS must be ventilated at tidal volumes of up to 6 ml/kg ideal body weight.	■ Tidal volume.
Over 95% of patients with or at risk of ARDS must be ventilated at plateau airway pressures 30 cm H2O or lower.	■ Plateau airway pressures.

Quality improvement methodology

- Consider how to improve consistency of delivery of prescribed tidal volume by incorporation into ventilator care bundle, and daily goals checklist.
- Measure compliance with regular audit and use of run chart.

Mapping

Curriculum competences: (ICM module) 3.8, 4.6, 7.3
CPD matrix codes: 1A01, 1A02, 2A05, 2A12, 2C02, 2C04, 3C00
GPICS 2019 standard: 4.1.2, 4.2

References

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9.5 Monitoring and targeting mean arterial pressure

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Dr Ian Rechner, Royal Berkshire Hospital

Why do this quality improvement project?

Blood pressure control in the intensive care unit (ICU) and the maintenance of a certain mean arterial pressure (MAP) is one of the main reasons requiring admission to the ICU. In addition, there is increasing evidence in the literature that clinical outcomes are dependent on targeting a certain MAP, although more research is needed.

Background

Shock is a life-threatening condition of circulatory failure that most commonly presents with hypotension. The effects of shock are initially reversible but can rapidly become irreversible, resulting in multiple organ failure and death. If a patient presents with undifferentiated hypotension and is suspected of having shock, it is important the cause is identified and the hypotension managed to prevent multiple organ failure and death.[1]

There are several different clinical situations that require explicit blood pressure targets. In critical care, this includes the septic patient, with and without pre-existing renal impairment, haemorrhagic shock and the patient with a head injury. Current guidelines in the trauma patient are to keep the systolic blood pressure greater than 90 mmHg, but this is in the prehospital setting and prior to control of haemorrhage. In the patient with an isolated head injury and the absence of haemorrhagic shock, a MAP of 80 mmHg or above is recommended.

The largest patient group passing though in the ICU are those patients with septic shock. In the septic patient, the Surviving Sepsis Campaign recommends targeting a MAP of 65 mmHg or above.[2] These recommendations are supported by the SEPSISPAM study, which randomised 776 patients with septic shock to either 80-85 mmHg (high-target group) or 65-70 mmHg (low-target group).[3] There was no difference in mortality at 28 or 90 days between the two groups.[3] Aiming for a higher blood pressure in the critically ill patient is associated with an increased incidence of supraventricular arrhythmias.[4]

Best practice

Standards are set according to the Surviving Sepsis Campaign for the septic patient, where a MAP 65 mmHg or above is recommended,[2] although supplementary fine tuning for individual patients may include surrogate assessment of end-organ perfusion such as determination of a threshold MAP for maintaining urine output.

Standards for traumatic brain injury according to the Brain Trauma Foundation are systolic blood pressure 100 mmHg or above for patients 50-69 years of age or at 110 mmHg or above for patients 15-49 years or over 70 years.[5]

Currently, best evidence recommends:

- Septic patients on inotropes should have a MAP 65 mmHg or above within two hours of admission to ICU.
- Septic patients on inotropes should maintain a MAP of 65-75 mmHg during their stay on ICU.
- Patients should have a recorded targeted MAP in their twice-daily reviews.

Suggested data to collect

- Percentage of patients admitted to ICU with sepsis with a MAP 65 mmHg or above within two hours of admission.
- Percentage of septic patients on inotropes who have achieved the target MAP 65 mmHg or above and 75 mmHg or above on twice-daily ICU reviews for each day of their stay on ICU.
- Percentage of patients with a documented target MAP on twice-daily ICU reviews for each day of their stay on ICU.
- Percentage of patients with traumatic brain injury who achieve a cerebral perfusion pressure of 60-70 mmHg. There should be a documented target MAP in the twice-daily review to achieve this cerebral perfusion pressure.

Quality improvement methodology

Process map the management of blood pressure during a patient's journey from acceptance of referral to discharge from ICU:

- What ICU capacity is available and what happens when demand exceeds capacity?
- Which health care workers are involved with admissions?
- Who sets the MAP target and when?
- Who inserts the appropriate monitoring and are there delays in this process?
- What medication is used to achieve a certain blood pressure and how is this provided, made up and prescribed?
- What measures are in place to ensure that recordings are accurate and reproducible?
- Is further training required in the use of ultrasound, management of central and arterial line?
- Is availability of equipment, such as ultrasound, optimal?
- Is a peripheral vasoconstrictor appropriate if MAP target unlikely to be achieved within two hours?

Run charts may be helpful to visualise progress with compliance over time:

- Are critical care nurses able to adjust inotropes?
- What is the locally agreed policy for confirmation of central line insertion?
- Is a chest x-ray required prior to starting inotropes? Are there delays in achieving this?

Mapping

ASCA standards: 4.2.1.1, 4.5.1.1, 4.1.0.5, 1.1.1.12, 1.3.3.1, 2.1.1.6, 2.2.3.2

FICM curriculum competences: 1.1, 1.4, 1.5, 2.7, 3.3, 3.9, 3.11, 4.3, 4.4, 5.8, 5.10

GPAS 2020: 3.2.22, 3.2.23, 3.3.32, 3.3.8, 5.2.4, 5.2.15, 7.3.13, 7.3.18, 16.2.25, 18.2.3

GPICS 2019: 4.6

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9.6 Monitoring of oxygen therapy and physiological targets

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Why do this quality improvement project?

Oxygen is delivered to many patients within the intensive care unit (ICU), but too much oxygen is associated with poorer outcomes in the acutely unwell patient and this therapy must be carefully monitored. There are outcome data for several patient groups, which have been linked to patient peripheral capillary oxygen saturation (SpO_2) as the main outcome measure as opposed to method of oxygen delivery device.

Background

A systematic review and meta-analysis looking at mortality and morbidity in 16,073 acutely ill adults treated with liberal versus conservative oxygen therapy suggested that SpO_2 greater than 94-96% might be deleterious at 30 days.[1] It is also well established that patients with chronic obstructive pulmonary disease (COPD) should receive oxygen therapy to achieve a SpO_2 target of 88-92%.[2]

Although supplemental oxygen is valuable in many clinical situations, excessive or inappropriate supplemental oxygen can be deleterious. According to human and animal studies, high concentrations of inspired oxygen can cause a spectrum of lung injury, ranging from mild tracheobronchitis to diffuse alveolar damage. The latter is histologically indistinguishable from that observed in the acute respiratory distress syndrome.[3]

Saturation monitoring is a continuous variable and in a 24-hour period, with a heart rate of 70 beats/minute, there will be 100,800 readings. This measurement is subject to artefact and currently, in most clinical practice, there are 24 recorded data points in the ICU, with hourly observations. It is practically easier to set a target SpO_2 as opposed to partial pressure of arterial oxygen (PaO_2), as the former is much easier to measure continuously and a patient's PaO_2 can easily alter within minutes.

Best practice

Currently best evidence recommends:

- If SpO_2 greater than 96%, then wean oxygen to the lowest possible FiO_2 until able to remove.
- If SpO_2 greater than 93%, do not start oxygen therapy.
- All other acutely unwell patients requiring oxygen therapy the target SpO_2 should be greater than 90%.[4]
- In patients with a diagnosis of COPD the target SpO_2 should be 88-92%.

Suggested data to collect

- Percentage of patients with a documented target saturation on twice-daily ICU reviews, for each day of their stay on ICU (standard: 100%).
- Percentage of patients who have achieved the target SpO_2 on twice-daily ICU reviews, for each day of their stay on ICU (standard: 100%).
- The following three standards are best assessed by taking measurements at a set time each day on the ICU. During this chosen time, it is important to ensure there is a good SpO_2 trace.
- Percentage of patients with a SpO_2 of greater than 96% receiving oxygen therapy at the chosen time, each day during their stay on ICU (standard: 0%).
- Percentage of patients with a SpO_2 of greater than 93% commenced on oxygen therapy during the chosen time, on any day during their stay on ICU (standard: 0%).
- Percentage of patients with a diagnosis of COPD on oxygen therapy with a SpO_2 of 88-92%, during the chosen time on any day during their stay on ICU (standard: 100%).

Quality improvement methodology

Correct documentation of target and achieved oxygen saturation

Process map the documentation and daily reviews:

- Are all patients on ICU reviewed twice daily by a consultant intensivist?
- Do all intensivists agree to follow current best practice guidelines for oxygen saturation?
- What is the best point during the review when SpO_2 (target and achieved) can be documented?
- Is there a way of prompting the reviewing intensivist to review this?

Correct oxygen prescribing practice

Process map a patient's journey through ICU, from admission to discharge:

- Who sets the oxygen saturation target on admission to ICU?
- When and why is oxygen therapy changed?
- Is there an oxygen prescribing protocol for all ICU patients? Does it include a flow diagram which is easily interpretable by the bedside healthcare worker?
- Which healthcare workers are involved in titrating oxygen therapy, either in response to various therapies or progress of disease?
- How is SpO_2 recorded? Is it continuous?
- Are alarms set to the correct limits to prompt health care workers to titrate oxygen therapy appropriately?
- What is needed to deliver oxygen therapy, what monitoring is available and methods of recording these. Use run charts to visualise improvements.

Mapping

ACSA standards: 1.1.1.9, 1.4.1.1, 1.4.2.4, 4.1.2.1, 4.2.2.1, 4.2.2.2,
GPICS 2019: 2.7, 3.8, 4.1, 5.1

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9.7 Renal replacement therapy in critical care

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Why do this quality improvement project?

Renal replacement therapy in critically ill patients is a complex, resource-intense therapy with potential harm to patients. It is important that this therapy is delivered safely, effectively and efficiently to the right patients.

Background

Acute kidney injury has been defined by the Kidney Disease: Improving Global Outcomes group.[1] Conventional indications of emergency renal replacement therapy include hyperkalaemia, hyperuraemia, acidaemia, fluid overload and for the removal of small and water soluble toxins.[2] The need for renal replacement therapy in critically ill patients occurs in up to 60% of intensive care admissions and is associated with a mortality rate of 15-60%.[3]

Most commonly, renal replacement therapy is delivered in critical care units by continuous venovenous therapies and can be subdivided according to the modality of solute clearance: convective haemofiltration (CVVH), osmotic dialysis (CVVHD) or a combination of these (CVVHDF).

Intermittent vascular and peritoneal renal replacement therapies are usually administered to stable patients by dedicated renal therapy services and are not covered in this quality improvement project.

Various clinical trials have attempted to provide empirical evidence to guide clinical care with regards to timing of initiation, mode of delivery, dose of therapy, types of extracorporeal circuits and filters and anticoagulation method.

Best practice

Best practice has not been proven by evidence or agreed upon by expert consensus.[3,4] It is difficult to define best practice or standards as equipment from different manufacturers are intended for use in different ways.

Based upon the available evidence, the best practice for general adult intensive care would appear to be:

- initiation of renal replacement therapy according to conventional indications and not earlier (KDIGO stage 2 or 3 for example)
- delivery of renal replacement therapy by CVVH or CVVHD for safety and efficacy
- dose of therapy, defined by the effluent production rate, of approximately 25 ml/kg/hour, as higher doses do not appear to have greater efficacy but will be more costly
- anticoagulation by citrate appears to be more efficacious and cost efficient compared with heparin.

Suggested data to collect

Structure

- Critical care units should have a lead consultant and nurse for renal replacement therapy.
- Critical care units should have a policy to standardise the delivery of renal replacement therapy.
- Percentage of critical care staff that are trained in the management of emergencies associated with renal replacement therapy (target greater than 50%).

Care processes

- Mean filter lifespan (target greater than 30 hours); most brands are licensed for up to 72 hours use.
- Mean downtime (target less than 25%); this is the percentage of time without effective blood circulation through a filter during a period of therapy.
- Mean effluent dose delivered per episode of renal replacement therapy (target 20-30 ml/kg/hour).

Outcomes

- Percentage of patients that require blood transfusion as a consequence of bleeding from the extracorporeal renal replacement therapy circuit (target less than 5%).
- Percentage of patients that have a confirmed deep-vein thrombosis or pulmonary embolism caused by the venous catheter (target less than 5%).
- Percentage of patients with a confirmed catheter-related blood stream infection caused by the venous catheter (target less than 5%).

Quality improvement methodology

- Assessment of the quality indicators relating to structure of care can be achieved through review of department policies and case review. Is the departmental policy being followed? Are renal replacement therapy orders (prescriptions) clear and appropriate?
- Many renal replacement therapy machines will save numerical data that can be interrogated by company representatives. This can provide average filter lifespan, downtime and delivered effluent dose for assessment against care process indicators with very little effort. Excessive downtime can be due to problems with

venous catheters, anticoagulation, blood pump speed, fluid exchange rates and filter type. An iterative process of optimisation through plan-do-study-act cycles can improve each component and overall patient care.

- Continuous surveillance of negative outcome measures can be achieved through incident reporting and investigation. Root cause analysis methodology with chronological details can often identify substandard care and contributory causes for events.[5] A 'five whys' investigation can assist with identifying the modifiable underlying factors, which can be mapped on a Fishbone Kawasaki diagram.[5]

Mapping

Curriculum competence: PC_IK_21
FICM curriculum 2019: 3.4, 4.7
CPD matrix code: 2C04
GPICS 2019: 1.5.12, 4.3

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9.8 Sedation, scoring and management on critical care

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Why do this quality improvement project?

There has been a shift in the emphasis of sedation practice away from the use of large doses of sedatives to the idea of analgosedation. Over-sedation can contribute to hypotension, venous thrombosis, prolonged ventilation, an increased risk for pneumonia and a prolonged stay in the intensive care unit (ICU), with an increasing burden on staff, bed availability and associated costs.[1,2]

Background

The sedative regimen must be tailored to the individual patient, necessitating a multimodal and multidisciplinary approach and does not simply involve the use of drugs.

Indications for the use of sedative drugs in the ICU include:

- to alleviate pain
- to facilitate the use of an otherwise distressing treatment and minimise discomfort (eg tolerance of endotracheal tubes and ventilation)
- to augment the effectiveness of a treatment (eg inverse ratio ventilation)
- as a treatment in its own right (eg seizure control or management of intracranial pressure)
- to reduce anxiety
- to control agitation
- for amnesia during neuromuscular blockade.

This document is not meant to be a rigid framework but provides information around which clinicians may build their own sedation protocols. It is intended for all groups of ICU patients, including specific patient groups such as those with neurological injury, burns, cardiac and liver conditions.

Best practice[3,4]

- To develop a multidisciplinary, structured approach for managing sedation and analgesia in the ICU.
- Perform patient assessment and optimise the ICU environment.
- Regularly perform and document structured patient evaluation and monitoring.
- All sedated patients should have a daily sedation plan and Richmond Agitation Sedation Score target.
- Select analgesic and sedative medications based upon individualised needs, drug allergies, organ dysfunction(hepatic/renal dysfunction), need for rapid onset and offset of action, anticipated duration of therapy and prior response to therapy.
- Titrate analgesic and sedative drugs to a define target, using the lowest effective dose.
- Implement a structured strategy to avoid accumulation of medications/metabolites: use scheduled interruptions or intermittent dosing of analgesic and sedative drugs.
- Recognise and take steps to ameliorate analgesic and sedative drug withdrawal during de-escalation of therapy.

Suggested data to collect

- Use of sedation guidelines for indications, duration and individualised targets used.
- Type of sedative medications used and their implications.
- Method of sedation scoring system used and its use on a daily basis by the medical and nursing staff.
- Practice and recording of daily sedation hold strategies.

Quality improvement methodology

- Assessment of compliance with sedation guidelines, scoring system and recorded daily sedation hold.
- Audit the use of specific sedation agents with defined target sedation score.
- Sedation hold strategies – compliance and acceptance, education programmes and safety concerns.
- Monitoring compliance with sedation hold in the context of a ventilator care bundle.
- Use of weekly/fortnightly collection of these data, which can be displayed on run charts and interventions and changes can be tracked with this data.
- Impact of following sedation guidelines and sedation holds on morbidity and mortality, particularly reduction in the number of days on mechanical ventilation, length of ICU stay and incidence of delirium.

Mapping

GPICS 2019: 4.1, 4.2, 4.12

References

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9.9 Performance and management of tracheostomies on the critical care unit

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Why do this quality improvement project?

The use of tracheostomy in the management of patients in critical care has increased in recent years. The National Tracheostomy Safety Project has created guidelines to standardise the way in which tracheostomies are both performed and managed to reduce complications, many of which are associated with common misconceptions and communication failures.[1] The care of tracheostomies is governed by established care bundles designed to reduce incidence of complications. The aim of this quality improvement project is to monitor how best practice is being implemented, to identify and address barriers to successful implementation and to embed the guidelines into everyday practice.

Background

Tracheostomies can be performed for a variety of indications and can be temporary or permanent. Over 5,700 surgical tracheostomies were performed in adults in England during 2009/10, along with an estimated 5,000-8,000 percutaneous tracheostomies in critical care.[2] Over the same period, about 570 laryngectomies were performed. As with any procedure, complications may occur immediately during performance (eg haemorrhage) or later (eg infection). The management of certain complications (eg displacement, obstruction) will depend on whether the patient has a patent upper airway or not. A variety of different tracheostomy tubes and insertion kits are available and may differ in their longer-term management need. The National Patient Safety Agency and NCEPOD identified a number of common themes in relation to tracheostomy complications.[1,3]

The National Tracheostomy Safety Project was developed to increase awareness of issues surrounding tracheostomy safety and to standardise best practice around insertion, care and the management of complications.[1]

Methodology

A retrospective audit of tracheostomies performed within a set time frame can be used both to quantify numbers and to identify whether established guidelines and care packages are being implemented. Prospective data collection may take longer, depending on the frequency of tracheostomy insertion, but can include aspects relating to the management of tracheostomies performed outside the critical care unit (CCU). Data collection can be coupled with educational events so that knowledge of practice related to tracheostomy can be consolidated among the multidisciplinary team. This can identify barriers to the implementation of best practice, which can be identified and addressed using a plan-do-study-act methodology.

Suggested data to collect

To determine whether all elements of the tracheostomy checklist are implemented and documented whenever percutaneous tracheostomy is performed.[4]

Performance of tracheostomy at the bedside

Preoperative phase:

- Use of appropriate local safety standards for invasive procedures which follow Intensive Care Society/ Faculty of Intensive Care Medicine guidance, including documentation of indication for procedure, staff present and roles, clotting status, airway management plan, anaesthetic record, equipment checklist.[4,5]
- Appropriate consent has been obtained and documented.

Perioperative phase:

- Time outperformed according to the World Health Organization surgical safety checklist.[6]
- Use of bronchoscopic/ultrasound guidance when appropriate.[7]
- CO_2 monitoring to confirm placement.[7]
- Complications and subsequent management.
- Whether a chest x-ray is required and the findings if one is performed.

Postoperative phase:[8]

- Type of equipment and tracheostomy tube used.
- Postoperative management plan recorded.
- Appropriate equipment to manage an emergency tracheostomy issue is available on the unit.

Is the tracheostomy care package being implemented?

- Analysis of documentation to determine whether the following are regularly implemented:
  - Tracheostomy tube is being properly secured and supported; regular wound care of stoma; regular suctioning; humidification device used; cuff pressure monitored and recorded eight-hourly; regular inner-tube cleaning recorded.
  - Display of appropriate signage at bedside.
  - Tracheostomy weaning and decannulation plan recorded.
  - Type and size of tracheostomy tube is clearly recorded.

Departmental and organisational issues

To determine workload and incidence of issues:

- Total number of tracheotomised patients passing through the CCU.
- Percentage of procedures performed in the unit.
- Percentage of procedures performed in theatre.
- Tracheostomy-associated complications recorded.
- Monitoring staff training in tracheostomy related issues (eg leak, blockage, replacement).
- Training for staff.
- Destination of patients on discharge from the CCU with tracheostomy in place.
- Quality of handover to ward concerning further tracheostomy management.

Quality improvement methodology

- A quality improvement project could be designed using the Model for Improvement framework.[9]
- First identify the what you are trying to accomplish (ie what is the aim of the project) using a SMART (specific, measurable, achievable, relevant, and timely) framework.
- The how do you know that a change is an improvement – what are your measures?
- What can you change to result in an improvement? These are your change ideas.
- Depending on what previous critical incidence have been reported with tracheostomies these findings can be used to make changes.
- Multidisciplinary team involvement is much more likely to make change a success.

Mapping

ACSA standards: 1.3.1.3, 1.3.1.5, 1.3.1.6, 1.4.2.2, 1.4.2.3, 1.4.4.2, 2.1.1.5, 2.1.1.11

CPD matrix codes: 1F01, 2A01, 2A03, 3A01, 3C00

GPAS 2020: 3.2.18, 3.2.25, 3.2.31, 4.2.12

GPICS 2019: 4.1, 4.2

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9.10 Transfusion threshold in the intensive care unit

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Why do this quality improvement project?

Blood transfusion is common in the intensive care unit; around 50% of patients receive a blood transfusion. Recommended thresholds for blood transfusion have changed following evidence that higher transfusion thresholds may confer no additional benefit to patients; indeed they may increase morbidity and mortality.

Background

There are multiple reasons why critically ill patients become anaemic, including repeated blood sampling for laboratory testing. The decision to transfuse a patient is always patient specific and guided by clinical factors that include comorbidities and acute illness. Research has led to the development of recommended transfusion thresholds for patients in intensive care to aid clinical decision making.

In general, a restrictive approach to blood transfusion is now favoured. The TRICC (Transfusion Requirements in Critical Care) trial has shown that the 30-day mortality rate was lower among patients transfused when their haemoglobin concentration dropped below a threshold of 70 g/l than among those with a threshold of 100 g/l.[1] Furthermore, observational studies have shown that red-cell transfusions in critically ill patients increase adverse outcomes, including increased risk of infection, acute respiratory distress syndrome and worsening organ dysfunction.

It is recognised that best practice transfusion thresholds can assist clinicians with decision making, but the decision to transfuse will always be patient specific following consideration of the benefits and risks of transfusion.

Best practice

- The Use of Blood Components and their Alternatives (Association of Anaesthetists).[2]
- Blood Transfusion (National Institute for Health and Care Excellence).[3]
- Guidelines on the Management of Anaemia and Red Cell Transfusion in Adult Critically Ill Patients (British Committee for Standards in Haematology).[4]
- Guidelines for the Provision of Intensive Care Services (Faculty of Intensive Care Medicine/Intensive Care Society).[5]

Suggested data to collect

- Review the case notes of patients who receive a blood transfusion in the intensive care unit:
  - What percentage of patients had a documented transfusion threshold/trigger recorded in the patient record?
  - What percentage of blood transfusions were appropriately administered using best-practice transfusion thresholds (or had a justification why there was variance from the suggested threshold)?
- In stable patients, review the percentage of patients who had blood tests to reassess haematology parameters before requesting further blood transfusions.

Quality improvement methodology

- A quality improvement approach should be used to develop a blood conservation bundle for patients in the intensive care unit, with the aim of decreasing blood transfusions.[6] This approach could include regular review of anticoagulant medications and stress ulcer prophylaxis, guidance on the frequency of blood sampling for individual patients and review of blood volumes being removed during sampling.
- A multidisciplinary approach involves including medical, nursing and pharmacy staff to develop a local approach to blood conservation.
- Improvement techniques may include a local programme of education for staff and checklists/techniques to prompt daily consideration of the need for blood sampling and avoiding unnecessary blood tests.
- The impact of the blood conservation bundle would require evaluation – for example, the impact on changing haemoglobin concentration and the number of blood transfusions.
- Implementation of aspects of the bundle can be displayed to the multidisciplinary team using run charts to monitor progress over time.

Mapping

Curriculum competences: POM_BK_28, POM_BS_12, PR_BK_51, POM_IK_07, POM_IS_10, POM_IS_15, PC_IK_08, CT_HK_09, POM_HK_12, AD_HS_12, GU_HS_03, GU_HS_04, GU_BK_06, GU_BK_07, CI_BK_24, OB_BK_06, IO_BS_09
CPD matrix code: 2A05
GPAS 2020: 5.5.50, 5.5.51
GPICS 2019: 4.12

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9.11 End of life care

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Why do this quality improvement project?

Around 20% of patients admitted to the intensive care unit will not survive hospital admission despite appropriate life-sustaining treatments.[1] High-quality care is a key component of intensive care medicine for patients and their loved ones at the end of life.

Background

A significant proportion of patients in hospital die in intensive care. Most deaths in the unit occur after withdrawal or withholding of life-sustaining therapies when treatment plans have not benefited the patient. This allows time and opportunity to provide high-quality end of life care.

Many patients will not have the ability to express their wishes, values and preferences. Communication with those close to the patient is thus particularly important to better understand the wishes of the patient.

Effective end of life care involves:

- the prompt identification of patients at the end of life
- a shared approach to decision making with treatment and care which align with the patients' values and preferences (including those previously expressed or documented if lacking capacity)[2]
- communication between teams and the patient/loved ones and symptom management.

Best practice

- Guidelines for the provision of intensive care services.[2,3]
- Care of dying adults in the last days of life (National Institute for Health and Care Excellence).[4]
- Good Medical Practice (General Medical Council).[5]
- Treatment and Care Towards the End of Life: Good Practice in Decision Making (General Medical Council).[6]
- Organ donation for transplantation: improving donor identification and consent rates for deceased organ donation (National Institute for Health and Care Excellence).[7]

Suggested data to collect

Review of patient records for those identified as being at the end of their life to assess the percentage of patients where best practice has been implemented and documented, including:

- discussion with the patient about end of life care (where this is possible)
- discussion with those close to the patient about end of life care (where this is relevant and appropriate)
- discussion with the patient's referring team about end of life care (where this is relevant)
- clear management plan agreed and documented at the end of life, including completion of do not attempt cardiopulmonary resuscitation form if appropriate
- prescription of anticipatory medications (according to local guidelines)
- consideration of spiritual and emotional support for the patient and those close to them
- discussion with the specialist nurse for organ donation where appropriate.

Quality improvement methodology

- Draw a process map of the patient pathway from end of life being identified through to (and shortly beyond) death.
- How can this pathway be improved for patients (comparing your existing local processes against best practice in national guidelines? This can be enhanced using the data you collected from local casenote reviews).
- What members of the multidisciplinary team will you engage in this improvement work?
- How will you evaluate the impact of changes to ensure it is improving the quality of end of life care? (P plan–do–study–act cycles will be helpful).
- How will you communicate progress with improving aspects of the pathway to the rest of the team? Run charts are a great way of showing improved performance over time.

Mapping

Curriculum competences: RC_BK_22, NA_IS_08, NA_IK_23, RC_HS_04, MT_HS_06, TF_AS_18, CC_D1_07, CC_D1_08, CC_D10_01
CPD matrix codes: 2C06
GPAS 2020: 5.9.11, 5.9.13, 5.9.16, 5.9.17
GPICS 2019: 3.11

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10 Pain medicine

Edited by Dr Matthew Brown and Dr Manohar Lal Sharma
QI editor Dr Fay Gilder

10.1 Assessment and documentation in acute pain management

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Why do this quality improvement project?

Developing methods to ensure and test the existence of comprehensive and systematic documentation will benefit both the service and patients alike as it will assure both continuity of care and robust clinical governance and provide evidence of the delivery of high-quality holistic care.

Background

Scoring and recording levels of acute pain represents a fundamental facet of many quality assurance methods. These present opportunities for pain teams to make efficiency savings for staff, potentially mitigate expensive legal cases for hospitals and, most importantly, facilitate the best analgesia for our patients either in the perioperative period or during a medical admission.

The availability and use of documentary systems within acute pain services is an excellent topic for quality improvement.

Best practice

Effective and safe acute pain services will be able to demonstrate:

- local protocols defining observations required for specific clinical scenarios
- appropriate maintenance and testing of equipment
- appropriate documentation for charting observations
- completion of documentation – leads to improved pain control[1]
- competency of staff
- provision of patient information of sufficient standard
- evidence of reporting, analysing and preventing adverse incidents.

These service features are detailed in the Faculty of Pain Medicine's Core Standards for Medicine Services in the UK and incorporate good medical practice.[2]

Suggested data to collect

Preoperative phase indicators (if appropriate)

1. The percentage of patients for whom a perioperative acute pain management plan is created at the preoperative assessment clinic.
2. The percentage of patients whose perioperative acute pain management plan is documented in an accessible manner in the clinical notes.

Inpatient acute pain management indicators

1. Protocols should be specific to the techniques used and based on the highest level of recent evidence that is available.
2. Any protocols should have appropriate document control measures in place (have been reviewed and accepted by relevant institutional body, have version number, be dated and have a date for review).
3. Where relevant (ie post nerve or neuraxial block), there should be an agreed and unique formal arrangement for recording the directions of the anaesthetist, together with contingency recommendations for action.
4. Clinical data for pain and analgesia and its adverse effects may be combined with other observation parameters to reduce duplication, but the directions must be explicit. The type and frequency of observations required should be clear. Pain scores should be appropriate to patient culture, language and development and take into account cognitive and emotional states.[1]
5. Other documents – a clear, concise operating manual should be available (and easily located) for each piece of equipment that is used (ie patient anaesthesia pump).
6. A robust process should exist and be used to report and investigating pain-related adverse events. Evidence of documentation of action regarding adverse incident reports should exist – this should align with local organisation policies.

Quality improvement methodology

Preoperative phase

The process by which a pain management plan is instigated (ie by whom and when) and then implemented can be identified using a process map. This requires mapping the existing pathway to identify the problems and then create an aim statement/driver diagram/measures of success (process and outcome) and balance. All stakeholders should be involved in the mapping and ideation process to capture a wide range of improvement ideas

Inpatient acute pain management

Indicators 3 and 4 would suit a process mapping approach as suggested for the preoperative phase, mapping out how, when and by whom recordings should be made and what recordings should be made, for each pain relief modality.

The modality addressed could be prioritised using the impact/effort matrix. The process map can be used to identify and prioritise challenges in the existing pathway.

The stakeholders can then decide on an aim, create a driver diagram and test ideas using plan–do–study–act methodology. Process, outcomes and balancing metrics must be agreed prior to any methodology employed and plotted using a statistical process control chart.

Overview of pain documentation in organisation

Establish a log of all areas of documentation for all aspects of pain in your organisation. For example, this could include electronic prescribing systems, paper-based drug charts or post-intervention order sheets as well as patient information sheets and pain-related content on the organisation's web site. There should be a process of who is responsible of keeping this information up to date.

Mapping

ACSA standards: 1.1.1.2, 1.4.1.2, 1.4.4.2, 1.2.2.1, 1.2.1.6, 1.4.2.1, 1.4.4.1, 1.4.4.2, 1.4.5.3, 1.4.5.4, 1.1.1.7, 2.1.1.13, 2.3.1.1, 2.3.1.2, 3.1.2.2, 4.2.1.1, 4.2.1.2, 4.2.2.1

Curriculum competences: PM_AK_14, PM_AK_15, PM_AK_16, POM_AS_08,

CPD matrix codes: 1D01, 1D02, 3E00

GPAS 2020: 11.5

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10.2 The use of gabapentinoids in the perioperative period

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Why do this quality improvement project?

The use of gabapentinoid agents (pregabalin and gabapentin) in the perioperative period has increased, driven both by the desire to minimise opioid intake and interest in using these agents to reduce the occurrence and severity of both acute and persistent post-surgical pain.[1] This improvement project aims to ensure that an organisation-level appreciation of the volume of perioperative gabapentinoid usage exists, as well as to stimulate the development and implementation of processes to ensure responsible, safe and effective prescribing of these agents. This is an important area, as there is increasing interest in the potential for abuse of these drugs and the rescheduling of gabapentinoids in April 2019 to controlled-drug status.

Background

A number of guidelines from learned bodies such as the American Pain Society and the Australian and New Zealand College of Anaesthetists have been published, which advocate a multimodal approach to perioperative pain control.[2,3] Gabapentinoids feature as a potential component in these guidelines. These guidelines do not provide specific instructions on optimal dosing, drug choice (gabapentin or pregabalin), monitoring of effect and adverse effects and duration of treatment.

Gabapentinoids have a range of clinical uses, including as anticonvulsants and anxiolytics and as treatment for (predominantly chronic) pain. However, gabapentinoids do present an abuse risk, more commonly in those patients with a history of previous aberrant opioid use, as well as having some addictive potential and so rigorous stewardship of these drugs is important.[4,5]

Best practice

Robust and actionable policies should be in place to identify patients who may potentially benefit from the use of these drugs in the perioperative period, to ensure that appropriate review is undertaken while the patient is receiving the drug and to facilitate weaning and termination of the drug in the postoperative period. These measures contribute to a measured and considerate deployment of these agents and help to safeguard against indiscriminate use (where supportive clinical evidence may be poor) and appropriate weaning in the postoperative period.

Suggested data to collect

Preoperative phase:

- Define the preoperative process for selecting patients. How are those patients at risk of developing severe acute pain or persistent post-surgical pain (ie those patients with anxiety, depression or catastrophising, pre-existing pain or opioid or anti-neuropathic agent consumption)?
- Types of surgical procedure that patients who are 'gabapentinoid appropriate' are undergoing.
- Number of patients per annum being prescribed gabapentinoids within the organisation.
- Provision of written information on the potential adverse effects and rationale for use of gabapentinoids (this could comprise part of a perioperative pain plan agreed with the patient) with documentation in the notes.

Operative phase:

- Aim to understand the frequency the factors contributing to inappropriate gabapentinoid use. Establish the percentage of people in whom a perioperative gabapentinoids is appropriately used. This includes starting when indicated only and correct administration of prescribed doses on day of surgery.
- Percentage of patients who receive gabapentinoids as prescribed in the perioperative period.

Postoperative phase:

- Percentage of patients receiving gabapentinoids not reviewed by the acute pain team or anaesthetist to identify potential adverse effects (standard: 0%).
- Percentage of patients who continue receiving a gabapentinoid following discharge when it should have been stopped (standard: 0%).

Quality improvement methodology

Correct planning and prescribing of gabapentinoid for perioperative use

- Draw out a process map of the patient journey from preassessment to postoperative ward care:
  - What is the most reliable point to make the perioperative plan and which staff members should make it? A plan-do-stud-act (PDSA) cycle may aid this process.
  - What is the most reliable point to prescribe gabapentinoids and who should prescribe them?

  - Can the prescription be standardised or preprinted to minimise prescribing errors? Run a PDSA cycle with a pilot group.
  - How can the plan be communicated most accurately across the admission phases and to the patient?
  - How can the plan for termination of gabapentinoids be communicated to and carried out accurately by the ward staff or following discharge? Patient and carer involvement would enrich this process.
- Define the preoperative process for selecting patients. Collect baseline data to understand how the process is working and where potential gaps exist.
- Once the gaps have been identified, use a Pareto chart to understand which are the most commonly occurring gaps.
- An effort impact matrix could also be used to prioritise which gap or issue to address first.
- To address the gap, a SMART (specific, measurable, achievable, relevant, time-bound) aim is required. Measures (process, outcome and balancing) must be agreed and these data collected as a baseline.
- A driver diagram can be used to describe what drivers contribute to the aim. Drivers are sources of improvement ideas. Ideas should be tested using rapid-cycle PDSA (ideally each lasting two weeks).
- Statistical process control charts can be used to understand the impact of each improvement idea.

Correct prescribing of gabapentinoids

- Look at the process map from admission to the postoperative ward stay identifying areas where pregabalin prescribing is often missed.
- Use a 'five whys' or fishbone diagram to identify which members of staff are involved in this process.[6,7]
- A driver diagram for ideas could then be followed by a PDSA cycle created by stakeholders involved in this process, which could be used to prompt the appropriate prescribing of gabapentinoids.

Mapping

ACSA standards: 1.1.1.2, 1.4.1.2, 1.4.4.2, 1.2.1.1, 1.2.1.3, 1.2.1.4, 1.2.2.1, 1.4.5.1, 1.4.5.3

Curriculum competences: POM_HK_01, POM_HK_04, POM_HK_05, POM_HS_05, POM_HS_06, POM_HS_17, PM_HK_02, PM_HS_06

CPD matrix codes: 1A02, 1D01, 1D02, 1I05, 2E01, 3E00

GPAS 2020: 11.2.5, 11.2.6, 11.4.2,11. 5.2, 11.5.6, 11.5.7, 11.9.1, 11.9.2, 11.9.3

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10.3 Non-medical prescribing for pain management

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Why do this quality improvement project?

Prescribing by non-medical healthcare professionals was developed to improve access to treatments and patient care, and to use resources more effectively. Non-medical prescribers are an ever-expanding workforce, who play an increasing role in the modern NHS. This quality improvement project aims to establish the scope of activity by non-medical healthcare professionals and improving individual performance.

Background

Prescribing by non-medical healthcare professionals has increased over the 2000s. Since 2006, nurse independent prescribers have been able to prescribe any medicine for any medical condition within their competence, which now includes most controlled drugs.[1] Non-medical prescribers and doctors consider that patients accessing non-medical prescribing receive higher-quality care, with greater choice and convenience.[2] Working with non-medical healthcare professionals can improve teamwork and either reduce doctor workload or free up time to spend on more acute patient cases.[3]

Non-medical healthcare professionals report that the authority to prescribe increases their job satisfaction and self-confidence, makes them more independent and enables better use of their skills.[4] They have also reported feeling that it enhances their relationships with patients.[5] As an alternative to independent prescribing, nurses, pharmacists and a range of allied health professions may use supplementary prescribing, which requires a voluntary prescribing partnership between an independent prescriber (doctor or dentist) and a non-medical prescriber to implement an agreed patient-specific clinical management plan with the agreement of the patient.

Best practice

Best practice for non-medical prescribing is dictated by the legal framework under which it was developed and the prescribing competency framework.[1,6] All non-medical prescribers must prescribe only within their own area of competence.

Suggested data to collect

Prescribing activity

- Total number of items prescribed and number of prescriptions written over a predetermined period.
- Proportion of medicines prescribed by a non-medical prescriber within their own personal formulary during a predetermined period.

Prescribing competence

- Adherence to local policies and personal formulary (independent prescribing scope of practice).
- Adherence to regulatory body's requirements (Royal Pharmaceutical Society, Royal College of Nursing, Health and Care Professions Council) for continuing professional development supporting registration and prescribing competence.

Supplementary prescribing

- Is a clinical management plan available for each patient?
- Is the clinical management plan specific for each patient?
- Is each clinical management plan completed fully?
- Is each clinical management plan legible?
- Proportion of patients reviewed by a medical practitioner within the last 12 months.

Quality improvement methodology

Prescribing practice

- One of the methods of assessing one's own performance is to carry out activity log sampling. A review is carried out to assess the appropriateness of prescriptions for 10% of patients over the previous month. This is then discussed with colleagues and supervisors to measure one's own performance against that of others and to set standards.
- Using a 'five-whys' analysis, causes of poor quality of care can be explored.[7]

Patient-focused care

- Looking at patient satisfaction surveys and having patients as major stakeholders in any service improvement work will help to identify areas for improvement.

Mapping

ACSA standards: 1.2.2.1, 1.4.1.2, 1.4.5.1, 1.4.5.3, 2.2.1.1
Curriculum competence: PM_AK_14
CPD matrix code: 3E00
GPAS 2020: 11.1.1, 11.1.4, 11.1.6, 11.2.9, 11.2.10, 11.4.1, 11.4.2, 11.4.3, 11.4.4, 11.4.6, 11.5.4, 11.5.5,11.5.6, 11.5.7, 11.5.10, 11.7.1

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10.4 Managing epidural analgesia

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Why do this quality improvement project?

Epidural analgesia remains integral to many enhanced recovery pathways,[1] but one-third of patients fail to gain effective analgesia,[2] a fact that must be weighed against the possible serious complications that may occur with epidural insertion.[3]

Background

Continuous epidural analgesia can offer excellent pain control following, for example, major intra-abdominal or intrathoracic surgery and it has been suggested that in some circumstances it may reduce the rate of chronic post-surgical pain.[4] However, despite studies such as the Third National Audit Project in 2009 highlighting the potential for serious complications with this technique, serious adverse events still occur.[3] Analysis of what is known of such events suggests that 'systems failure' is often a major factor.

Best practice

The RCoA publication Best Practice in the Management of Epidural Analgesia in the Hospital Setting was updated in 2010 and describes the requirements for good practice under a number of headings that cover the process of delivering safe epidural analgesia.[5] These are reflected with a number of recommendations in each chapter of the RCoA's Guidelines for the Provision of Anaesthetic Services. Organisational structure is an important aspect in optimising outcomes from pain management techniques.[6]

Suggested data to collect

The RCoA publication outlines a number of recommendations that would be suitable to audit compliance to best practice. Some of these recommendations are mandatory (eg patient selection and consent) but many are advisory and can be adapted for local practice.

Suggested key audit recommendations include:

- There should be a discussion of the risks and benefits of epidural analgesia with documented values for those risks according to local or national figures.
- The department of anaesthesia should ensure that there are designated personnel and clear protocols to support the safe and effective use of epidural analgesia.
- Registered nurses with specific training and skills in the supervision of epidural analgesia and management of its complications must be present on the ward and on every shift (ie 24-hour cover).
- Local guidelines should be in place with respect to the insertion and removal of epidurals in patients receiving anticoagulants with impaired coagulation. All staff should be aware of, and adhere to, these guidelines.
- Epidural infusion lines should be clearly identified as such. All NHS institutions use the newly developed NRFit™ (ISO 80369-6) neuraxial connector.
- The Bromage scale should be used consistently between healthcare professionals to prevent serious complications that could arise from using an incorrect scale.[7]
- Protocols for the management of these complications should be available locally.
- Availability of neuraxial imaging for detection of epidural space occupying lesion.
- Information specific to the use of epidurals in paediatric patients should be provided to parents and/or carers based on local guidelines.
- There should be clear procedures for the reporting of, and response to, critical incidents associated with the use of epidural analgesia.

Quality improvement methodology

- The epidural service should be process mapped to understand the issues preventing delivery of high-quality care.
- Once this has been established, the following approach could be taken to decide how important each issue is in terms of patient care and service delivery.
- This could be done using the 'five whys' or fishbone methodology and then a Pareto chart used to measure frequency of the problem perhaps aided by an impact/effort matrix to help decide what issue to focus on first.[8,9]
- Decide a SMART (specific, measurable, achievable, relevant, time-bound) aim for the issue that needs to be improved and use a driver diagram to understand drivers for the issue and to explore possible solutions.
- For each potential improvement idea, measures need to be decided and should be classified as outcome measures, process measure and balancing measures. These should be decided before the idea is tested.

- Ideally, rapid-cycle plan-do-study-act methodology can be used to test each idea, with data collected frequently and plotted on a run or statistical process control chart. By establishing the impact of each idea, this would strengthen each improvement cycle.

Mapping

ASCA standards: 1.1.1.7, 1.2.1.6, 2.1.1.13, 2.1.1.7, 2.1.1.8, 3.1.2.1, 3.1.2.2

Curriculum competences: RA_BK_07, RA_BK_08, RA_BK_09, RA_BS_02, RA_BS_05, RA_BS_08, RA_BS_09, RA_BS_10, PC_BK_85, PA_BK_11, PM_BK_03, 08, PM_BS_01–06, 08, RA_IS_02, PM_IS_01, 02, 10, VS_HS_06, PR_IK_01, RA_HS_01, VS_HS_06, PA_HS_07, PM_HK_01, PM_HS_01–04, 06, VS_AS_04, PM_AS_05

CPD matrix codes: 1E01, 1F01, 1F05, 1H02, 1I01, 1I02, 1I05, 2E01, 2G01, 2G02, 2G04, 3A09

GPAS 2020: 2.5.17, 3.2.24,4.1.11, 4.3.17, 6.2.19, 6.5.22, 7. 3.39, 9. 2.28, 9.2.30, 9.5.4, 9.5.5, 9.5.8, 10. 9.12, 11. 1.5,11. 2.1,11. 2.4, 11.4.7, 11.9.1, 16. 4.7, 16.4.8, 5.25, 17.9.2

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10.5 Opioid use in chronic pain

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Why do this quality improvement project?

There has been a large increase in opioid prescriptions in the UK over the past two decades.[1] Chronic opioid use may be associated with harm such as addiction and death.[2] The implementation of the suggested standards is central in improving patient care, reducing the burden of overtreatment and unwarranted variation as well as identifying and managing clinical risks.

Background

Chronic opioid use, especially at higher doses, may be associated with harms such as increased risk of overdose, misuse, dependence, depression, fractures, myocardial infarction, road traffic accidents and sexual dysfunction.[3] There is a lack of good-quality randomised controlled trials that study long-term opioid use, with the majority of studies being of three months' duration or less. There is no reliable evidence to support the effectiveness of long-term opioid therapy for chronic pain.[4] However, there is a place for short-term, low-dose opioid treatment for some conditions with appropriate monitoring.[2]

There are several important guidelines which have been developed to provide recommendations for the appropriate use of opioids in clinical practice, including the opioid aware resource.[5] The section of the Scottish Intercollegiate Guidelines Network guidelines on the use of opioids has recently been updated, based on current best evidence and provides a useful resource.[6] This aligns with the Scottish quality prescribing for chronic pain guide.[7]

Best practice

While there is a limited evidence base in some areas, clinical practice should aim to ensure that individual benefit (decreased pain, improved function and/or quality of life) outweighs harms (including misuse, addiction, opioid induced hyperalgesia, tolerance, endocrine dysfunction, possible immune system dysfunction). Non-pharmacological approaches and/or non-opioid analgesics should be considered before initiating opioid treatment.

Suggested data to collect

Standards	Measures
Before commencing opioid therapy, the patient should have a biopsychosocial assessment for suitability of strong opioid use. A plan for an opioid trial, with agreed outcomes, should be made.	■ The assessment should include the severity and type of pain (eg Read code 1M52 'Chronic Pain'), impact on mood, sleep, function and quality of life. ■ Previous pharmacological and non-pharmacological treatments; relevant past history (including mental health).
There should be planned review of patients started on opioid therapy within four weeks of commencement. If patients continue on opioids there should be regular planned review, at least annually.	■ Percentage of patients with documented review (including efficacy and adverse effects) within four weeks of starting opioids (eg Read code 66n 'Chronic Pain Review'). ■ Percentage of patients with documented review (including efficacy and adverse effects) at least annually if on opioids for more than one year.

Opioids should only be continued if there is ongoing evidence that benefits outweigh risks. They should be used at the lowest effective dose for the shortest possible time. Specialist advice or referral should be sought for those patients on more than 90-120 mg morphine-equivalent doses (MED)/day (depending on local policy).	■ % of patients on opioids for more than 1 year; % of patients on high dose opioids more than 90-120 mg MED/day) where specialist advice has been sought.
If risks of harm outweigh benefits of continued opioid use, a plan for reduction or cessation of opioids should be agreed between patient and prescriber.	■ Percentage of patients with an agreed management plan for opioid reduction.
Signs of misuse or addiction should be sought. If there is evidence of addiction of misuse, then there should be a plan to support reduction or cessation, with specialist support if needed.	■ Percentage of patients developing problematic opioid use. ■ Percentage of patients with problematic use who have a documented management plan.

Quality improvement methodology

Opioid initiation

- Draw out a process map of when opioids are used in chronic pain management. Look at assessment and planned outcomes of treatment.
- Are anticipated benefits (eg decreased pain, improved quality of life) clearly documented?
- What information is given to patients before commencing opioid therapy and by whom (pain specialist, general practitioner, pharmacists; written, oral, websites)?
- How is any planned review scheduled?
- Is dose titration monitored and by whom?

Continuing opioid therapy

- Current guidance is for short- to medium-term use in carefully selected patients.
- What processes are in place to ensure regular review occurs (at least annually)?
- How is continued benefit assessed? How are harms and adverse effects assessed?

Risk assessment

Risk of harms increases as dose increases, with evidence of harm at doses more than 50 mg MED/day, increasing further at more than 90 mg MED/day, and limited evidence of any additional benefit at doses over 120 mg MED/day.

Who monitors opioid dose?

- Is there a mechanism where patients on more than 90 mg MED/day are reviewed, to assess need for specialist advice or review?
- How are risks assessed?
- Can a systematic approach be used to assess different harms (eg gastrointestinal; cognitive, sedative; misuse, tolerance, dependence, addiction, endocrine)?

Opioid reduction or cessation

- Draw a process map of how opioids are reduced of stopped.
- How is the decision to reduce opioids made?
- What support is available for patients reducing opioids?
- Who carries out planned reviews?
- What information is given to patients reducing opioids?
- What non-pharmacological approaches can be used?

10.5 Opioid use in chronic pain

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Mapping

ASCA standards: 1.4.1.2, 1.4.5.1, 1.4.5.2, 1.4.5.3, 1.4.5.4, 4.1.2.1

Curriculum competences: PM_BK_04_06_07, PM_IK_04, PM_IK_06,_07,_08, PM_IK_06,_08,_10, PM_HK_02, PM_HS_01,_04,_06, PM_AK_04, PM_AS_01,_03,_07

CPD matrix: codes: 2 E03, Level 3

GPAS 2020: 11.1.1, 11.1.2, 11.1.6, 11.2.5, 11.2.6, 11.2.7, 11.2.8, 11.4.1, 11.4.2, 11.4.3, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.6, 11.7.1, 11.7.2

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10.6 Intrathecal drug delivery in the management of cancer-related pain

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Why do this quality improvement project?

Current practice of using intrathecal drug delivery systems varies widely depending on local factors including funding and expertise. The aim of this project is to help identify opportunities for improvement in the services at local levels.

Background

Pain is common in cancer. It affects between 40% and 60% of patients, depending on tumour type and stage of disease.[1] Pain has a marked impact on those living with and beyond cancer; affecting multiple aspects that contribute to a reduced quality of life.[2,3]

Use of the World Health Organization analgesic ladder in 1986 are 80-90% effective in providing adequate pain relief in this patient group.[4,5] The remainder will experience refractory pain and will require more specialist techniques.[6] Intrathecal drug delivery systems are one such intervention. Their clinical use is supported by class 1 evidence on treatment efficacy and safety, when compared with standard care,[6] providing a therapeutic option for those with uncontrolled cancer-related pain or those receiving escalating dosages of opioid medications with associated negative consequences. Importantly, the British Pain Society report that this technique is underused in the management of cancer pain.[7]

There are recommendations published relating to the use of specific drugs, the maximum doses and concentrations.[7] Additionally, there are also recommendations published addressing best practices.[6,7] It is not known whether all recommendations are stringently adhered to.

Best practice

Good practice guidance has been set by the British Pain Society and the Faculty of Pain Medicine.[7,8] Additionally, the NHS England clinical commissioning policy on intrathecal pumps for treatment of severe cancer pain provides details surrounding criteria for commissioning, patient pathways and governance arrangements, among other elements.[6] Further information and guidance on interventional cancer pain management is contained within the Faculty of Pain Medicine's core standards for the provision of pain services.

Suggested data to collect

Pre-procedural phase

- Percentage of patients initially assessed within three months from referral; the NHS England Clinical Commissioning Group suggests that the number of referrals assessed within three months should be audited (standard 80%).
- Percentage of patients receiving multidisciplinary team assessment including appropriate psychological work-up.
- Percentage of patients having baseline endocrine function checked (standard 95%):
  - serum testosterone, luteinising hormone and follicle-stimulating hormone levels in men
  - estradiol, progesterone, luteinising hormone and follicle-stimulating hormone levels in women.
- Percentage of patients assessed using validated tools to determine the impact of pain, pain relief, quality of life and function (standard 95%).
- Percentage of patients having proposed position of pump reservoir agreed preoperatively, considering clothing to be worn.

Procedural phase

- Percentage of patients receiving antibiotic prophylaxis at the time of implant.

Post-procedural phase

- Percentage of patients receiving documented instructions regarding arrangements for changes and refill attendances.
- Percentage of patients with access to 24-hour medical cover from an experienced team.
- Percentage of patients with annual measurements of endocrine function (standard 95%).
- Percentage of patients with continued assessment using validated tools to determine the impact of pain, pain relief, global impression of change, quality of life and function (standard 95%).

Quality improvement methodology

This whole pathway way is well suited to a rigorous pathway or process mapping approach, given that an ideal pathway has been described by several authorities. There is excellent scope for this quality improvement project to look at the whole pathway and identify gaps, bottlenecks and opportunities to improve standards of care.

Suggested approach

- Assemble stakeholder group (including patients).
- Map out existing pathway.
- Compare existing to ideal as defined by the authorities.
- Define gaps, bottlenecks and opportunities using data to describe current state.
- Prioritise the issues using a matrix which could be either urgent/important or impact/effort.
- Agree first improvement opportunity.
- Use stakeholder group to decide aims statement and create driver diagram (see section A5).
- Generate improvement ideas.
- Choose an idea and agree process, outcome and balancing metrics.
- Collect baseline data.
- Do a first plan-do-study-act cycle and collect agreed metrics frequently enough to rapidly generate a statistical process control chart. Use the chart to identify an improvement and opportunity for scale up and spread or identify and study why improvement is not working. If it is not working, abandon the chart, share learning and move on to the next idea.
- Scale up and spread the successful improvement but continue to measure and use statistical process control to ensure continuing improvement.

Mapping

ASCA standards: 1.2.2.1, 1.4.5.3, 1.4.4.2

Curriculum competences: Annex E: PM_AK_40, PM_AK_41, PM_AK_42, PM_AK_43, PM_AK_44, PM_AK_45, PMS_AS_38, PM_AS_39, PM_AS_40, PM_AS_41, PM_AS_42

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10.7 Audit of pain management programmes

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Why do this quality improvement project?

It is vital to ensure that patients with chronic pain are provided with the opportunity to engage in biopsychosocial approaches to pain management within evidenced-based interventions, such as pain management programmes. Pain management programmes should be interdisciplinary and should meet minimum requirements in respect to content and delivery outlined in the Faculty of Pain Medicine's Core Standards for Pain Management Services.[1] Pain management programmes reduce psychological distress and improve physical function in well-selected patients, but continued improvement approaches will ensure ongoing quality in service provision, as well as supporting the continuing commissioning of services.

Background

Chronic pain is estimated to affect over 28 million patients in the UK with significant negative consequences to the individual and society.[2] Chronic pain and disability are not just influenced solely by somatic pathology but also psychosocial factors. Multidisciplinary biopsychosocial approaches are accepted and used more frequently over recent decades in the treatment of chronic pain. Pain management programmes are cost effective, as they have been found to reduce healthcare consumption, pain related issues in primary care, onward referrals and medication use.

Best practice

Evidence suggests that interdisciplinary pain management programmes are more effective in the long-term management of chronic pain than unidisciplinary interventions.[3] Pain management programmes are designed to improve both the psychological and physical functioning of a patient in the context of chronic pain. All programmes should comply with the British Pain Society's most up-to-date recommended guidelines, which state:[4]

- Pain management programmes should consist of methods to promote behaviour change to promote wellbeing.
- They should include education on pain physiology and psychology, general health and pain self-management. Pain management programmes also contain guided practice on exercise and activity management, goal setting, identifying and changing unhelpful beliefs and ways of thinking, relaxation and changing habits to reduce distress and disability.
- Core staff should include Health and Care Professions Council practitioner psychologists, physiotherapists, occupational therapists and a medically qualified person (preferably a consultant in pain medicine).
- Data should be collected at baseline, post treatment and minimally at a six-month follow-up.

Suggested data to collect

Core outcome datasets for assessing the effectiveness of interdisciplinary pain management have been presented by both IMMPACT and the VAPAIN consensus statements.[5,6] Commissioners, referrers and participants expect providers to deliver an effective pain management programme and there is an expectation that this should be reflected in measurable outcomes. It is commonly agreed that there is no single primary outcome, since multiple problems imply multiple outcomes, and goals are to a large extent determined by participants themselves. The following domains have recently been proposed for assessing the effectiveness of interdisciplinary multimodal therapy by an expert panel of clinicians and patients:[6]

- pain intensity and pain frequency
- physical activity (including activities such as household chores)
- emotional wellbeing
- health-related quality of life
- satisfaction with social roles and activities
- productivity (including work-related activities both paid and unpaid)
- participant's perception of treatment goal achievement.

These domains have been listed in the same order as the primary source and the order does not reflect importance.[6] In addition to the above, the following domains could also be considered:

- healthcare use
- patient experience of the programme (both quantitative and qualitative)
- process outcomes (monitoring concordance of the programme with best practice)
- participant demographic data.

Services should routinely use the data collected to evaluate the service and make improvements where a need is identified. Outcome data should be evaluated for minimally clinically significant change and reported as the percentage of patients who make meaningful change in the outcome domains described. Patient satisfaction data should also be routinely collated.

Quality improvement methodology

- Use process mapping to describe current state and identify gaps.
- Ensure that a stakeholder group is involved in mapping the pathway to capture as many experiences of the pathway as possible.
- Gaps and bottlenecks can then be prioritised, an aims statement created and a driver diagram used to identify drivers and create improvement ideas.
- Ideas are then prioritised, metrics (process, outcome and balancing) are agreed, baseline data are collected and the plan-do-study-act started.
- A statistical process control chart can be plotted for each metric to rapidly identify if there has been an improvement such that the idea can be scaled up, learnt from or abandoned and another idea tested.
- Determine the ways in which the outcomes of your pain management programme are collected, analysed and interpreted. Do the data points collected serve their required purpose and how is this information disseminated throughout the relevant teams? How could this process be improved?

Mapping

Curriculum competences: PM_AK_02, PM_AK_03, PM_AK_16, PM_AS_02, PM_AS_14
CPD matrix codes: 1D01, 1D02, 3E00

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10.8 Continuing professional development and practice improvement for pain medicine anaesthetists

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Why do this quality improvement project?

Continued improvements of their performance against set standards and peers will allow individual clinicals to deliver better care to their patients and also make improvements to the systems that they work in.

Background and best practice

The General Medical Council published the Good Medical Practice Framework for Appraisal and Revalidation in 2013.[1,2] The framework, based on Good Medical Practice, is the standard approach for all appraisals. The Academy of Medical Royal Colleges has published a structured reflective template to allow doctors to document their reflections for their portfolio.[3] The supporting information detailed below is not a comprehensive list of everything required in all the domains but aims to highlight the most important requirements in pain medicine practice. No patient identifiable data must be present in the portfolio.

Suggested data collect

General information (scope and description of your practice)

- Your job plan must be balanced between pain medicine and anaesthetic sessions to allow appropriate maintenance of skills, especially in relation to on-call commitments.
- You must detail any voluntary, private and medicolegal practice activity in the scope of your practice.
- Your whole practice description should include information about your pain medicine multidisciplinary team and your role within the team. Detail how the team functions, including pain multidisciplinary team, continuing professional development (CPD) and clinical governance meetings.
- If your pain service implants spinal cord stimulators and intrathecal infusion pumps you must provide information about how your service provides continuous out-of-hours emergency cover.
- Your workload (continuously recorded logbook including outcome data (eg with new/discharge ratio, Brief Pain Inventory data, functional outcomes and complications of interventions) details:
  - annual numbers of new outpatients seen and diagnostic categories
  - annual number of patients followed-up (new to follow-up ratio referenced to national data)
  - annual number and type of procedures performed (with details of complex procedures).
- Details of any issues concerning probity or health.

Keeping up to date (continuing professional development)

- You must meet the objectives of your personal development plan agreed at appraisal.
- CPD must cover the full scope of your clinical, medicolegal and non-clinical practice, including training for educational supervision, research and management.
- Use the principles outlined in the RCoA guidelines for continuing professional development and levels 1-3 of the CPD matrix.[4,5]
- Keep records and minutes of meetings attended, including action reports after multidisciplinary team and governance meetings.
- Complete reflective templates after CPD activities.
- Achieve at least 50 credits/year and at least 250 over the five-year revalidation cycle.
- Of the 50 annual credits, a minimum of 20 external and 20 internal should be obtained.

Review of your practice (audit/service evaluation)

- You will need to demonstrate that you participate in activities that review and evaluate your pain medicine practice to show quality improvement activity and, where possible, evidence and reflection of personal performance against recommended standards and guidelines:
  - Clinical audit: a minimum of one complete audit cycle (audit, practice review and re-audit) in every five-year revalidation cycle.
  - Case reviews and discussions demonstrate your engagement in discussion with your pain medicine colleagues and team to enhance and maintain the quality of your work.
  - Significant events: clinical incidents, significant untoward incidents. Keep anonymised records of incidents or declare in your appraisal if there are no incidents.

Three hundred and sixty degree feedback on your practice

- Colleague feedback: at least one validated multisource feedback exercise from a spread of the healthcare professionals with whom you work, should be undertaken in each five-year revalidation cycle.[6] The results should be benchmarked to other pain medicine specialists. Reflections and development needs should be detailed.
- Patient/carer's feedback: at least one validated patient feedback exercise should be undertaken in the revalidation cycle, preferably in year two. This allows time for a repeat survey if required. Additional patient feedback may be used:
  - pain department patient experience and satisfaction surveys
  - patient-reported clinical outcomes.
- Feedback from clinical supervision, teaching and training:
  - Evidence of training for the role should be given.
  - Evidence of performance from school of anaesthesia, deanery or department is required at least once in a five-year revalidation cycle.
  - Feedback from course organisers about the quality of teaching.
- Formal complaints: details of any formal complaints, your response and reflection and learning should be discussed at each appraisal.
- Compliments: annual record of unsolicited compliments from patients, carers and colleagues.

Standard

It will be expected that 100% of appraisals will meet all the above criteria as monitored by each NHS hospital's appraisal lead and responsible officer. Anaesthetists must measure their own performance against peers in their specialty.

Quality improvement methodology

- There are a number of ways of assessing one's own performance (ie agreeing basic standards of care and measuring oneself and others against that standard).
- When poor quality of care is identified then a 'five whys' diagnostic approach could be used to understand the challenges, a Pareto chart to look for the most common issue and then a driver diagram to understand the drivers of this aspect of poor performance.[7]
- An aim statement should describe what good could look like and then improvement ideas tested using a plan-do-study-act (PDSA) cycle.
- Process, outcome and balancing measures should be defined at the start of the PDSA cycle and then data collected (sampling frequently) and statistical process control charts used to assess impact.

Mapping

Curriculum competences: PM_AK_14, PM_AK_15, PM_AK_16

CPD matrix codes: 1H01, 1H02, 1I04, 1I05

GPAS 2020: 11.4.1, 11.4.2, 11.4.4, 11.4.7, 11.4.8, 11.5.4

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10.9 Medial branch block and radiofrequency denervation for lumbar facet joint pain

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Why do this quality improvement project?

Lumbar facet joint radiofrequency denervation is recommended by the National Institute for Health and Care Excellence (NICE) for the treatment of low back pain.[1] This improvement project will facilitate continuing improvements to patient pathway and subsequently patient outcomes.

Background

Lumbar facet (zygapophyseal) joints are one of the structures in the spine that can act as primary pain generators and a source of somatic low back pain. Lumbar facet joints have been implicated as a cause of chronic pain in up to 15-45% of patients with low back pain.[2,3]

Medial branch of the dorsal primary rami (MBDPR) nerve supply to the facet joint blocks has been shown to be effective in diagnosing lumbar facetogenic back pain. False positive rates of a single diagnostic block have been reported to range from 17% to 41%. The false positive rate is reduced when two sets of diagnostic blocks are performed.

Radiofrequency denervation of the MBDPR has been demonstrated to be effective in the treatment of facetogenic low back pain in appropriately selected patients. Dreyfuss et al reported that, at one year, 60% of their patients have 80% pain relief and 80% can expect 60% pain relief.[4] Bogduk et al, in a narrative review, summarised the available evidence for radiofrequency denervation of the MBDPR and highlighted the problems with older studies emphasising the need for proper patient selection and appropriate technique of radiofrequency denervation for optimal outcome.[5]

Best practice

- NICE Quality Standard on low back pain and sciatica in the over 16s published in 2017.[1]
- Standards of good practice for medial branch block injections and radiofrequency denervation for low back pain published by the British Pain Society and the Faculty of Pain Medicine in 2014.[6]
- Standards of good practice for spinal interventional procedures in pain medicine published by the British Pain Society and the Faculty of Pain Medicine in 2015.[7]
- Lumbar medial branch blocks: practice guidelines for diagnostic and treatment procedures, published by Spinal Intervention Society.[8]
- Lumbar medial branch thermal radiofrequency neurotomy: 2013 practice guidelines for diagnostic and treatment procedures, published by Spinal Intervention Society.[9]

Suggested data to collect

- Pre- and post-medial branch block pain scores and functional improvement following diagnostic medial branch block within 2-4 hours of the procedure. This is to confirm whether the pain is originating from the lumbar facet joints.
- Saving and reviewing fluoroscopic images of lumbar medial branch block and radiofrequency denervation.
- Percentage pain relief and duration of pain relief after radiofrequency denervation.
- Percentage of pain relief following diagnostic medial branch block and cut-off figure for pain relief for offering radiofrequency denervation.
- Technique of radiofrequency denervation and duration of pain relief following the procedure.
- When is radiofrequency denervation repeated (ie how long has previous radiofrequency denervation helped for before considering a repeat procedure).
- Complications following medial branch block or radiofrequency denervation (eg permanent aggravation of pain, permanent nerve damage).
- EuroQoL Quality of Life Scale EQ-5D and other outcome measures as suggested by the Faculty of Pain Medicine and the British Pain Society.[10]
- Any decrease in analgesic requirement following radiofrequency denervation.
- Outcome measures following radiofrequency denervation: in a number of different domains which collectively look at several quality of life indicators including pain relief (degree and duration), effect on sleep and mood, effect on mobility and ability to work, and use of healthcare resources.

Standard

All the cases in the hospital undergoing medial branch block and radiofrequency denervation must have patient-reported outcome data collected in all the domains as above.

Quality improvement methodology

- The pathway could be mapped from referral to discharge and compared with an ideal pathway (as in NICE low back pain guideline).[11]
- The best practice for patient selection for radiofrequency denervation treatment (eg have patients followed NICE Guideline 59 recommendations before consideration of radiofrequency denervation?) should be highlighted to clinicians treating patient with low back pain in secondary care and compared locally with an emphasis on improvement projects targeted to converge local pathway towards those suggested by the NICE Guideline 59.[11]
- A stakeholder group approach (including general practitioners, physiotherapists and patients) could be used to understand how to improve patient selection with timely access to pain service.
- An aims statement should be created to chart out improvement ideas that could be tested as a quality improvement project.
- Prior to testing any ideas, outcome, process and balancing measures should be defined and baseline data collected to understand whether the idea being tested is appropriate to allow assessment for an improvement in low back pain pathway.

Mapping

ASCA standards: 1.2.2.1, 1.2.2.2, 1.4.4.2
Curriculum competence: PM_HK_01
CPD matrix codes: Level 3: Pain Medicine

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11 Delivery of services

Edited by Professor Jaideep J Pandit
QI editor Dr Toby Reynolds

11.1 Focus on sustainability: reducing our carbon footprint through inhalational agents

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Why do this quality improvement project?

The health of people and our environment is damaged by pollutants released and resources used in delivering healthcare.[1] Legislation mandates a reduction in carbon emissions;[1,2] there are ethical, public and staff expectations that our health and care systems operate in a sustainable manner.[3] Medical gases have been highlighted as a carbon hotspot.[1] Measuring, recording and modifying their use will help us to achieve mandatory targets.[2] Quality improvement projects should promote 'sustainable value' (ie they should maximise positive patient outcomes for environmental + social + financial costs and impacts).[4]

Background

Medical gases (nitrous oxide (N_2O), isoflurane, sevoflurane and desflurane) are potent greenhouse gases and it is estimated that they contribute to 5% of the carbon footprints of acute hospitals.[1] Their impacts are dominated by uncontrolled emissions of waste gases, with desflurane having the largest (15x isoflurane and 20x sevoflurane per minimal alveolar concentration hour); all increasing significantly when delivered with N_2O admixture.[5] In accordance with the Climate Change Act 2008, we must reduce our carbon emissions by 80% of the 1990 baseline by 2050.[1] NHS carbon emissions have reduced by 18.5% (2007-2017)[3] so there is still some way to go to achieve these targets. The NHS Long Term Plan has outlined measures to achieve this objective, including a 2% reduction by transforming anaesthetic practices.[2]

Best practice

No best practice guidelines are currently established in this area but the College has stipulated that low-flow anaesthesia should be default when using inhalational agents.[6] With the publication of the NHS Long Term Plan it is likely that recording and reporting of medical gas usage will soon become mandatory.[2]

Suggested data to collect

A Volumes (litres) of liquid volatile agents issued to departments per unit time: hospital pharmacies have accurate records of drugs issued, usually stored on a database such as Define.*

B Medical gas delivery (N_2O): gas suppliers give at least an annual statement of cylinder delivery.* Do not include size F N_2O cylinders or N_2O/O_2 mix cylinders as these are likely to reflect use in areas outside anaesthesia, such as cryotherapy and analgesia, respectively.

C Spot check/interrogation of anaesthetic machine logbook where possible. Data should include (per case summary):
- medical gas use in litres (air, O_2 and N_2O)
- volatile consumption and uptake in millilitres
- total time per case.

*It would be advisable to obtain data retrospectively to include the 2017/18 financial year as this dataset will probably form the baseline data from which our emissions will be benchmarked in accordance with the NHS Long Term Plan.[2]

Quality improvement methodology

The overall aim is to reduce carbon dioxide equivalent (CO_2e) through adoption of anaesthetic techniques that have lower emissions associated with them.[1,5,7,9] This equates to minimising or abolishing the use of desflurane and N_2O where possible. Agreeing with relevant stakeholders on how much effort can be allocated to data collection is the first step. Data collected from point C above are the most accurate but are not available on all anaesthetic machines currently in use. As technology develops, so will the data we are able to collect, potentially remotely, from our machines to assist in modifying practices. Regular feedback to users through run charts and discussions with stakeholders will identify barriers and enablers to reducing carbon emissions and communicating results when interventions have been trialled. It may be appropriate to start in a few theatres and roll out across the whole suite or hospital when interventions are successful.

Emissions and efficiency data

- CO_2e values for medical gases data obtained in A-C above. Input data into a calculator such as table 3 in Pierce.[7]
- A more detailed 'snapshot' of data (C) can be useful to monitor trends and patters following interventions and allows feedback in a more reasonable timescale than A and B.
- Use of volatile consumption and update data collected from C can be used as a marker of efficiency by calculating volatile efficiency ratios.[8] These ratios can be useful to individual anaesthetists and collectively within the department.

Examples of interventions to reduce carbon emissions and enhance efficiency

- Educate all staff on relative CO_2e of different anaesthetic techniques and the reasons why it is vital to reduce overall emissions.[1–3,5–9]
- Removal of desflurane (with or without piped N_2O supplies) from anaesthetic machines. Agents would still be available if clinically indicated but unconscious use likely to be reduced as not immediately present.[8]
- Advocate the use of low-flow anaesthesia and audit efficiency by calculating volatile efficiency ratios.[8] Monitoring this in the anaesthetic room, as well as in theatre, will highlight areas for reducing waste around induction, reducing initial fresh gas flow rates in anaesthetic rooms from 10 litres/minute to 6 litres/minute, then moving to low flow (0.5 litres/minute or less) after intubation, for example.[9]
- Engage in discussions with anaesthetic machine suppliers to explore how an upgrade in your hospital could help to improve efficiencies, carbon emissions and expenditure related to volatile agents.[9]
- Meet regularly with budget holders; strike an agreement that financial savings made with interventions could be used to procure equipment to increase uptake of alternative anaesthetic techniques with lower carbon emissions such as total intravenous anaesthesia and regional anaesthesia.[5]
- Explore perceived and actual barriers to the use of alternative anaesthetic techniques (total intravenous anaesthesia and regional anaesthesia) within your department then develop plans to tackle these barriers.

Mapping

ACSA standards: 1.1.1.9, 2.1.1.14, 2.1.2.1
CPD matrix codes: 1A02, 1I02, 1I05, 3J00
GPAS 2020: Chapter 1 - Areas for future development - sustainability, 3.2.15, 3.2.16

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11.2 Focus on sustainability: are you wasting your waste?

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Why do this quality improvement project?

Sustainable use of resources and effective waste management are key areas for the NHS to focus on.[1] Each operating theatre produces around 2,300 kg anaesthetics waste and 230 kg sharps waste per annum, approximately 40% of which could be reclassified as domestic waste or recycling, with significant financial and environmental benefits.[2] This section does not address reducing carbon emissions through changes in inhaled anaesthetic gas use. For details relating to this topic, see section 11.1. Quality improvement projects should promote 'sustainable value' (ie they should maximise positive patient outcomes for environmental + social + financial costs and impacts).[3]

Background

The NHS produced just less than 590,000 tonnes of waste in 2016/17. There are two key waste management challenges for the health and social care sector:[1]

- Avoid as much waste as far up the supply chain as possible.
- Ensure that organisations treat waste in the most efficient and productive way possible. All waste should be seen as having potential material value.

The legislation surrounding medical waste management is complex and there is variation among the four countries of the UK with respect to legislation and policies. The primary aim of waste disposal in the UK is that it should be handled, treated and disposed of safely.[4]

Best practice

Disposal of devices contaminated with drug residues and waste should follow local and national guidelines.[4,5] Operating theatre waste streams should include:

- mixed recycling
- non contaminated domestic waste
- microwave-/steam-treated clinical waste
- incinerated waste including drug residues
- anaesthetic room steel single-use items.

To reduce waste in clinical practice we should use the waste hierarchy or an adaptation, as outlined by DEFRA: refuse → reduce → reuse → recycle → recover → dispose.[1]

Suggested data to collect

- Current waste practices (contact and involve your waste manager) in each theatre or discreet anaesthetic area in your hospital.
- Different waste streams being used (eg domestic, mixed recycling, specialist recycling, sharps, pharmaceutical waste, clinical waste, infectious waste, anatomical).
- Weight of bags over a specified time period going into each waste stream.
- Number (and locations) of waste receptacles available for each waste stream (map out your work area and look for opportunities for improvement).
- Spot check: is waste being disposed of into correct waste stream. Exercise caution and correct personal protective equipment when evaluating waste streams.
- Survey healthcare professionals' knowledge of waste disposal streams for different items.
- Ask your waste manager for details on current waste disposal contracts and costs of waste disposal.

Quality improvement methodology

Identify stakeholders to engage with this project (theatre, anaesthetic and recovery coordinators and waste management lead) and agree specific and realistic aims. Once these have been established identify a measurement plan, such as daily weights or bag counts for each theatre/specific theatre areas and make an intervention. The effectiveness of the intervention can be gauged by plotting data on a run chart to monitor progress and improvements. Repeated data collection will show whether improvements are sustained over time. The above information can be used to create a table to outline the amount of waste in each stream, cost per unit weight and proportion of waste not correctly streamed. Use these data, together with the subheadings below, to identify areas for financial and environmental (CO_2) savings in your waste disposal practices.

Examples of good practice

Refuse

Refuse to allow unnecessary packaging and avoidable waste into your hospital (eg Claussen hook rings on facemasks).[6] Have a conversation with suppliers about procurement alternatives. Ask supply managers to preferentially tender drug and equipment contracts based on environmental credentials.[7]

Reduce

Reduce and redistribute unwanted items or repurpose them into other products.[8]

Reuse

Switch from single-use to reusable equipment where possible.

Recycle

As well as general mixed recycling, think about specialist initiatives for items made of steel and plastic, which could generate money rather than a cost of disposal.[9–11] Be cautious with glass and other receptacles containing drug residues; these cannot be recycled or washed in main water courses and need to be incinerated.[4]

Recovery

Think about waste to energy systems, purchasing of a biomass boiler and technologies which can allow treatment of clinical waste on site so that it can be diverted from clinical waste streams and used as fuel where appropriate.

Dispose

Rethink your waste ergonomics in clinical areas.[2,7] Do you have the right bins in the right places to make it easy for people to put their waste into the correct stream? Staff training on waste management and the use of visual prompts can be helpful, empowering staff to get waste management right first time and emphasising individual responsibility for the content of waste streams.

Research new methods of packaging, waste treatment, disposal and sterilisation.[2]

Mapping

ACSA standards: 1.1.1.9, 2.1.1.14
CPD matrix codes: 1E01, 1I02, 1I05, 3J00
GPAS 2020: Chapter 1 - Areas for future development - sustainability, 3.2.15, 3.2.16

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11.3 Theatre use and efficiency

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Why do this quality improvement project?

Anaesthetists play a key role in the management and running of operating theatres. Even if not in a direct managerial role, anaesthetists are individually responsible for the smooth running and use of the theatre resource. With some three million general anaesthetic procedures in the UK per year and operating theatres costing some £20/minute, theatres represent a significant proportion of healthcare spending, so measures to save costs are important.

Background

Individual experience tells us that all too often use of operating theatres is less than optimal. This is borne out by data. On-the-day cancellation rates average 15%;[1] about one-third of theatres significantly underrun, while a similar proportion overrun.[2] All this is wasteful of financial resources, but also harms patient care; when there is a waiting list those patients are simply waiting even longer for surgery. Cancellations on the day are especially potentially harmful to patients and carers alike, yet it is now well established that individual measures so often used by hospitals as surrogate metrics for 'efficiency' are themselves misleading or erroneous. Among these are 'start times' and 'use'. It is wrongly claimed that simply starting on time, or simply using as much theatre time as possible, will solve the problems within operating theatres. The fallacy of this argument is readily seen by the fact that there is no correlation shown between late starts and late finishes or other measures of efficiency, and by considering the fact that high use can be easily achieved by overbooking a list and overrunning.

Best practice

Operating theatre management is no longer a nascent science but has a large literature base.[3] There are two core elements of best practice: applying a bias-free concept of efficiency, ε[3,4], and scheduling probabilistically.[3,5] Efficiency, (ε) is best defined as the achievement of as near full use as possible without overrun or cancellation and this can be described by a simple formula:

$$\Sigma = \left[\left(\begin{array}{c}\text{fraction of}\\ \text{scheduled}\\ \text{time used}\end{array}\right) - \left(\begin{array}{c}\text{fraction of}\\ \text{scheduled time}\\ \text{overrunning}\end{array}\right)\right] \times \left(\begin{array}{c}\text{fraction of}\\ \text{scheduled case}\\ \text{completed}\end{array}\right)$$

By using fractions, this formula handles both use and overrunning in an unbiased way. The 'fraction of scheduled time used' means that if a list scheduled for eight hours finishes in six hours this quantity is three-quarters or 0.75 and the 'fraction of scheduled time overrunning' for this list is zero. The 'fraction of scheduled time overrunning' means that if a list scheduled for eight hours overruns by two hours this quantity is one-quarter or 0.25, and the fraction of scheduled time used for this list = 1. Thus, the first two terms operate in a mutually exclusive manner: a single list cannot be both under- or overused at the same time. The 'fraction of scheduled operations completed' means that if four of five of the patients booked on the list have their operations (ie one patient is cancelled), this quantity is four-fifths or 0.80. The formula theoretically yields a result for efficiency ranging from 0 to 1.0 (or 0-100% if this result is multiplied by 100). The value of 100% is obtained when all booked cases are complete at the scheduled time. Tools to simplify the calculations are readily available from resources.[3,4]

Scheduling is best understood by asking how do we know how many cases to book on a list scheduled for eight hours? It is tempting to 'book to the mean'; that is, to obtain the mean durations of each of the operations and then sum these. So, if each operation is known to last one hour on average, we can book eight cases. This is wrong and will result in a large overrun, and probable cancellation of at least one case. We also need to take into account the variance (standard deviation) of each case. Thus, using standard deviation we can know the probability that six, seven or eight cases will finish within eight hours. This is known as 'probabilistic scheduling' and tools are readily downloadable from several resources.[3,5]

Suggested data to collect

- Scheduled times for the lists under review.
- Use of each list (ie the time spent in anaesthesia or surgery, with patient contact) as a percentage of scheduled time (values less than 100% represent underrun and over 100% represent overrun).*
- The number or percentage of lists under- or overrunning.
- Gap times (the times between cases when there is no surgery or anaesthesia), which includes any late starts (note also, early starts should also be measured in minutes).*
- The mean time for each operation as is described; this will also generate a standard deviation over a large number of cases.*
- The estimated time that a booked list will finish, so that this can be compared with when it actually did finish.*
- The cancellation rate (as a percentage of cases booked).

Quality improvement methodology

- Ideally, efficiency ε scores should be greater than 85%.*
- Ideally, as few lists as possible should under- or overrun.
- Ideally, cancellation on the day of surgery should be zero.
- Where there is inefficiency (ε less than 85%)* for any given team, analysis should focus on what caused it; it could be under- or overrunning or cancellations, and each of these in turn will have separate, different solutions.
- Start times*: these are established to not affect efficiency, even if as large as 30-45 minutes late, but they are a thermometer of problems elsewhere in the system. If late starts are excessive, then analysis should focus on factors that led to them (arrival and management of patient admissions, number of porters or ward staff, effectiveness of preassessment so that results are available, etc).[3,6]
- Gap times*: it is rare for mid-list gaps to exceed 15% of the scheduled list times. Again, if gaps are excessive, focus should be on root causes (which may relate to blockage in recovery, lack of porters or nursing staff on ward, delays in obtaining equipment, etc).[3,6]
- Assessing that predicted list durations by probabilistic scheduling actually match what happened.[3,7]

*For all these, data should be presented as mean (standard deviation) or median (interquartile range) to provide an estimate of variance.

Mapping

ACSA standards: 1.5.1.2, 4.1.1.1

GPAS 2020: 2.5.29, 2.6.2, 2.7.2, 3.5.10, 3.5.14

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11.4 Cancellation of surgery

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Why do this improvement project?

Cancellation of surgery has major consequences for the patient, their carers and relatives, and for the hospital. It may also indicate failures in hospital processes. It is a very poor patient experience and risks wasting staff, theatre and organisational resources. A 2018 seven-day observational cohort study in the NHS found a cancellation rate on the day of surgery of 13.9%.[1] The reasons for cancellations are multifactorial, including but not limited to clinical reasons, bed capacity, critical care bed availability, operating theatre capacity and lack of equipment or specialist staff.

Background

Three perspectives should be considered:

- Patients, their relatives and carers, who are both physically and psychologically affected by cancellation of surgery, particularly at short notice.[2] Patients' stories include loss of income, loss employment, stress and anxiety and a worsening of their pre-existing condition.
- The hospital: financial sustainability of a hospital is in greatly dependent on surgical activity. It is estimated that it costs £1,200/hour to run a single operating theatre.[3] As resources become more limited for the NHS it is imperative that theatre resources are used optimally to contribute the financial sustainability of the hospital.
- Clinicians: surgeons in particular have close relationships with their patients and will be responsible for the clinical consequences of cancelled operations.

While cancellations for operational reasons such as bed capacity may be out of the control of anaesthetists, there are areas where we can make significant improvements. These may include:

- investing in robust preassessment services ensuring that patients' health is optimised when they present for surgery to minimise cancellations on the day of surgery for clinical reasons (eg anaemia, hypertension)
- risk stratification of patients to identify who would benefit from critical care postoperatively; having a system in place to communicate this clearly will help list scheduling
- forging good links with critical care and consideration of alternative models of providing elements of critical care postoperatively, for example the postoperative enhanced care model in place at York Hospital,[4] which may ease pressure on critical care capacity while still providing high quality care for postoperative patients
- improving processes in theatre such as encouraging minimal turnaround times, proactive management of the list, timely sending for patients, ensuring good throughput through recovery.

Best practice

Patient level and capacity reasons for cancellations are addressed in sections 1.2, 1.3 and 3.9. In this section, we consider the role of anaesthetists in optimising theatre efficiency. Best practice includes having a real-time understanding of why cases are cancelled and an improvement programme in place to address all causes of avoidable cancellations.

Suggested data to collect

- Establish the baseline number of cancellations per unit time (day/week/month).
- Reasons for cancellation can be categorised as clinical/non-clinical:
  - all elective surgery cancellations on the day with reason for cancellation recorded
  - all elective surgery cancellations within 24 hours of surgery with reason for cancellation recorded
  - all elective surgery cancellations within a week of planned surgery, with reason for cancellation recorded
  - all emergency surgery cancellations with reason for cancellation recorded.
- Timings in all cases: send times, anaesthetic room arrival, anaesthetic time, theatre entry, time to incision, closure to leaving theatre, leaving theatre to start of next anaesthetic.

Quality improvement methodology

- After the baseline data have been collected, an affinity diagram can be used to help categorise the cancellations by reason or a driver diagram to list key drivers for improvement.
- A Pareto chart can be used to determine the most common causes and suggest lines of enquiry.
- Process mapping can be used to determine 'what good looks like' and indicate the reliability of your current system.
- For each cancellation reason, tools like the 'five whys' or a fishbone chart can be used to understand the underlying factors contributing to the cancellation.[5]

Case example

A good example of improving turnaround time in theatres is described by Fletcher et al at Southmead Hospital, who used quality improvement methodology to improve turnaround time in orthopaedic theatres 20 minutes per case over a three month period.[6] They describe process mapping to understand all steps involved from skin closure in one patient through to skin incision in the next patient. They used a stepwise approach to introduce new interventions including a warning call to the preoperative area, releasing the operating department practitioner to check in the next patient, assigning a dedicated team for cleaning and synchronising cleaning with sending. Important points in their conclusions are the role of all staff and engagement of the entire team to maintain sustainability of their changes.

Mapping

ACSA standards: 1.2.1.1, 1.2.2.1, 1.2.1.5, 1.2.1.6, 1.5.1.2, 3.1.2.1, 4.2.2.2

Curriculum competences: AT_D3_01, AT_D3_05, AT_D3_06, AT_D3_08, AT_D4_01, AT_D5_04

CPD matrix codes: 1L02, 1L05, 2A03, 2D02, 3J00, 3J01

GPAS 2020: 2.5.29, 2.6.2, 2.7.2, 3.5.10, 3.6

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11.5 Sharing, improving and learning from critical incidents

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Why do this quality improvement project?

A critical incident in healthcare can be defined as 'any unintended or unexpected incident which could have, or did, lead to harm for one or more patients'.[1] It is axiomatic in modern safety thinking that identifying and investigating errors and near misses, rather than ignoring them, is likely to reduce the chances that they will recur. Good reporting and subsequent action are therefore prerequisites for safe care.

Background

Systematic investigation of critical incidents has been used as a tool in aviation since at least the 1950s, and has been credited with much of the vast improvement in the safety record of this and many other high-risk industries.[2] This approach was applied to anaesthesia in the Australian Incident Monitoring Study,[3] which led to important developments in practice including the production of a critical incident handbook.

The establishment of the National Reporting and Learning System in England and Wales in 2003 facilitated anaesthesia-specific incident report analysis by the Safe Anaesthesia Liaison Group (SALG), with regular publication of summaries and recommendations.[4] However, it seems clear that the benefits of incident reporting are far from fully realised. In part, this stems from gross underreporting,[5] driven by a variety of factors including a fear of punitive consequences, lack of understanding about what should be reported and a lack of belief that reporting will lead to change.

Reporting and learning systems are criticised for concentrating on collecting reports and doing little with them.[6] In particular, near misses are rarely given the same level of investigation as incidents that cause harm, despite being equivalent learning opportunities.[7]

To be of most use, reports need to be submitted in a timely fashion by the right people and containing the right information.[8] The SALG anaesthetic e-form attempts to facilitate this process.[9]

Best practice

- All members of the department know how to report an incident and feel empowered to do so without fear of blame or retribution.
- All critical incidents are reported in a timely fashion with sufficient information to enable investigation. Near misses are reported and given the same attention as incidents that cause harm.
- All appropriate reports to the local system are forwarded to the national system.
- All reports receive a suitable response.
- Governance is professionalised with appropriate training and job planning and is promoted as an important role within the service. This can include job planning support for investigators but also identifying areas where direct clinical care and supporting professional activities are better planned for a safer working environment. In particular, clinical governance leads and incident investigators are trained in investigating and responding to incidents and near misses.
- The outcomes of any investigations are disseminated effectively, using means such as email, newsletters, slide packs, safety boards, local induction, team brief, safety huddles and morbidity and mortality meetings, and are embedded in relevant policies and standards.
- Anaesthesia Clinical Service Accreditation standards require departments to have a system for reporting of critical incidents and other untoward incidents and near misses.
- NHS England's National Safety Standards for Invasive Procedures section 4.1.5 requires all patient safety incidents and near misses to be reported and analysed, and the results of investigations to be fed back to staff.[10] There are similar standards in devolved health systems in other parts of the UK.

Suggested data to collect

Measuring safety itself as an outcome is notoriously difficult. Process measures are therefore common substitutes. Suitable measures include:

- assessing the safety culture within the department using questionnaires, specifically the proportion of staff who feel empowered to report an incident
- the total number of incidents reported
- the proportion of these reports that involved harm and it's category (since a high harm : incident report ratio is often used as an indicator of underreporting)
- the proportion of reports containing a minimum dataset, such as that required for the anaesthetic e-form
- the proportion of reports that led to governance actions (such as entry to the risk register)
- the proportion of reports where the response led to a suitable change in practice.

Quality improvement methodology

- Assuming that not all incidents are reported, the general aim will be to increase the reporting rate such that a greater proportion of risks are identified and managed. Setting a specific aim will depend on the department's current reporting behaviour and may involve focusing on one of the other process measures above.
- A driver diagram can help to identify areas for change, which might include clarification of what constitutes an incident, the ease of use of the reporting system and the responsiveness (speed and quality) of feedback following a report.
- Continuous monitoring of reporting rates or other process measures will make it easier to know whether a change has been effective, using a run chart or similar tool.

Case example

Hotton et al have described a project at Bath's Royal United Hospital in which a single incident reporting tutorial and a focused week of encouraging incident reporting dramatically raised the number of incidents reported by junior doctors and provided evidence that the system for warfarin prescribing needed improvement.[11]

Mapping

ACSA standards: 4.2.1.1, 4.2.1.2, 4.2.2.1

Curriculum competences: PO_BK, PO_BS, CI_BK, CI_IK, CI_IS

CPD matrix codes: 1I01, 1I05

GPAS 2020: 3.5.24, 3.5.25, 3.5.26, 3.7.2

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11.6 Training on, maintenance and purchase of anaesthetic equipment

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Why do this quality improvement project?

Modern anaesthesia is dependent on a range of equipment from the old, simple and cheap to the innovative, complex and expensive. Evidence must be provided to make a case for equipment to be procured, it must be maintained thereafter and we require training to fully use its potential and provide a safe and progressive anaesthesia service.

Background

The benefits of maintaining normal cardiorespiratory parameters, normoglycemia, normothermia and the negative effects of accidental awareness under general anaesthesia are well established and, indeed, advances in anaesthesia delivery and monitoring have contributed to the decrease in mortality secondary to anaesthesia by a factor of 10 in the last 20-30 years.[1] Healthcare is expensive. The Office for National Statistics calculated the total spend on healthcare in the UK was £197.3 billion in 2017, of which 10% was on medical goods.[2] There is increasing pressure to use these resources efficiently and the spending on medical goods fell in real terms in 2017.

Best practice

The RCoA Guidelines for the Provision of Anaesthetic Services sets standards that are assessed by the Anaesthesia Clinical Services Accreditation scheme.[3,4] It is recommended that all departments have a lead clinician for anaesthetic equipment.

Suggested data to collect

Standards	Measures
Anaesthetic machine should be checked at least daily.	■ The percentage of anaesthetic machines with logbook confirming daily checks completed (or electronic record of daily check) and anaesthetic records confirming that the checks are complete.
No anaesthetic machine should be able to deliver a hypoxic gas mixture.	■ Identify all anaesthetic machines that can still deliver a hypoxic gas mix, especially in remote locations, and have them removed from service.
Where piped oxygen is not available, there must be an adequate supply from cylinders that are checked regularly. Oxygen and air cylinders are stored separately.	■ Cylinders should be seen and evidence sought of paper records of checks, together with an operational policy for backup oxygen provision. Oxygen and air cylinders are seen to be stored separately in accordance with never event 15: unintentional connection of a patient requiring oxygen to an air flowmeter. ■ Is there a transfer audit form?
Equipment for monitoring, including capnography, ventilation of patients' lungs and resuscitation including defibrillation, is available at all sites where patients are anaesthetised or sedated and on the delivery suite. In areas that treat children, this must include equipment specifically designed for children. This specifically includes all situations where a patient will be intubated, including the ward.	■ A walk around checking for the presence of all basic anaesthetic equipment including defibrillators, bag and masks and capnography, including in remote locations. Staff should be asked if they encounter any difficulties with equipment in any sites.

Ultrasound imaging equipment is available to assist with vascular access and regional anaesthesia.	■ Number of working ultrasound imaging machines. ■ Is there a process for replacement and servicing?
Devices for monitoring and maintaining or raising the temperature of the patient are available throughout the perioperative pathway, including control of theatre temperature. Devices, including those suitable for use on children, should be seen and need to be in working order so that they can be used intraoperatively. Equipment for fluid and blood warming and, where appropriate, rapid infusion, is available.	
There is standard and specialised equipment for the management of difficult airways immediately available in every area where anaesthesia is given.	■ The difficult airway trolleys should be seen and the equipment on them should be checked.
Appropriate equipment is available and is used for all intra- and interhospital patient transfers.	■ Number of portable ventilators and monitoring equipment available for both adults and children. ■ Is there an audit transfer form?
There is specialised equipment for the management of postoperative pain.	■ Number of patient-controlled and epidural pumps available for the services being provided. ■ Staff spoken to should agree that numbers are sufficient.
There is adequate protection from environmental hazards provided for staff.	■ Is there a staff member with responsibility for safety of x-ray, control of substances hazardous to health and infection control?
There is a planned maintenance and replacement programme for all anaesthetic equipment as required.	
Use of continuous monitoring (eg the transition from theatre to recovery) is a recent addition to the Association of Anaesthetists' recommendations for standards of monitoring during anaesthesia and recovery guidelines.[5]	■ Percentage of cases that have continuous monitoring between theatre and recovery feedback compliance to staff using run charts.
All anaesthetists and anaesthetic assistants receive systematic training in the use of new medical equipment and the training is documented.	

11.6 Training on, maintenance and purchase of anaesthetic equipment

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Quality improvement methodology

- Choose a location (eg theatres) and walk around noting the age of the equipment. Ask medical physics to provide written evidence of the replacement programme. The plan should include a timetable to implement the agreed facilities, equipment purchase and replacement, which includes both planned objectives for the immediate year and outline plans for two to five years.
- Training needs can be identified by relevant questionnaires and followed up by tea-trolley training sessions or similar. This method can used both for continuing training (eg difficult airway training such as front-of-neck airway) or when new equipment is introduced.
- All members of staff should be able to confirm the difficult airway trolley location for adults and children. Ideally, there should be a difficult airway trolley available at every location. There must be a robust process for obtaining assistance in remote sites; this can be tested using in-situ simulation.

Mapping

ACSA standards: 2.1.1.1, 2.1.1.4, 2.1.1.5, 2.1.1.6, 2.1.1.7, 2.1.1.8, 2.1.1.9, 2.1.1.10, 2.1.1.11, 2.1.1.12, 2.1.1.13, 2.1.1.14, 2.1.2.1, 2.1.2.2,

Curriculum competences: PO_BK_01, PO_BK_02, IG_BK_02, G_BS_02 TF_BK_03, DI_IK_03, DI_IS_01, TF_IK_05, TF_IK_10

CPD matrix code: 1105

GPAS 2020: 3.2.17, 3.2.18, 3.2.19, 3.2.20, 3.2.21, 3.2.24, 3.2.26, 3.2.27, 3.2.28, 3.2.29, 3.2.31, 3.2.32, 3.3.5, 3.3.6, 3.4.8, 4.2.18, 7.2.9, 7.2.13, 7.2.14, 7.2.15

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Delivery of services

11.7 Availability of ultrasound equipment in anaesthetic areas

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Background

The use of real-time ultrasound guidance has become standard practice in the performance of a wide variety of anaesthetic procedures, including but not limited to peripheral and central vascular access, peripheral and neuraxial nerve blockade, gastric, lung and cardiac ultrasound. For many of these procedures, it is recognised as best practice.[1–3] Annexes C–F of the RCoA curriculum specify competence in the use of ultrasound as a specific training requirement in domains relating to regional anaesthesia and central venous access. ACSA standards have also highlighted the need for ready availability of equipment to conduct ultrasound guided vascular access and regional anaesthesia.

Despite this, ready availability of an ultrasound machine and essential consumables such as probe covers remains an issue in many centres.

Ready availability of equipment is crucial in maximising theatre efficiency and workflow, in providing the highest quality of patient care and in supporting continuing training requirements for anaesthetic staff.

Issues that have been highlighted include:

- a widespread disparity in perceived compared with actual need for availability of ultrasound equipment across anaesthetic departments (highlighted by a 2019 national Welsh survey)[4]
- potential for patient care to be compromised if an anaesthetic plan is changed because of non-availability of equipment (eg a nerve block not being done)
- potential for delay in the anaesthetic room as a result of the time taken to find ultrasound equipment (where machines are shared between multiple theatres or areas)
- non-availability of dedicated anaesthetic ultrasound in sites remote from main theatres (eg obstetrics).[5]

Anaesthetic departments may be able to help address some of these issues by conducting regular assessments of departmental requirements for ultrasound equipment and by auditing its availability. The information gathered from these audits may help to guide departmental policy or support business cases for equipment acquisition.

Best practice

All procedures should be carried out without delay attributable to lack of ultrasound equipment and without plan changes dictated by the unavailability of equipment.

Standards:

- Where anaesthesia is administered in a location remote from the main theatre suite (examples: obstetrics, intensive care, emergency department), that area should have a suitable ultrasound machine immediately available at all times (100% standard).
- Fewer than 5% of cases should be delayed more than 10 minutes with delay attributable to lack of availability of ultrasound equipment.
- There should be a named member of staff with responsibility for procurement and maintenance of ultrasound equipment.
- Any changes to the preoperative anaesthetic plan should not be attributable to lack of availability of ultrasound equipment.
- There should be an overall ratio of one ultrasound machine to three simultaneously running operating theatres.
- The whereabouts of departmental ultrasound machines should be readily visible (for example, on a whiteboard in the theatre department or logged on a computer system).

Suggested data to collect

- Equipment availability issues causing theatre delays: document the length of delay and the cause.
- Regular checks in remote areas in which anaesthesia is delivered to ascertain whether ultrasound is immediately available if it is required.
- Regular survey of consultants, trainees and anaesthetic assistants within a department to gauge perceived compared with actual need for availability of ultrasound machines. Results of these surveys to be fed back to hospital's quality improvement and/or safe care leads.
- Regular audit of working condition of machines and availability spot checks.
- Departmental reporting of all cases in which a preoperative anaesthetic plan had to be changed because of a lack of ultrasound availability (including performance of landmark regional anaesthetic or vascular access techniques where this was not the original plan). Change of anaesthetic plan owing to lack of equipment should also be recorded on the hospital's incident reporting system.
- Spot checks of whether documented location of ultrasound machines in the theatre department correlates with their actual location.

Quality improvement methodology

- Map the steps required to access ultrasound equipment in a theatre/anaesthetic room. Is the storage area for the equipment well signposted, including easy recording of the location of ultrasound machines in use?
- Can all relevant staff members (anaesthetists and operating department practitioners) describe how they would access an ultrasound machine? How is this covered in departmental induction? As equipment may be used rarely by some staff, can accessing equipment be made compatible with human factors, and so not rely on memory (ie good signposting or keeping a note of equipment locations in each theatre)?

Mapping

ACSA standards: 2.1.1.7, 2.1.1.8, 2.1.2.1
Curriculum competences: RA_IK_05, RA_HK_03, RA_HS_02, RA_HS_03, RA_HS_04, RA_AK_01
CPD matrix codes: 1I02, 1I03, 1I05, 2B01, 2B02, 2B03, 2B06, 2G01, 2G02, 2G03, 2G04
GPAS 2020: 3.2.18, 3.2.24, 5. 2.31, 5.2.32, 6.2.20, 9.2.15, 9.2.16

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11.8 Check and challenge: severe local anaesthetic systemic toxicity

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Sheffield Teaching Hospitals NHS Foundation Trust

Why do this quality improvement project?

After injection of a bolus of local anaesthetic, systemic toxicity may develop at any time in the following hour. Although the incidence of local anaesthetic systemic toxicity (LAST) is low, the consequences may be severe, up to and including cardiac arrest. These consequences can be prevented with prompt treatment. All anaesthetists practising regional anaesthesia should be able to immediately recognise and treat LAST.

Best practice

The approximate incidence of LAST after peripheral regional anaesthesia is 3/1,000 with about half of cases presenting as seizures. Ultrasound has been shown to decrease, but not eliminate, the risk.[1] Twenty per cent intravenous fat emulsion (Intralipid® 20%, Baxter Healthcare) therapy is was first used in 2006 to resuscitate a patient with LAST and it is a key component of its treatment.[2,3] The Association of Anaesthetists has published a safety guideline on the management of severe local anaesthetic toxicity,[4] which is incorporated into the current Advanced Life Support guidelines,[5] and knowledge of the management of LAST is explicit in the RCoA curriculum.

Suggested data to collect

Anaesthetic knowledge

All anaesthetists should be able to describe:

- the signs and symptoms of LAST
- the immediate management of LAST
- treatment of LAST with patient in circulatory arrest
- treatment of LAST without circulatory arrest
- follow-up after a LAST episode.

Theatre set-up

- 100% of anaesthetists and operating department practitioners should be able to describe the exact location of the departmental Intralipid.
- All operating theatres should contain written Association of Anaesthetists local anaesthetic toxicity guidelines.
- All theatre suites should stock 1000 ml Intralipid 20%.
- Remote sites using local anaesthetic should have the nearest Intralipid and emergency equipment signposted and available without delay (within five minutes).

Patients undergoing regional anaesthesia

- All patients should be monitored according to Association of Anaesthetists minimum monitoring standards from local anaesthetic injection to one hour post-injection (electrocardiogram, non-invasive blood pressure, peripheral capillary oxygen saturation, capnography if sedated).[6]

Quality Improvement methodology

As local anaesthetic toxicity is uncommon, staff may not retain knowledge on the management and location of drugs. Try to co-locate information with regional equipment and provide compatible signage and guidance so that staff do not need to commit rarely used knowledge to memory.

High-fidelity simulation can be used to practice LAST drills and to test the accessibility and usability of local anaesthetic toxicity equipment.

Review theatre stocking processes to ensure that Intralipid remains in date and is replaced after any use.

Consider departmental refresher training in anaesthetic emergencies as part of a regular training or governance programme.

Mapping

ACSA standards: 1.3.1.6, 2.2.1.3
CPD matrix codes: 1B04 2A06 2G04 2G01
Curriculum competences: RA_BK-02, RA_BK-04, RA_BK-12, PR_IK_03, CI_BK_27
GPAS 2020: 3.5.18, 3.5.19, 7.2.19, 9.2.31, 9.2.47, 10.5.19

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11.9 Anaphylaxis and the anaesthetist

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Why do this quality improvement project?

Perioperative anaphylaxis is an unanticipated emergency with a short window of opportunity to diagnose and treat. Reactions are rare but can be life threatening. The Sixth National Audit Project (NAP6) demonstrated a delay in starting anaphylaxis-specific treatment in 25% of cases of perioperative anaphylaxis, that vasopressin and glucagon were rarely used, that an anaphylaxis pack was used in fewer than 50% of cases, that the understanding of what constituted an anaphylaxis pack varied between hospitals and that only 35% of anaesthetic departments had an anaphylaxis lead.[1] Chlorhexidine allergy was particularly problematic, with anaesthetists not suspecting chlorhexidine to be the cause of anaphylaxis in around 75% of cases.[2] This meant a continuing risk of allergen exposure during anaphylaxis. Teicoplanin was second highest cause of antibiotic-induced perioperative anaphylaxis. Given that teicoplanin is frequently administered where there is a history of penicillin allergy, effective delabelling of penicillin allergy would decrease the overall risk of anaphylaxis. If NAP6 recommendations are being followed, each anaesthetic department will have systems in place to optimise patient outcomes.

Background

Unlike most perioperative emergencies, where risk can be anticipated based on the preoperative health of the patient, anaphylaxis cannot be anticipated and may occur in otherwise well patients. Chlorhexidine is the sole exception, where it is estimated that through better history taking, anaesthetists would be alerted to an allergy prior to exposure in 80% of cases. Presentation of anaphylaxis can be non-specific (eg profound hypotension only in the absence of skin signs). Beta blockade, use of angiotensin-converting-enzyme inhibitors, coronary artery disease and obesity are associated with fatal reactions/cardiac arrest. Serum tryptase can help to confirm the diagnosis. Immediate diagnosis and management can be challenging but, equally, prompt recognition and treatment are necessary for a good outcome. To achieve better outcomes in anaphylaxis, clinical leadership, staff training and education, and widespread uptake of risk mitigating practices are required.

Best practice

- RCoA, Sixth National Audit Project.[1]
- BSACI perioperative anaphylaxis guidelines.[3]

Suggested data to collect

Standards	Measures
Anaesthesia anaphylaxis treatment packs should be available in all theatre suits and include: i) an anaphylaxis management algorithm; ii) adrenaline prefilled syringes suitable for intravenous administration; iii) hydrocortisone; and iv) details of the location of glucagon and vasopressin, which should be immediately available wherever anaesthesia is administered.	■ Is there a department lead for perioperative anaphylaxis? ■ Percentage of theatres with immediate access to an anaphylaxis treatment pack and management guidelines? ■ Percentage of anaesthetists aware of the location and content of anaphylaxis treatment packs? ■ Percentage of anaesthetists aware of where the nearest glucagon and vasopressin are to be found, and how and when use them?
Anaesthesia anaphylaxis investigation packs should be available in all theatre suites. These should include: i) blood bottles for serum tryptase with instructions for timing; ii) instructions for how to make an onward referral for further investigation, including details of the allergy clinic the patient will be referred on to; and iii) documentation for the patient.	■ Percentage of theatres containing available anaphylaxis investigation packs. ■ Percentage of anaesthetists aware of the content of anaphylaxis investigation packs? ■ Percentage of anaesthetists who know where to refer suspected anaphylaxis patients for further investigation. ■ Retrospective: in patients with suspected anaphylaxis, the percentage of patients and their general practitioners with anaphylaxis who receive a letter, as per the NAP6 template.
Blood samples for mast cell tryptase should be taken at three timepoints: i) as soon as the patient is stable; ii) 1-2 hours after the event; iii) at least 24 hours after the event.	■ Percentage of anaesthetists aware of time points to check serum tryptase. ■ Percentage of anaesthetists aware of correct bottle to use. ■ Retrospective analysis of percentage of patients with suspected anaphylaxis who had three serum tryptase samples checked and at the correct timepoints.

11.9 Anaphylaxis and the anaesthetist

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Referrals to allergy clinics for investigation of perioperative anaphylaxis should include: i) full details of the patient's medication; ii) the event and timings of all drugs administered prior to the event; iii) copy of the anaesthetic chart; and iv) a standardised form (eg the Association of Anaesthetists' proforma). Referrals should be made to a centre with the experience and ability to investigate reactions to a range of drug classes or substances by skin testing, blood tests and provocation tests. Patients should be offered follow-up, either in hospital or in primary care, to detect adverse sequelae such as new anxiety, impairment of cognition or activities of daily living or deterioration in cardiorespiratory or renal function. The anaesthetic department lead should coordinate this.	■ The percentage of anaesthetists aware of what constitutes a comprehensive referral. ■ The percentage of anaesthetists aware that follow-up post suspected anaphylaxis should be offered to all patients.
Chlorhexidine allergy should be included in the allergy history (eg allergy-type symptoms during previous medical or dental procedures), allergy-type symptoms when using hygiene products (eg antiseptic creams or mouthwashes or urinary catheterisation). Itch or rash following preoperative antiseptic body wash or following cannulation or venesection. Operating theatres should have an accessible list of chlorhexidine-containing items. Appropriate alternatives should be readily available for patients with suspected or confirmed chlorhexidine allergy and anaesthetists should know where to find them. Clinical teams should be aware of 'hidden chlorhexidine' such as in urethral gels and coated central venous catheters.	■ The percentage of anaesthetists that specifically include a reference to chlorhexidine history. ■ The percentage of anaesthetists that know about hidden sources of chlorhexidine. ■ Do operating theatres have a list of chlorhexidine-containing items? ■ Is there a list of alternatives available for chlorhexidine allergic patients? ■ Do anaesthetists know where chlorhexidine free items are kept?
There should be a process for penicillin allergy delabelling.	

Quality improvement methodology

Anaphylaxis investigation and treatment packs

- Consider trialling anaphylaxis packs in a simulated scenario and altering the contents and instructions until they are clear to the first-time user or a non-anaesthetist who may be providing help in a resuscitation situation.

Training

- Review the training offered within the department. Are protocols and feedback from morbidity and mortality meetings or serious incident reports disseminated to all?
- Take feedback from training sessions to review efficacy, both immediately and at two months. Are members of the department and wider theatre team familiar with the protocols and instructions? If not, what do you need to change about your training to ensure staff are prepared? This may be changes to the training (improve awareness) or changes to the anaphylaxis packs (improve visibility of packs and human factors during crisis scenario).

Driver diagram

- Produce a driver diagram (Figure 11.9.1) to improve outcomes and follow-up care of patients with suspected perioperative anaphylaxis.

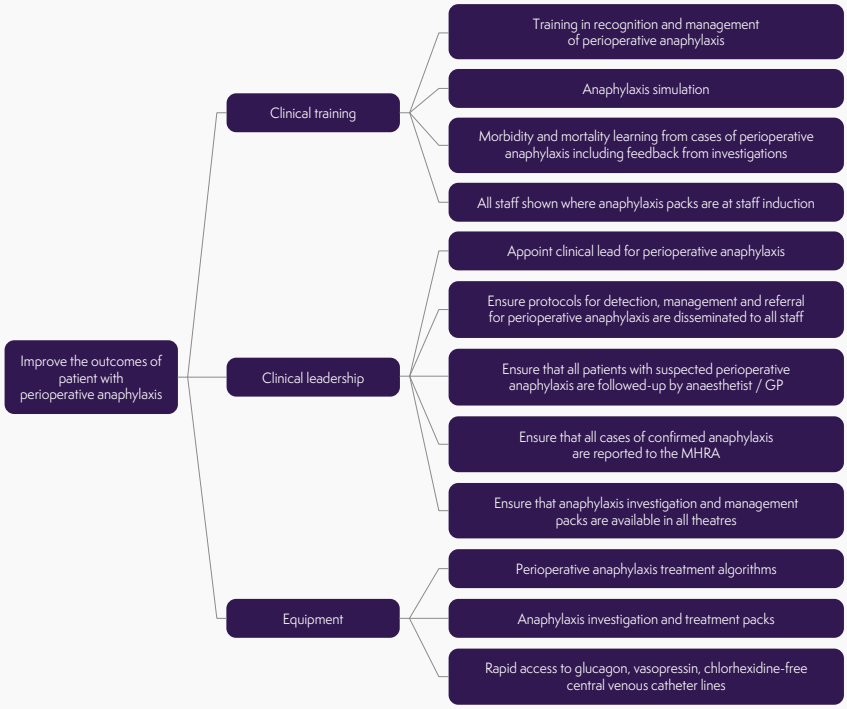

Figure 11.8.1: Driver diagram to improve outcomes and follow-up care of patients with suspected perioperative anaphylaxis.

Mapping

ACSA standards: 1.4.4.2, 2.2.1.3, 4.2.1.1, 4.2.2.2
GPAS 2020: 3.5.18, 3.5.19

References

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11.10 The Cappuccini test: effective clinical supervision to ensure safe delivery of anaesthetic services

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Why do this quality improvement project?

Safe anaesthetic care depends on rapid access to consultant support when anaesthetists in training, physician's assistants and some staff and associate specialist grade (SAS) doctors are working solo. Knowing that such support is available will also reduce stress and anxiety for these groups of practitioners, especially in the early stages of training. This tool tests the robustness of the clinical supervision pathway.

Background

The Guidelines for the Provision of Anaesthetic Services (GPAS) state that: 'Departments of anaesthesia should ensure that a named supervisory consultant is available to all non-consultant anaesthetists (except those SAS anaesthetists that local governance arrangements have agreed in advance are able to work in those circumstances without consultant supervision) based on the training and experience of the individual doctor and the range and scope of their clinical practice. Where an anaesthetist is supervised by a consultant, they should be aware of their supervisor's identity, location and how to contact them.'[1]

The need for this provision was underlined by the case of Frances Cappuccini, who died in 2012 after returning to theatre following a moderate postpartum bleed which was managed effectively and quickly under general anaesthesia. However, after extubation there was apnoea or severe hypoventilation for up to 90 minutes, during which the non-consultant anaesthetist was unable to access effective support. At the inquest, the coroner noted that, 'The supervision arrangements in respect of [the anaesthetist] were undefined and inadequate and no one was aware who was supervising him and their availability.'[2]

Best practice

As clearly mandated by GPAS, all non-autonomous anaesthetists who are working alone should know which consultant is supervising them and how to contact them. The supervising consultant should know who they are supervising and what they are doing, and they should be free to assist them rapidly enough to mitigate acute serious issues such as loss of airway.

Suggested data to collect

In any anaesthetic environment where care is being provided by a non-consultant (with the exception of SAS doctors approved by local processes to work unsupervised):

1. Does the anaesthetist know the name of their supervising/supporting consultant?
2. Do they know how to contact them?
3. When the contact method is tried, does it work?
4. Does the supervisor know who they are supervising?
5. Does the supervisor know what kind of work the supervisee is doing?
6. Are they free to attend if required?

Indeed, even where consultants are acting alone, it would be prudent for them to apply a version of this Cappuccini test to confirm that back-up is available.[3]

Quality improvement methodology

- Over a suitable period (two weeks is suggested) identify all 'office hours' anaesthetic sessions where anaesthetic services are provided by a non-consultant/non-autonomous anaesthetist as defined above.
- Ask them questions 1 and 2.
- Use the information from the answer to question 2 to contact the supervisor and confirm that this works (question 3).
- Ask the supervisor questions 4-6.
- When data have been gathered, present at a departmental meeting to discuss where and how the communication pathway is interrupted and brainstorm solutions. Involving all members of department to identify solutions is much more likely to lead to meaningful results rather than imposing change.
- Implement and reaudit. Implementing simple changes first will ensure that the resulting change in an improvement.

Case examples

From preliminary data, it appears that failure to meet the requirements of the Cappuccini test more likely occurs at the consultant end (not knowing who they were supervising or what they were doing), although in some centres, the breakdown point occurred at the point of communication between the two parties (eg failure of a mobile phone signal or switchboard not having a contact number; question 3).

Solutions included managing the rota so as to ensure better matching of supervisees and supervisors; texting individuals at the start of the day to remind them to check on who and where their supervisor is; including supervision status in the prelist World Health Organization 'huddle'; improving hospital wi fi coverage to deal with 3G/4G dead spots in some clinical areas to ensure effective communication.[4]

Mapping

ACSA standards: 1.1.1.1, 1.1.1.2, 1.1.1.8, 1.1.3.3, 2.5.2.1, 2.5.2.2, 2.5.3.1, 2.5.3.2, 1.7.2.4, 1.3.1.4, 2.4.1.3

CPD matrix codes: 1H01, 1I02, 1I03

GPAS 2020: 3.1.2, 3.1.3, 3.1.4, 3.4.5, 3.4.6, 3.4.7, 5.1.4, 5.3.21, 5.4.11

References

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11.11 Prevention and control of healthcare-associated infection in anaesthesia

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Why do this quality improvement project?

Healthcare-associated infection remains a major challenge in the NHS; 6.4% of inpatients in acute care hospitals had a healthcare-associated infection, as reported in the English national point prevalence survey.[1] In addition to creating a huge economic burden on the NHS, healthcare-associated infections can cause significant mortality and morbidity. Cross-transmission of pathogenic micro-organisms between patients, hospital staff and equipment can occur during the administration of anaesthesia. The financial burden of healthcare-associated infection is not only due to expenses associated with prolonged hospital stay but also because of loss of productive working days through sickness.[2,3]

Background

During the conduct of anaesthesia, micro-organisms from one person can potentially be transmitted to another person through contaminated hands, gloves, clothing or hospital equipment.[4] It is important that due precautions are taken to prevent such incidents. Contaminated laryngoscope handles have been alleged vectors of infection with reported deaths.[5–7] Anaesthetic machines have been positive for cultures,[8] when cultures were taken between two consecutive anaesthetics within a span of time as short as 30 minutes, underlying the need to decontaminate equipment thoroughly between cases. Invasive anaesthetic procedures such as central venous lines and central neuraxial blocks require standard sterile precautions as they can serve as portal of entry for serious infections.[9] Equipment has been found to be positive for proteinaceous deposits even after supposed cleaning and decontamination,[10] thereby highlighting the need for monitoring and maintaining high standards of equipment decontamination. There is also a need to provide regular staff training and facilities to ensure effective decontamination services.[8]

Best practice

The World Health Organization, the Association of Anaesthetists, Department of Health, American Society of Anesthesiologists and Australian and New Zealand Society of Anaesthetists have made recommendations on hand washing techniques, observing standard precautions, decontamination practices between patient contacts and on infection control practices in anaesthesia.[11–16] It is important that healthcare centres train staff to maintain high standards of infection control and implement systems that promote effective decontamination of medical equipment. These systems must be regularly monitored, evaluated and updated. There must be a named lead for infection control in anaesthesia.[12]

Suggested data to collect

Although some outcome measures may be worth measuring (such as central line-associated bloodstream infections in intensive care), in general outcomes are multifactorial in origin and so for meaningful improvement work it will be important to collect the process measures listed below:

- hand washing habits and techniques in anaesthetic practice
- use of gloves and changing gloves between procedures on the same patient and between different patients
- assess any potential contamination of anaesthetic surfaces and machines through swabs and cultures at random or regular intervals
- decontamination of anaesthetic surfaces between cases
- decontamination of reusable equipment like laryngoscopes, flexible scopes, monitoring leads that are in direct contact with patients
- facilities for safe storage and transport of decontaminated equipment
- training of anaesthetic staff in decontamination methods
- facilities for decontamination of reusable and safe disposal of single use devices.

Quality improvement methodology

- Improvement cycle: an audit of existing practices of hand decontamination, use of gloves and decontamination of equipment can be undertaken and shared with the department and a reaudit conducted after recommending a change of practice to complete the audit cycle. This could be repeated in other areas listed, including staff training, swab cultures of anaesthetic surfaces. The audit processes could be continuous or intermittent depending on the data and the aim of the study. Hand washing and line-related infections are best audited continuously while culture samples from equipment may be taken periodically as required.
- Performance benchmarking: compare and share results of the local audit with nationally established benchmarks to drive progress. Evaluate and ensure improving compliance with locally established policies.

- Drivers of healthcare-associated infections are many, so a driver diagram might help to identify them in a systematic way.

Case example

One example of a project around preventing healthcare-associated infections is found in Preventing Harm From CLABSI from the Health Research and Educational Trust.[17]

Mapping

ACSA standards: 4.6.1.2, 4.3.1.2, 4.1.0.1
GPAS 2020: 3.2.15

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11.12 Professional Compliance Analysis Tool for improving the working environment and rotas

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Why do this quality improvement project?

Recent events have served to highlight the increasingly difficult and pressurised nature of the environments in which doctors in training often find themselves working. Evidence shows that poor morale and burnout negatively impact on patient safety and are driving many doctors to leave medicine.[1]

This project is designed to engage stakeholders in conversations around working patterns and factors affecting the working environment. The Professional Compliance Analysis Tool (PCAT) looks at issues beyond simply the number of hours worked; considering patient safety, quality of training and trainee health and wellbeing.[2]

Best practice

- Rotas should be compliant with rules as per British Medical Association rota rules at a glance.[3]
- Rotas should be designed and managed collaboratively between employers and doctors working the rota.
- Rotas should be published with sufficient notice, as defined by the Code of Practice (eight weeks for the rota template and six weeks for the duty rota).[4]
- Rota should be balanced, with different types of shifts (on calls, nights, long shifts) evenly distributed.[2]
- Time for handover should be built into the rota.
- Training needs must be able to be met with suitable proportion of out of hours working.
- There should be clear routes for escalation and senior contact out of hours.
- Annual leave should not be fixed and study leave should be accessible.
- There should be adequate induction to new departments.
- Rest facilities should be provided.
- Arrangements should be in place to ensure that teaching can be attended and be bleep free.

Suggested data to collect

PCAT is a four-step process (Figure 11.12.1), which begins with the engagement of key stakeholders within a department. Although these stakeholders may vary between individual departments, they must include:

- a doctor-in-training (eg chief resident or trainee representative)
- a training lead (eg college tutor)
- a service management lead (eg clinical director or clinical service manager).

Top tips to enhance the value of the process include the following:

- The local team may choose to modify or add questions relevant to issues raised within the department.
- Ensure a local context to ensure action-focused discussions around potential areas of improvement.
- Engage the whole cohort of doctors in training prior to implementation. Gain buy-in through focus on action, buy-in from senior leaders and sharing success stories from other departments.
- The report should be disseminated to all key stakeholders and then considered at a feedback meeting of the whole team (doctors in training, training leads and service management leads). Good facilitation of a structured meeting will enhance the output.
- Outputs from this meeting should include priority areas for improvement; dividing into those best led by anaesthetists in training and areas which require escalation and action by clinical leaders.

Figure 11.12.1: Professional compliance analysis tool four-step process.

Examples of change resulting from PCAT

- Restructuring of rotas for doctors-in-training:
  - introduction of different shift patterns
  - changes in patterns of out of hours working and rest periods
  - altered allocation of work-place tasks
  - re-establishing team structures.
- Identification of the need for additional doctors (eg appointment of non-training grade doctors and additional doctors on hospital-at-night teams).
- Appointment and novel uses of non-medical staff (eg advanced nurse practitioners) to supplement doctors-in-training.
- Changes in consultant working to improve support and supervision for doctors in training.
- Resource allocation such as rest facilities for doctors in training.
- Clear escalation plans published.
- Opportunity for conversations and paired learning across training grades and management.

Quality improvement methodology

- PCAT itself should be conducted as a plan–do–study–act cycle.
- Areas for improvement should be identified and taken forward as projects by the most appropriate stakeholders.
- Qualitative measurement can be achieved using one of the tools as outlined in the wellbeing section of this chapter.
- Quantitative data such as percentage of out of hours and rest post on call can also be measured and used to build the case for change.

Mapping

ACSA standards: 1.1.1.3, 2.4.2.1, 2.4.2.2, 2.4.2.3, 2.5.3.2, 2.5.6.1, 4.1.3.1, 4.2.1.1, 4.2.1.2, 4.3.3.1

GPAS 2020: 3.1.1, 3.1.5, 3.2.8, 3.4.1, 3.4.3, 3.4.5, 3.4.8, 3.5.13, 5.1.14, 5.1.15, 5.1.16, 5.1.17, 5.1.19, 5.4.3, 5.4.4, 5.4.9, 5.4.11, 6.4.3, 9.1.5, 9.1.7, 9.4.7

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11.13 Wellbeing

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Why do this quality improvement project?

Improvements in staff wellbeing have a positive impact on the individual (job satisfaction), on the organisation (improved productivity through improved staff retention and reduced sickness),[1–3] on the patient (high levels of staff engagement are associated with better patient outcomes)[4] and on finances (the cost of employee mental ill-health is around £2,000 per employee).[3] It is estimated that the return on investment in workplace wellbeing is £4.20 for every £1 spent.[3] Work-related stress is a significant problem within the NHS and within anaesthesia. Effects include stress-related illness, depression and burnout.[5–7]

Like excessive stress, fatigue can be a barrier to wellbeing. This topic is covered in section 11.14.

Background

Wellbeing relates to how people feel, how they function and how they evaluate their life as a whole.[8,9] It is more than an absence of illness, stress and fatigue, although these can be significant obstacles to wellbeing.[10] Many sources cite Martin Seligman's PERMA model of wellbeing, which outlines five pillars that contribute to positive wellbeing: positive emotions, engagement, relationships, meaning and accomplishment.[11] The NHS website lists five factors which have an evidence base for improving psychological wellbeing: connecting with others, being active, being mindful, learning and giving to others.[12]

Several bodies are recognising the importance of wellbeing and have developed guidance and suggestions for employers to improve staff wellbeing and/or reduce work-related stress:

- The National Institute for Health and Care Excellence (NICE) has published several guidelines and quality standards about wellbeing in the workplace.[13–15]
- NHS Employers have developed a Workforce Health and Wellbeing Framework, which sets out an approach for organisations to plan and implement their own staff wellbeing programme.[16]
- Heath Education England (HEE) has set up the NHS Staff and Learners Mental Wellbeing Commission.[17] Their 33 recommendations include appointing a workforce wellbeing guardian, a workforce wellbeing lead, provision of a psychologically safe space for staff and adequate rest facilities.
- The National Workforce Skills Development Unit has commissioned a review into workforce stress,[3] which presents a systematic approach to psychological wellbeing, acknowledging that work-related stress is a key barrier to wellbeing.
- The Health and Safety Executive has published management standards for managing stress at work.[18,19] Six risk factors for stress at work are listed: the demands of the job (workload, work patterns and environment); the control people have over the way they work; the support people receive from seniors and colleagues; relationships at work; their role in the organisation and how change is managed. The Executive recommends consideration of these factors when identifying areas for action to reduce stress at work.

Best practice

The wellbeing standards and guidelines above are not specific to anaesthesia but apply across all specialties. Specific Anaesthesia Clinical Service Accreditation (ACSA) standards related to wellbeing are referenced below and all the best practice measures listed here fit within the overarching standard: 'the department establishes and implements a culture for promoting the health and wellbeing of staff members' (ACSA 4.1.3.1).[20]

- A clinical lead should be appointed for wellbeing and welfare within the anaesthetic department and their role should include establishing a wellbeing programme and/or linking with organisational wellbeing endeavours.[16,20]
- Employee mental health and wellbeing should be routinely monitored and action taken to address any issues raised.[12,16] This will need support from departmental and organisational management and may require support from occupational health.
- Employees should be provided with good working conditions and should be consulted about what matters to them at work.[4,16]
- Education about wellbeing should be provided, such as information resources, sessions at departmental meetings, online or face-to-face courses.[16]
- Psychologically safe support services such as mentoring, counselling, physiotherapy and occupational health services should be available and staff should be aware of how to access these services.[17]

Suggested data to collect

Measuring wellbeing may seem nebulous, but metrics do exist.

- Data can either be taken from existing surveys already in place for, for example, staff engagement from NHS Staff Survey data or burnout in anaesthetists in training from the General Medical Council national training surveys, or a new questionnaire can be conducted.
- Wellbeing can be measured with the World Health Organization's Five Well-Being Index,[8] or a combination of the Short Warwick-Edinburgh Mental Well-Being Scale, the Office for National Statistics' subjective wellbeing scale and social trust question,[9] and there are several online survey tools available that link to the PERMA model.[21,22]
- There are also validated questionnaires to measure burnout (Maslach Burnout Inventory, Oldenberg Burnout Inventory, Copenhagen Burnout Inventory),[23] minor psychiatric disorders (General Health Questionnaire),[24] and the Professional Quality of Life questionnaire has been developed to measure compassion satisfaction, burnout and compassion fatigue.[25]
- Surveys can be designed to establish user rating of working conditions and awareness of initiatives to help with wellbeing such as the staff wellbeing lead, the wellbeing programme and how to access support services. Availability of and attendance at educational events about wellbeing can also be monitored.

Quality improvement methodology

- PDSA cycles: choose a wellbeing measure to study (wellbeing; staff engagement; burnout etc).
- Implement measures to improve wellbeing (and/or reduce stress), for example education on the importance of wellbeing or how to access to support, improved rest or catering facilities. Interventions can also be designed to address factors with an evidence base for improving psychological wellbeing as mentioned above, such as measures to encourage and enable colleagues to connect with each other, to give positive feedback or to access mindfulness.[11]
- Remeasure with the same questionnaire to assess the impact that an intervention or a bundle of interventions have on wellbeing.

Mapping

GPAS 2020: 5.1.14, 5.1.16, 5.1.17, 5.1.19. 9.2.44, 9.2.45, 9.2.46

ACSA standards: 2.4.2.1, 2.4.2.2, 2.4.2.3, 2.4.3.1, 4.1.2.1, 4.1.3.1

11.13 Wellbeing

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Delivery of services

11.14 Fatigue and the anaesthetist

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Why do this quality improvement project?

Anaesthetists play a key role in the care of two-thirds of all hospital patients.[1] On-call patterns of work, sleep disturbance and deprivation have detrimental effects on individual performance, which may impact on patient safety. Strategies to reduce and mitigate the effects of fatigue will improve personnel wellbeing and ensure best care for the patients.

Background

The modern NHS strives to deliver safe, efficient and effective health care 24 hours a day, seven days a week, 365 days a year. This takes a toll on staff, and recent publications have highlighted the impact of the high pressure environment on personal and professional wellbeing. A survey by McClelland et al of fatigue in UK anaesthetists in training highlighted the impact of fatigue on commuting safely and on their physical, mental and emotional health,[2] and the RCoA report into morale and welfare in the same group painted a worrying picture about levels of burnout.[3] Many issues highlighted will resonate with consultants, staff and associated specialist grade doctors, colleagues in other specialties and all healthcare professionals. The potential risk of harm to both patients and the healthcare workers themselves due to sleep deprivation and fatigue can no longer be ignored. Both healthcare professionals and NHS administrators should have strategies to minimise the occurrence of fatigue, recognise it when it does occur and mitigate its risks.

Best practice

Multiple publications have been written to understand the impact of fatigue and shift work on the NHS workforce.[4,5] A colour-coded system has been suggested by the Association of Anaesthetists to identify what facilities are available and what needs to be improved.[6]

Each department can use the standards to identify what they currently have in terms of rest facilities and what is the attitude of their organisation towards rest culture. Educational resources and handover tools, such as those produced by the Association of Anaesthetists, should be used and available. This information can be collected as suggested below.

Suggested data to collect

- Rest culture: what is the current institutional attitude towards rest?

GREEN Positive attitude of organisation towards, rest culture, awareness of detrimental effects of fatigue and introduction to rest facilities during induction.

AMBER Fatigue awareness and mention of rest facilities at induction.

RED Threatening culture towards rest or limited awareness of rest facilities.

- Does the organisation encourage and enable staff working on the night shift to nap during breaks from clinical work?
- Are there educational presentations about fatigue and wellbeing?
- Are there clear displays of posters on effects of fatigue and rest facilities available in the department or hospital?
- Use of SLEPT-NOD tool at handovers.[6]
- Use questionnaire tools to determine the awareness of staff about the effects of sleep deprivation on their wellbeing and patient safety.
- Are the current rest facilities adequate?

GREEN Quiet, dark, private room with a bed.

AMBER Private area with reclining chair, pullout mattress.

RED No or communal facilities.

- What is the current access to rest facilities?
- Can facilities be accessed within 15 minutes?
- Are these facilities used for other purposes as well (eg dining, working)?
- What is the quality of the accommodation (eg quiet and dark with furniture to enable horizontal rest)?
- Is the use of rest facilities encouraged during the shifts?

Quality improvement methodology

- The qualitative data collected can be summarised using a driver diagram. This will allow categorisation of the data into groups that have some affinity.
- The driver diagram will reduce a large amount of information to a few useful focus areas for an improvement effort. For example, a department can identify common themes and focus improvement in these areas, such as improving rest facilities or highlighting educational resources available.
- Using subjective fatigue measurement scales such as the Karolinska Sleepiness Scale or the Samn–Perelli Fatigue Scale can help individuals in self-assessment of tiredness during working hours.[7,8] This can be used to gauge the rotas to see what effect this has on individuals and can be used as a continuous outcome measures.

Mapping

ACSA standard: 2.4.21

GPAS 2020: 5.1.14, 5.1.16, 5.1.17, 5.1.19. 9.2.44, 9.2.45, 9.2.46

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12 Neuroanaesthesia

Edited by Dr Judith Dinsmore
QI editor Dr Lesley Jordan

12.1 Prevention of hyperthermia in patients with acute brain injury

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Why do this quality improvement project?

Acute brain injury is a leading cause of death and disability. Management focuses on the prevention of secondary neuronal damage. Patients with acute brain injury commonly develop pyrexia. The prevention of hyperthermia in these patients may improve long-term outcomes.

Background

Patients with acute brain injury have been demonstrated to suffer adversely as a consequence of pyrexia.[1] Every intensive care unit (ICU) should have established guidelines to both monitor and treat hyperthermia in patients with acute brain injury. This is particularly relevant during the acute phase of the admission but may be extended if there is evidence of continuing cerebral ischaemia or inflammation.

Best practice

For every one degree C rise in admission temperature, the relative risk of a worse outcome is doubled for stroke patients.[2] The European Stroke Organisation (ESO) guidelines recommend that the cerebral metabolic rate should be limited by avoiding hyperthermia.[3] In acute ischaemic stroke, the ESO advocates prompt investigation for concurrent infection and treatment with paracetamol and fanning should the temperature reach 37.5 degrees C.[3]

Fever is an independent risk factor for poor outcome following aneurysmal subarachnoid haemorrhage. It is recommended that temperature is controlled using pharmacological and/or physical means.[1] Pyrexia has also been shown to independently increase mortality and worsen secondary injury after traumatic brain injury.[4]

Evidence from patients sustaining out of hospital cardiac arrest suggests that normothermia may be just as advantageous as hypothermia, (33 degrees C vs 36 degrees C).[5] Furthermore, patients with peak temperatures of less than 37 degrees C also demonstrated an increased mortality.[6] Targeted temperature management should be closely monitored to maintain the core temperature at 37 degrees C plus or minus 0.5 degrees C.[7]

Suggested indicators

The definition of acute brain injury for the purposes of this quality improvement project includes traumatic brain injury, thrombotic or haemorrhagic stroke, subarachnoid haemorrhage and cardiac arrest.

The aim is for 95% of patients with acute brain injury as defined above to remain normothermic during admission to ICU by the locally agreed date.

Suggested data to collect

Standards	Measures
100% of patients with acute brain injury should have their core temperature measured and recorded on an hourly basis as a minimum.	■ Percentage of patients with acute brain injury remaining normothermic (36.5-37.5 degrees C) throughout admission to ICU. ■ Proportion of patients who have hourly core temperature measurements from admission to ICU (or juncture at which acute brain injury is diagnosed if subsequent to admission) until discharge from ICU.
100% of patients with a core temperature greater than 37.5 degrees C should receive prompt interventions within an hour to reduce their temperature.	■ Time taken for active cooling to commence when temperature rises higher than 37.5 degrees C. ■ Analyse reasons when core temperature remains elevated for over 1 hour to identify problems to work on, and processes to improve actions to lower temperature quickly.

100% of ventilated patients should have their temperature maintained below 38 degrees C.	■ Highest and lowest recorded temperatures. ■ Time spent with a temperature above 38 degrees C.
100% of patients with a temperature rising greater than 37.5 degrees C should be investigated for concurrent pyrogenic infection.	■ Rate of undertaking investigations including white cell count and C-reactive protein. ■ Time taken for culture samples to be taken.

Quality improvement methodology

- Draw a process map for an acute brain injury from the time of admission of the patient to ICU until discharge. Develop the map with representatives of all the staff involved. Identify delays and steps that do not add value.
- Brainstorm ideas for improvement and then test in a small group of patients to see whether they are effective. Learn from the test, adapt your idea and test again until working well (eg where would it be most helpful to remind staff to measure patient temperatures and or intervene to treat hyperthermia? Which members of staff are most reliable at intervening to treat hyperthermia? Do they have lessons to share?).
- Review cases that failed the standard by a long way. Are there common themes that could be improved?
- Review cases where processes worked well and determine the reasons, so these cases can be repeated.
- Measure each step and share the results with the team.

Mapping

ACSA standard: 2.1.1.9

Curriculum competences: Annex C NA_IK_02, NA_IK_03, NA_IS_10, NA_IS_14, Annex D NA_HK_03, NA_HK_04, Annex G AR_BK_05, AR_BK_06, AR_BK_07, AR_BS_10, AR_HS_09, AR_AS_04

GPAS 2020: 2.18, 3.2.31, 5.15, 5.2.2, 14.2.8

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12.2 Transfer of the patient with traumatic brain injury

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Why do this quality improvement project?

Transfer of patients with an acute brain injury is potentially hazardous if poorly executed. Consensus guidelines agree that high-quality transfers will be associated with better outcomes.

Background

Many patients with a serious brain injury (Glasgow Coma Scale score of less than 8) need to be transferred urgently between or within hospitals. Priorities for care are the prevention of secondary brain injury and the early detection and evacuation of intracranial haematomas. Secondary brain injury occurs as a consequence of cerebral hypoxia due to either reduced oxygen supply (raised intracranial pressure, hypotension or hypoxaemia) or increased oxygen demand (hyperthermia or seizures). Surgical evacuation of intracranial haematomas is time critical; a maximum of four hours is the commonly accepted target.

Best practice

- The transfer of patients with brain injury measures against standards set by the Association of Anaesthetists and the Neuro Anaesthesia and Critical Care Society and endorsed by the RCoA, the Intensive Care Society and the Joint Royal Colleges Ambulance Liaison Committee.[1]
- Aim: 95% of appropriate patients with significant brain injuries as defined above are transferred to neuroscience unit within four hours of injury, following guidelines from the Association of Anaesthetists and the Neuro Anaesthesia and Critical Care Society.[1]

Suggested data to collect

Standards	Measures
There should be designated consultants in referring hospitals and neuroscience units with overall responsibility for the safe transfer of patients with a brain injury.	■ Percentage of referring units and neuroscience units with named consultant lead.
Local guidelines, consistent with national guidelines, should be available and should state that transfers should only be undertaken by individuals with appropriate training and should occur in a timely manner.	■ Percentage of units with transfer protocols in place. ■ Percentage of individuals undertaking transfer who have received training in patient transfer. ■ Time from injury to receiving definitive treatment. ■ Number of delayed transfers (over four hours) with documentation of reasons for delay (analyse reasons for delays over four hours and transfers faster than two hours, with reasons).
All patients must be haemodynamically stable prior to transfer, arterial oxyhaemoglobin saturation (SaO_2) and end-tidal CO_2 should be checked against arterial blood gases prior to transfer.	■ Percentage of patients with documented SaO_2 and end-tidal CO_2 checked against blood gas prior to transfer.

All patients should have high-quality care during transfer with the airway controlled by intubation and mechanical ventilation with end-tidal CO_2 monitoring.	■ Targets of SaO_2 greater than 95% and end-tidal CO_2 4.5-5.0 kPa achieved. ■ Percentage of patients intubated and ventilated with end-tidal CO_2 monitoring during transfer. ■ Percentage of patients where ventilation parameters were recorded during transfer and percentage of those who required adjustment (analyse where changes were made and identify issues).
All patients should be sedated with continuous intravenous infusion; neuromuscular blocking agents should be used with appropriate monitoring.	■ Percentage of patients without continuous intravenous sedation. ■ Percentage of patients receiving muscle relaxation. ■ Percentage of patients who had peripheral nerve stimulator monitoring.
All patients should have monitoring with electrocardiogram, SaO_2, pupillary reactions and invasive blood pressure.	■ Percentage of patients who received all of the above as per monitoring guidance.
All patients should achieve blood pressure targets of 110–150 mmHg systolic and mean arterial pressure greater than 90 for isolated traumatic brain injury.	■ Percentage compliance with guidance for blood pressure targets. ■ Percentage of patients who received treatment for hypotension. ■ Percentage of patients receiving treatment for hypertension (analyse effectiveness of treatments).
Staff at the neurosciences unit should be available to receive a handover. There should be a written record of transfer and patient observations.	■ Percentage of patients arriving in the neurosurgical centre with appropriate medical handover, as defined by a written record of transfer, including patient observations, untoward events during transfers such as equipment failures, proportion of patients who deteriorate (eg pupils becoming unreactive), transport problems (eg delays or navigation errors), missed injuries identified at the receiving hospital.

12.2 Transfer of the patient with traumatic brain injury

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Quality improvement methodology

- The qualitative data collected can be summarised using an affinity diagram. This will allow you to categorise the data into groups that have some affinity.
- The affinity diagram will reduce a large amount of information to a few useful focus areas for an improvement effort; for example, identify common themes (eg barriers to improving compliance with recommended monitoring and achieving ventilatory or blood pressure targets) and focus improvement in these areas.
- Process map each step using the staff involved and identify issues and delays, as well as steps that do not add value.
- Display baseline measures in a run chart and share with staff.
- Collect patient stories where there has been delay and the impact of the delay.
- Identify all improvement ideas and test on a small number of patients first; see what happens and adapt as necessary, always including the views of the staff who helped with the testing, to get engagement and ownership of the new idea. This will increase the change that the improvement will be sustained.

Mapping

ACSA standards: 5.1.1.2, 5.1.1.3, 5.1.1.4
Curriculum competences: NA_IK_22, NA_IS_07, MT_IK_04, MT_IS_06
CPD matrix codes: 2A11, 2C04, 2F01, 3F05
GPAS 2020: 5.2.13, 5.2.15, 5.2.16, 7.3.12, 7.3.13, 14.2.4, 14.4, 14.5.11,14.5.12, 14.5.17, 14.7.2

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Neuroanaesthesia

12.3 Subarachnoid haemorrhage

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Why do this quality improvement project?

Subarachnoid haemorrhage (SAH) results in significant morbidity and mortality. Anaesthetists are involved in early resuscitation, patient transfer, providing anaesthesia for neuroimaging or definitive treatment in the operating theatre or neuroradiology. Critical care management includes prevention of rebleeding and treatment of other complications. Optimal management may lead to dramatic improvements in outcome for patients when applied promptly.

Background

There are more than 100,000 cases of stroke every year in the UK, of which SAH accounts for 5%.[1] Management includes early investigation with computed tomography (CT) or lumbar puncture with negative imaging, prevention of rebleeding and treatment of other complications.

Best practice

National and international guidelines from NCEPOD, the European Stroke Organisation and the American Heart/Stroke Association outline the best evidence based practice in management of SAH.[2–4]

Standards include:

- time to secure aneurysm: definitive treatment within 48 hours
- blood pressure control: unsecured aneurysms systolic blood pressure less than 160 mmHg
- nimodipine should be commenced on admission for 21 days
- glucose should be controlled at 6-10 mmol/l.

Aim: 95% all appropriate patients with SAH to receive immediate protocolised treatment and definitive surgical treatment within 48 hours of the onset of symptoms.

Suggested data to collect

Standards	Measures
There should be protocols for the care of patients with aneurysmal SAH, covering initial assessment and diagnosis, management, referral, transfer to a neurosurgical/neuroscience centre and subsequent repatriation to secondary care, including rehabilitation.	■ Percentage of appropriate patients receiving full immediate treatment protocol and definitive surgery within 48 hours. ■ Baseline measures: protocol available and covers all minimal elements.
All patients presenting with acute severe headache should have a neurological examination and immediate CT of the head.	■ Time from admission to secondary care to undergoing CT examination.
Upon diagnosis, all patients with SAH should have a documented Glasgow Coma Scale-based grading.	■ Percentage of patients with clearly documented World Federation of Neurological Surgeons scale grading on admission.
Hypertension should be avoided in unsecured aneurysmal SAH, maintaining systolic blood pressure less than 160 mmHg.	■ Percentage of patients with systolic blood pressure over 160 mmHg for longer than 15 minutes (or other specified time). ■ Analysis of what interventions were used and effectiveness of interventions.
All patients with SAH should immediately be commenced on nimodipine.	■ Percentage of patients commenced on nimodipine and the time elapsed to first dose. Agree a local standard target time for the first dose (eg 15 minutes/30 minutes after arrival).

Hyperthermia (greater than 37.5 degrees C) should be avoided, pharmacological and physical measures used to aim for normothermia.	■ Percentage of patients with temperature above 37.5 degrees C. Analyse methods use to decrease temperature and measure frequency and effectiveness of each method.
Hyperglycaemia (glucose level above 10 mmol/l) should be avoided.	■ Percentage of patients with glucose above 10 mmol/l during their stay.
All aneurysmal SAH cases should have a definitive treatment with clipping or coiling.	■ Percentage of patients with aneurysm treated within 48 hours of diagnosis. A run chart of treatment times for consecutive patients is helpful in analysis.
Thromboprophylaxis should be commenced in all patients with compression stockings or pneumatic compression device on admission, with low molecular weight heparin after intervention if no contraindications are present.	■ Percentage of patients with active thromboprophylaxis (pharmacological or physical means). ■ Percentage of patients who develop deep venous thrombosis during admission.
Following fatal SAH, the option of organ donation should be sought.	■ Percentage of patients with fatal SAH who were referred to the organ donation pathway.

Quality improvement methodology

- Use a process map to detail the patient's journey from admission to treatment.
- Identify delays, unreliable steps and steps that do not add value.
- Include timings measured in your own audits, and benchmark against standards at specific points to identify areas of improvement.

Mapping

ACSA standards: 2.1.1.9, 2.1.1.12

Curriculum competences: NA_IK_09, NA_IK_10, NA_IK_19, NA_IK_23

CPD matrix codes: 2F01, 3F00

GPAS 2020: 14.1.6, 14.2.11, 14.2.13, 14.5.17

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12.4 Initial management of spinal cord injury

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Why do this quality improvement project?

Acute spinal cord injury is a devastating event requiring a multidisciplinary team approach. Improving the initial care that these patients receive is critical in preventing secondary cord injury and will have major implications for long-term outcome.

Background

Spinal cord injury is a major cause of morbidity, often resulting in severe and permanent disability. Approximately 500-600 people sustain acute traumatic spinal cord injuries every year in the UK, often leading to serious neurological damage, causing paraplegia, tetraplegia or death.[1] The majority are incomplete lesions with significant potential for neurological improvement.[2] Early recognition and prevention of secondary injury is paramount to future quality of life. Initial management in the critical care unit is targeted at preserving spinal cord function, minimising secondary injury and prevention of further morbidity.

Best practice

Evidence for best practice in the management of spinal cord injuries is published by the British Association of Spinal Cord Injury Specialists, the National Spinal Cord Injury Strategy Board and by the American Association of Neurological Surgeons.[1–3] The National Institute for Health and Care Excellence has also published guidance on the initial assessment and management of spinal injuries.[4] Local protocols may vary according to the services available but should all be in accordance with national recommendations.

Aim: 95% patients with a spinal cord injury to receive all standards to care in 24 hours in the intensive care unit by an agreed date within a department.

Suggested data to collect

Outcome measures

- American Spinal Cord Injury Association (ASIAIS) Impairment Scale scoring in six months compared with ASIAIS scoring on admission and 72 hours from admission.
- Deterioration of neurology within the first seven days from admission.
- Percentage of patients receiving all standards of care within 4, 24 and 72 hours of admission to the intensive care unit (ICU).

Process measures

Within four hours of admission to ICU:

Standards	Measures
All patients admitted to ICU with a spinal cord injury at T6 or above should have their airway secured or regular vital capacity measurements taken if not intubated.	■ Proportion of patients meeting this standard.
An arterial line should be inserted in all patients and a target mean arterial pressure documented.	■ Proportion of patients meeting this standard.
All patients should have both a nasogastric and a urinary catheter inserted.	■ Proportion of patients meeting this standard.

All patients should have appropriate venous thromboprophylaxis prescribed.	■ Proportion of patients meeting this standard.
All patients should be log-rolled and have their skin inspected, with assessment of anal tone and sensation.	■ Proportion of patients meeting this standard. ■ Percentage of patients receiving all five standards within four hours of ICU admission.
Within 24 hours of admission to ICU:	
All patients should have bowel management prescribed and initiated.	■ Proportion of patients meeting this standard.
All patients should have ASIAIS assessment completed.	■ Proportion of patients meeting this standard.
All patients should have secondary trauma survey completed.	■ Proportion of patients meeting this standard.
All patients should have spinal clearance form filled.	■ Proportion of patients meeting this standard. ■ Percentage of patients receiving all standards required within 24 hours.
Within 72 hours of admission to ICU:	
All patients should be referred to a spinal cord injury specialist centre.	■ Proportion of patients meeting this standard.
All patients should have a repeat ASIAIS assessment.	■ Proportion of patients meeting this standard.
All patients should be referred to a speech and language specialist and a dietician.	■ Proportion of patients meeting this standard. ■ Percentage of patients receiving all standards required by 72 hours.

Quality improvement methodology

Admission to ICU

- Baseline measures of the above to determine current compliance with clinical care within four hours of admission to ICU. Identify areas for improvement. Is there potential to design a specialised spinal cord injury pro forma with a checklist to ensure that all parameters are covered?
- Process map with the staff to identify areas of delay or noncompliance and use baseline data to display issues. Identify processes that add or do not add value. Identify areas to focus improvement work on, brainstorm ideas and then test them in a small group of patients first and see what results in an improvement.
- Develop a driver diagram to identify measures and display the whole project on a page.
- Involve all multidisciplinary stakeholders in the planning of process map and driver diagram and in the planning and testing of improvements.
- Display the compliance with the standards in run charts easily visible for all staff and document interventions made.

Within 24 hours of admission to ICU

- Look at the daily review notes of a patient with a spinal cord injury. Are all aspects reviewed and discussed in the ward round? Is there potential to design a specialised daily proforma for patients with spinal cord injury?

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- Develop a bedside checklist for patients with a spinal cord injury so all members of multidisciplinary team are fully informed.

Overall

- Is there scope to improve education within the multidisciplinary team?
- Potential to hold a course on the advanced management of patients with a spinal cord injury with workshops (respiratory, bowel, rehab) and simulation? Is there an opportunity to collaborate with other centres to develop this course?

Mapping

ACSA standards: 2.1.1.11
Curriculum competence: MT_BS_06
CPD matrix codes: 2F02, 3FOO
GPAS 2020: 14.5.11, 14.5.12, 14.5.17

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12.5 Management of raised intracranial pressure in severe traumatic brain injury

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Why do this quality improvement project?

Improving the care of patients with raised intracranial pressure following a severe traumatic brain injury through adherence to guidelines will ensure better patient outcomes.

Background

Despite the development of specialist neurointensive care, severe traumatic brain injury (Glasgow Coma Scale less than 8) is still a common cause of morbidity and mortality.[1–4] The early transfer of patients to and the implementation of evidence-based protocols in these specialist units have been shown to reduce mortality in patients with traumatic brain injury,[2,4] but there is still marked variation in adoption and adherence of local guidelines for the management of raised intracranial pressure.[5]

Best practice

Guidelines for the management of severe traumatic brain injury include those by the Brain Trauma Foundation in the United States.[6] There are no universally agreed UK guidelines, but neuroscience units should have locally agreed guidelines based on best practice and evidence.

Aim: by the date agreed within the department, 95% patients with traumatic brain injury, as defined by a Glasgow Coma Scale score of less than 8, receive appropriate care as defined by local protocols, including measurement of intracranial pressure and standard management of raised intracranial pressure.

Aim for 100% of all future neuro-intensive care admissions of patients with severe traumatic brain injury receive appropriate care defined by local protocols, including appropriate level of multimodal monitoring.

Suggested data to collect

Standards	Measures
A target intracranial pressure with triggers for escalation in treatment should be set for each patient.	■ Percentage of patients meeting this standard.
An optimal cerebral perfusion pressure target should be set for each patient. For calculations, the arterial transducer should be placed at the level of the tragus.	■ Percentage of patients meeting these standards.
Levels of care for intracranial pressure management should be determined. Failure to control intracranial pressure within one level should prompt rapid progression to next level.	■ Compliance with each level of care for intracranial pressure management. Analyse reasons for escalation of care.
Level of sedation (including agents to be used and reasons for use of paralysis) and ventilation targets (PaCO2 and PaO2) should be set.	■ Proportion of patients with monitoring of depth of sedation and ventilatory target set.
Hyperosmolar therapy (including mannitol and hypertonic saline) should be used intermittently if required.	■ Percentage of these that were within set indications. Review reasons administered in those outside indications set.

Hyperthermia (temperature over 37.5 degrees C) is associated with adverse outcome and should be treated.	■ Proportion of patients with targeted temperature management: - target temperature - percentage patients receiving cooling. ■ Technique used for targeted temperature management (invasive or non-invasive).
In those patients who fail to respond to lower level interventions for reduction of intracranial pressure decompressive craniectomy or barbiturate coma should be considered.	■ Percentage of patients receiving decompressive craniectomy. ■ Percentage of patients receiving barbiturate coma. ■ Percentage of patients having electroencephalogram monitoring.

Quality improvement methodology

- Identify improved adherence with guidelines:
  - Process map with the staff the current pathway and identify delays or divergence from guidelines. Identify steps that do not add value.
  - Brainstorm ideas for improvement with the staff and test interventions on a small number of patients first to see whether the ideas are effective.
  - Adapt and develop using the learning from the testing and involve the staff caring for these patients.
  - Use a run chart to show the impact of the interventions on improved adherence to the guidelines and display for all staff to see.
- Consider assessment of qualitative data (staff confidence in using guidelines). Assessment of staff confidence before any intervention will allow understanding as to the correct intervention methods to use. For example, the reduced compliance may be due to new or agency medical and nursing staff not understanding the reasons for the guidelines.

Mapping

ACSA standards: 1.3.1.5, 2.1.1.9
Curriculum competences: NA_IK_20, NA_IK_04
CPD matrix codes: 2F01, 2F03, 2A11, 2A02, 3F00
GPAS 2020: 14.4, 14.7.2

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12.6 Management for the unconscious patient in intensive care at risk of spinal cord injury

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Why do this quality improvement project?

The incidence of cervical, thoracic and lumbar spine trauma is reported at 5% in patients with blunt multi-trauma.[1–2] A delay in spinal clearance, diagnosis or mobility management plan predisposes the unconscious patient to the complications of immobilisation and resultant increase in morbidity. An improved multidisciplinary approach to the assessment of risk, decision making and adherence to local guidelines will lead to better patient outcomes.

Background

This group of patients may be unconscious for a long time; waiting for Glasgow Coma scale to improve prior to clearance is not appropriate. However, there is little consensus on spinal clearance in the patient under sedation, so it can be difficult to get someone to accept responsibility.[2]

The Eastern Association for the Surgery of Trauma Practice Management Guidelines Committee in the United States has produced recommendations for cervical spine evaluation and thoracolumbar clearance but there remains a lack of level 1 evidence in both.[1,4] In the UK there is currently no national guidance and we rely on expert opinion and consensus recommendations.[2,3,5,6] The National Institute for Health and Care Excellence (NICE) has included guidance for the management of cervical spine injuries within their head injury guidelines.[7] Locally agreed guidelines tend to be based on available evidence and best practice.

Best practice

The safe, timely and correct decision making measured against standards set by NICE and locally agreed guidelines based on best practice and evidence. The locally agreed guidelines will include the personnel, imaging, timing and techniques necessary for managing the patient's conscientiousness.

Suggested data to collect

Quantitative

- Location and timing of initial imaging performed.
- Adequacy of the imaging performed.
- Time of the imaging reported.
- Personnel reporting the imaging.
- Personnel involved with the spinal management plan.
- Timing of intervention of the management plan.
- Nursing management when turning the patient before reporting the imaging.
- Documentation and duration of use of the hard collar.
- Duration of time before the management plan is defined.

Qualitative

- Staff confidence in reporting imaging.
- Staff confidence in understanding spinal management guideline.

Quality improvement methodology

Identify adherence with local guidelines

- Collect baseline measures and see where improvements are required.
- Brainstorm ideas with the team and test ideas for improvement on a small number of patients first to see whether effective.
- Adapt with learning from the testing and develop until working well.
- Involve the staff in the changes so that implementations are owned by the staff doing the interventions.
- Use a run chart to show the impact of the interventions on improved adherence to the guidelines.
- Consider assessment of qualitative data (staff confidence in using guidelines).
- Assessment of staff confidence before any intervention will allow understanding as to the correct intervention methods to use. For example, reduced compliance may be due to new or agency medical and nursing staff not being confident to follow guidance in high-risk areas.

Identify areas to focus on

- Consider plotting a process map to identify where the quality improvement project needs to focus to improve care.
- Develop the map with the staff involved. Identify areas for improvement and steps that do not add value.
- Identify steps that can be measured.
- This system should identify whether it is a training, communication or resource issue preventing optimal care.

Mapping

ACSA standards: 1.3.1.5, 2.1.1.5
Curriculum competences: NA_IK_13, NA_IK_14
CPD matrix codes: 2A02, 2F02, 2F03, 3F00
GPAS 2020: 14.2.6

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12.7 Endovascular thrombectomy

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Why do this quality improvement project?

Stroke is the third leading cause of death and the leading cause of disability in the developed world. High-quality evidence supports the use of endovascular thrombectomy (EVT) in the management of acute ischaemic stroke. Improving outcomes will have major benefits for individual patients and society as a whole.

Background

EVT is recommended in acute ischaemic stroke for patients with anterior circulation, large vessel occlusions who present up to six hours after symptom onset. EVT should also be considered for up to 24 hours in patients with potentially salvageable brain tissue. Anaesthetic input is required to reduce pain and maintain physiological stability, and for airway management. Time from stroke onset to successful reperfusion is crucially important and any delay may contribute to poor outcome. Studies have found an association between periprocedural hypotension and adverse outcome. More controversially, retrospective observational studies have also reported an association between general anaesthesia and poor outcome.

Best practice

- UK and international consensus standards exist for the provision of safe thrombectomy services.
- The aim is to have 90% of appropriate patients receive recommended treatment (EVT) within six hours symptoms by a specified date agreed within the department.

Suggested data to collect

Standards	Measures
Outcomes for all patients, including successful reperfusion, should be documented and adjusted for baseline stroke severity.	■ Percentage of patients who have documented successful reperfusion (successful reperfusion being clearly defined so measured consistently). ■ Length of hospital stay.
All hospitals performing EVT require rapid access to cerebral angiography, experienced neurointerventionalists and a comprehensive periprocedural stroke team. Hospitals should develop and adhere to care protocols reflecting national guidance.	■ Baseline measures as part of planning and defining areas to work on: - the presence of a protocol - adherence to each aspect of the protocol as below - reasons for deviations from protocol with reasons. ■ Review handful of cases and identify some 'patient stories' to support engaging staff in your improvement ideas.
Levels of care for intracranial pressure management should be determined. Failure to control intracranial pressure within one level should prompt rapid progression to next level.	■ Compliance with each level of care for intracranial pressure management. Analyse reasons for escalation of care.
All patients should have an assessment of stroke severity, American Society of Anesthesiologists (ASA) physical status category, baseline investigations and medical history obtained on arrival.	■ Percentage of patients with full baseline assessment documented (ASA status, stroke severity by National Institutes of Health Stroke Scale score, documentation of medical history, electrocardiogram). ■ If compliance with this is low, identify which aspect(s) is commonly missing and identify project idea for improvement.

Time critical procedures and delays must be minimised. Standard is six hours from onset of symptoms to groin puncture.	■ Times from stroke onset to arrival in the interventional neuroradiology (INR) suite: - from arrival to induction of anaesthesia - from arrival to arterial puncture - overall time from stroke onset to thrombectomy. ■ Document reasons for delays.
General anaesthesia is recommended in patients with a reduced level of consciousness, those who are uncooperative or agitated, those who cannot protect their airway or those already intubated.	■ Percentage of patients receiving general anaesthesia. ■ Percentage of patients converted from local to general anaesthesia. ■ Percentage of patients with documented incidence of aspiration.
Systolic blood pressure should be maintained between 140-180 mmHg or within 10-15% of baseline with fluids and vasopressors.	■ Baseline percentage of patients with hypotension lasting more than five minutes. ■ Review strategies for and effectiveness of management of hypotension. ■ Consider setting a standard management protocol and measure compliance with the protocol and track whether the number of episodes of hypotension longer than five minutes improves.
Supplemental oxygen should be titrated to maintain arterial oxyhaemoglobin saturation (SaO^2) greater than 94%. Hyperoxia should be avoided.	■ Proportion of patients with SaO_2 less than 94%.
100% of patients ASA score of 3 or above should have access to level 2/3 care.	■ Percentage of patients ASA score of 3 or above admitted to critical care. ■ Overall percentage patients admitted to critical care. ■ Duration of stay on critical care.

Quality improvement methodology

Avoiding delays

- Develop a process map of patient journey including all the steps from arrival in hospital to the end of successful treatment.
- Develop the map with the teams involved.
- Identify steps that do not add any value or where there are delays.
- Identify where changes could be made to simplify or minimise delays.
- Produce baseline run chart of time from arrival to treatment and review the variation in times.
- Review cases where there is a significant delay and identify any common features in these cases that you can improve, as well as reviewing cases where the time is short, to see what worked well and can be repeated.
- The process map will help to identify which of the above processes you need to improve and start there.

Improving preprocedural documentation

- Draw out a process map from the time between referral and arrival in the INR suite. Develop with the staff in those areas. Identify delays and reasons.
- Brainstorm ideas for improvement with the staff (eg where is it most helpful to remind staff to record and handover necessary information?).

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- Test those ideas on a small number of patients and see what happens and adapt the process according to what you find (ie learn from the test).

Design a driver diagram for the overall project, identifying the key drivers. Identify projects and key measures. It is useful to demonstrate to everyone where it all fits together and display the whole project on a page. It can also identify your key measures.

Mapping

ACSA standards: 1.3.1.5, 2.1.1.2, 2.1.1.5, 2.1.1.9, 2.1.1.12
Curriculum competences: NA_1K_10, NA_HK_01, NA_HK_02
CPD matrix code: 3F00
GPAS 2020: 14.7.2, 14.1.4, 14.1.11

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13 Cardiac and thoracic surgery

Edited by Dr Rebecca Summers and Dr Seema Agarwal
QI editor Dr Carolyn Johnston

13.1 Delays in thoracic aortic surgery from diagnosis to theatre

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Why do this quality improvement project?

Timely referral and transfer to a specialist centre is required when dealing with acute aortic syndrome. Improvements in this process will ensure better outcomes for patients.[1]

Background

Aortic surgery within the UK takes place in specialist aortic centres with multidisciplinary teams with a specialist interest in prevention, detection and management of aortic disease (acute aortic syndrome and chronic aortic disease). Acute type A aortic dissection has a mortality of 1% per hour or 50% if not operated on within 48 hours.[1] In contained rupture of a thoracic aortic aneurysm, mortality is 54% at six hours.[2] When referral and transfer to a specialist centre is required for treatment, delays can occur, which could lead to significant patient harm. This has been highlighted by the Healthcare Safety Investigation Branch, which reported on the death of a 54-year-old man with an acute diagnosis of Stanford type A aortic disease.[3]

Best practice

- Acute aortic syndrome pathways recommend a door-to-treatment decision within six hours.[4]
- Where lesions are more complex, such as type B dissection or contained rupture, diagnosis should be made within four hours and a decision on their treatment made within six hours.
- The timescales involved in other pathologies such as vasculitis, infection and blunt trauma are difficult to legislate for, but a decision on management is required within six hours.
- Abdominal aortic aneurysms have set standards for timeframes from diagnosis to surgery of 60% of patients within 8 weeks and 100% within 12 weeks.[5]

Suggested data to collect

Acute presentations:

- date and time of symptom onset, hospital admission, diagnostic imaging and referral to aortic centre
- method of referral to aortic centre
- ambulance transfer booking time
- medical escort present
- date and time of arrival at specialist centre and time of surgery
- reasons for any delay in transferring to surgery.

Chronic presentations:

- date of appointment with specialist (chronic)
- date of preoperative assessment (chronic)
- date of surgery
- reason for delay, if applicable.

Quality improvement methodology

- A stakeholder group can be formed, including relevant representation from referring hospitals and specialist aortic centres.
- A process map of patient pathway can be mapped to identify any unnecessary waiting or unreliable steps as areas for improvement.
- The above data collected should be triangulated with morbidity; mortality reviews can be used to identify common themes where care is perceived to be suboptimal.
- Common emerging themes can be targeted for small-scale improvements.
- Run charts can be useful in displaying performance of key process measures over time, to keep staff engaged in making changes and understanding the team's performance.
- Multidisciplinary team meetings are a good opportunity for learning and sharing to identify potential areas for improvement. Teams can also visit other specialist centres to share learning.

Mapping

ACSA standards: 1.1.3.1, 1.5.1.4, 1.1.1.4, 5.4.1.1, 5.4.1.2, 5.4.2.2, 5.4.2.4, 5.4.3.1
Curriculum competences: POM_AK_03, CT_HS_04, CT_HS_10, TF_HS_10, AR_BS_10, AR_HS_09
CPD matrix codes: 1I05, 2A03, 3G00, 3A05
GPAS 2020: 2.1.1, 2.1.3, 2.5.12, 2.5.12, 5.5.42, 5.2.13, 5.2.14, 5.2.15, 5.2.16, 7.3.13, 18.1.1, 18.1.13, 18.1.14, 8.7.2,

Acknowledgements

Mr Mark Field, Consultant Aortic and Cardiac Surgeon, Aortic Dissection Awareness (patient group).

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13.2 Consent for transoesophageal echocardiography

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Professor Abkar Vohra, Manchester University Hospitals NHS Foundation Trust

Why do this quality improvement project?

The use of intraoperative transoesophageal echocardiography (TOE) as a diagnostic and monitoring technique is now routine for many elective cardiac procedures. Current best practice states that patients should be included in the decision-making process when determining anaesthetic technique for elective surgical procedures. This should include decisions regarding the use of invasive monitoring techniques, as their use carries a risk of complications. The risk of associated morbidity from TOE is not insignificant, with reports of up to 1.4% of patients experiencing some form of complication, while the risk of mortality has been quoted as 0.03%.[1,2]

Background

In order 'for consent to be valid, it must be voluntary and informed, and the person consenting must have the capacity to make the decision'.[3] Written consent for TOE in elective cardiothoracic surgery is not routinely obtained in most tertiary units. Information regarding the benefits and risks of the use of TOE is usually provided to the patient verbally by the anaesthetist, following inpatient admission, and during the immediate preoperative period. The patient's capacity to understand and retain information regarding interventions and make an informed choice about their use may be impaired due to a number of confounding factors, such as fear and a desire to prevent delay to surgery. Guidance surrounding consent advises that information should be made available to patients at the earliest opportunity, in a range of formats, to facilitate processing and understanding. The balance between risk and benefit must be considered on an individual patient basis as each patient will have their own definition of acceptable risk. Patients should also be made aware of alternatives to any proposed intervention.

There are a number of recognised complications of TOE.[1] While many complications may be deemed to be minor, damage to the oropharynx or upper gastrointestinal tract can lead to the need for surgery and carries a small risk of mortality. Absolute and relative indications and contraindications to use of TOE are published.[4–6]

Best practice

Information regarding patient consent is available from the following sources:

- RCoA Accreditation Standards.[7]
- RCoA Guidelines for the Provision of Anaesthesia Services.[8]
- General Medical Council.[9]
- Association of Anaesthetists.[10]

Suggested data to collect

- How consent for TOE is obtained in your institution?
  - What are the timings?
  - How is validity of consent assessed?
  - Is consent verbal or written?
- What information is available to patients about the procedure?
  - When do they receive such information: preoperative assessment; after admission to the ward etc?
  - Who is responsible for giving this information?
- How are complications of TOE are identified and documented?
- How are critical incidence and near misses communicated to members of the team?
- What are the alternatives available in case of contraindications for TOE?

Quality improvement methodology

- Survey and interview staff to explore the barriers to taking consent for TOE. Consider using some behaviour change models to think about how to improve consent. Do staff have the right resources (time, supporting leaflets etc) and are motivated to take consent (do they believe it is necessary)?
- Consider co-designing information leaflets with patients to ensure that they are clear and meet patients' expectations. Are there any other ways you can share helpful information (eg via video or on the hospital website)?

Mapping

ACSA standards: 1.2.1.1, 3.1.1.1, 3.1.2.1, 3.1.1.2

Curriculum competences:
Core: OA_BK_11, OA_BK_12, POM_BS_08, AR_BS_06
Intermediate: POM_IS_03, PC_IK_12
Higher/Advanced: CT_HS_02, CT_HS_10, POM_HK_04, AR_HS_05

CPD matrix codes: IF01, 1I05, 3G00

GPAS 2020: 2.9.1, 2.9.4, 2.9.13, 18.2.11, 18.3.22, 18.9.3, 6.9.1, 6.9.4, 10.9.1, 10.9.2

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13.3 Timeliness of primary percutaneous coronary intervention for ST-segment elevation myocardial infarction

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Why do this quality improvement project?

Prolonged door-to-balloon times in patients with ST-segment elevation myocardial infarction (STEMI) are associated with increased mortality, notably in those with cardiogenic shock or following out-of-hospital cardiac arrest.[1,2] This quality improvement project focuses on improving provision of primary percutaneous coronary intervention (PCI).

Background

Anaesthetists are frequently involved in the multidisciplinary care of patients undergoing primary PCI. Specific groups include those requiring organ support or sedation or following out-of-hospital cardiac arrest. It is important to ensure that timely assistance is provided to maximise the outcomes for these patients.

The FITT-STEMI trial found that after one hour from first medical contact, every 10-minute treatment delay resulted in 3.3 additional deaths per 100 PCI-treated patients with cardiogenic shock, and 1.3 additional deaths per 100 patients after out-of-hospital cardiac arrest without cardiogenic shock.[3] Centres will differ in their provision of acute cardiology services.

Best practice

The European Society of Cardiology and the European Association for Cardio-Thoracic Surgery recommend reperfusion in patients less than 12 hours from symptom onset with persistent ST-segment elevation. Primary PCI should be offered in a timely fashion with a 24/7 service at specialist centres. Primary PCI should be performed as soon as possible.[3]

Suggested data to collect

Standards	Measures
PCI centre	
Time from first medical contact to diagnosis less than 10 minutes.[3,4]	■ Time from diagnosis to reperfusion (wire crossing) less than 60 minutes. ■ Percentage of patients undergoing primary PCI after STEMI where the diagnostic time target has been met. ■ Percentage of patients undergoing primary PCI after STEMI where the therapeutic time target has been met.
Non-PCI centre	
Time from first medical contact to diagnosis less than 10 minutes.[3,4]	■ Time from diagnosis to reperfusion by PCI less than 90 minutes. ■ Percentage of patients undergoing primary PCI after STEMI where the diagnostic time target has been met. ■ Percentage of patients undergoing primary PCI after STEMI where therapeutic time target has been met.
Out-of-hospital cardiac arrest	
Time from return of spontaneous circulation to reperfusion less than 120 minutes.[3,4]	■ Percentage of patients undergoing primary PCI after out-of-hospital cardiac arrest where the therapeutic time target has been met.

ST-segment elevation myocardial infarction.	■ Time of symptom onset. ■ Time of first medical contact (hospital arrival or emergency medical services). ■ Time of STEMI diagnosis. ■ Time catheterisation laboratory activated. ■ Time catheterisation laboratory ready. ■ Time of arrival into catheterisation laboratory. ■ Procedure start time. ■ Revascularisation time. ■ Pre-hospital times (eg time of ambulance arrival). ■ Pre-hospital and in hospital airway management. ■ Anaesthetic intervention(s) required.
Additional data fields in out-of-hospital cardiac arrest.	■ Time of collapse. ■ Time of return of spontaneous circulation. ■ Time without basic life support (this includes provision by bystanders). ■ Initial rhythm. ■ Requirement for imaging before transfer.

Quality improvement methodology

- Construct a process map of the patient pathway and annotate your measured times on the map. Which steps are the cause of greatest delay? How can you mitigate or reduce these delays?
- Multidisciplinary learning is an effective way of engaging staff and an opportunity to discuss change ideas and how they may be implemented. Simulation is a useful way to trial new ideas in a low-stress environment. Simulate the journey of a patient to the cardiac catheterisation laboratory. Can you make any improvement to the logistics involved? Is all equipment easily accessible and are lines of communication clear and easy?

Mapping

ACSA standards: 1.5.1.4, 5.4.2.4, 5.4.2.16

Curriculum competences:
Basic: RC_BK_21, RC_BS_10, AR_BS_11
Intermediate: CT_IK_04, TF_IK_07, TF_IS_01, TF_IS_05, TF_IS_09
Higher: CT_HS_10, CT_HS_11, POM_HK_04, AR_HS_05, AR_HS_07

CPD matrix codes: 1I05, 2A08, 2A11, 2A12, 3G00

GPAS 2020: 18.1.6, 18.1.7. 18.1.10, 18.1.11, 18.2.1, 18.2.2, 18.2.3, 18.2.18, 18.3.18, 18.3.19, 18.3.20, 18.3.21, 18.4.1, 18.5.6, 18.5.7, 18.7.2

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13.4 Adherence to patient blood management for cardiac surgery

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Why do this quality improvement project?

Cardiac surgery is associated with perioperative blood loss and a high risk of transfusion. Reducing blood product use has the potential to avoid transfusion-related complications, decrease adverse postoperative events and reduce health care costs.

Background and best practice

The three pillars of perioperative blood management include preoperative, intraoperative and postoperative measures aimed at identifying patients at high risk of bleeding and pre optimising them, maintaining haemostasis, minimising blood and microvascular blood loss postoperatively. The first two pillars are particularly open to influence by the anaesthetist. Detection and management of preoperative anaemia has been shown to reduce perioperative transfusion.[1] The National Institute for Health and Care Excellence recommends that all patients presenting for elective surgery should have their haemoglobin measured at least two weeks prior to surgery and, if necessary, preoperative management of any coexisting anaemia.[2] International consensus guidelines advise optimising haemoglobin to 130 g/l in both sexes prior to surgery.[3]

Intraoperatively, the use of antifibrinolytics has been shown to reduce hyperfibrinolysis and bleeding. Both tranexamic acid and aprotinin have been extensively studied and have been shown to reduce the risk of reoperation for bleeding in cardiac surgery.[4,5] The use of cell salvage may contribute to an overall reduction in the need for transfusion. In cases with cardiopulmonary bypass, the use of cell salvage rather than cardiotomy suction may help to prevent systemic inflammation and continued bleeding, as cardiotomy suction may activate platelets and cause extracorporeal thrombin generation.[6] The washing of blood has been shown to reduce inflammation.[7]

Suggested data to collect

There are five subcategories used to calculate the total composite score. All subcategories should be completed to indicate whether guidelines are being met. Operative urgency should also be recorded as, for patients in need of urgent surgery, there will be less time to optimise and investigate preoperative anaemia.

Denominator: Patients aged 18 years and above who undergo a cardiac operation.

Numerator: Patients for whom selected blood conservation strategies were used.

- Preoptimisation of haemoglobin (Aim more than 130 g/l in both sexes):
  - numbers of patients presenting for surgery with suboptimal haemoglobin
  - numbers of patients with anaemia who had received supplemental iron (intravenously or orally)
  - percentage of total patients with anaemia.
- Use of antifibrinolytics:
  - percentage of patients who received intraoperative tranexamic acid or aprotinin.
- Use of red-cell salvage using centrifugation:
  - percentage of patients receiving cell-saved blood
  - volume of cell saver collected and given (do not include autologous, allogeneic, pump-residual, or chest-tube recirculated blood)
  - percentage of patients receiving cardiotomy blood after bypass.
- Use of transfusion algorithm supplemented with point-of-care testing:
  - Does the unit use point-of-care testing?
  - Does the unit have an evidence-based transfusion algorithm?
  - Percentage of patients having product transfusion without point-of-care testing.
- Bleeding rates/take back to theatre for bleeding as a percentage of numerator:
  - percentage of patients needed re-exploration for bleeding.

Quality improvement methodology

Draw a process map of the patient journey to identify areas for potential improvement:

- When and how are patients with anaemia identified?
- What changes can you make to the pathway to enable earlier detection of anaemia? Remember to measure any balancing measures of changes you introduce (eg the impact of patient experience or delays to surgery).
- What information do patients receive to inform them of the importance of managing anaemia, encouraging compliance with medication and dietary changes?
- A driver diagram will help to identify potential issues that can be targets for improvement.

Mapping

ACSA standards: 1.2.1.1, 2.2.2.2

Curriculum competences:
Core: IN_BS_01, POM_BK_11, POM_BS_04, AR_BK_05
Intermediate: POM_IK_03, POM_IK_07, POM_IS_14, POM_IS_15
Higher: POM_HK_01, POM_HK_04, AR_HS_05

CPD matrix codes: 2A03, 2A05, 3G00

GPAS 2020: 18.2.6, 18.2.7, 18.2.8, 18.2.25, 18.2.26

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13.5 Simulation in cardiothoracic anaesthesia

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Why do this quality improvement project?

Multiple studies have shown the benefit of simulation to improve patient safety both through improvement in clinical skills and behaviours.[1,2] ACSA guidelines recommend multidisciplinary training for emergencies based on the Guidelines for the Provision of Anaesthetic Services (GPAS).[3,4] Use of simulation allows a department to address a number of different requirements including:

- technical skills training
- equipment training
- environment familiarisation
- testing standard operating procedures
- human factors
- multidisciplinary team working.

Background

Cardiac anaesthesia and critical care are staffed by many different professions and experience levels who will often be unfamiliar with the environment, equipment and procedures. Teams may only meet for the first time at the start of an emergency and high patient turnover may preclude prior in-depth knowledge of the patient's background. Non-technical skills, such as communication, situational awareness and leadership, are essential. The benefits of simulation to improve these areas have been well known in the aviation industry,[5] and are now being transitioned into the healthcare industry not only to improve non-technical skills but also to guide wider organisational changes.[6]

Best practice

- ACSA standard 4.4.3.2: There is regular multidisciplinary team training for emergency situation.
- GPAS 5.4.5: Teams should train for and practise their standard operating procedures for serious, complex and rare emergencies, as well as major incidents. There should be regular multidisciplinary training for emergency situations, and simulation training should be considered.
- The benefits of simulation training decrease over time and are almost entirely gone after one year. For this reason, multidisciplinary team training should be available on a monthly basis. Individuals should attend at least annually.

Suggested data to collect

Cath lab:

- the deteriorating patient
- cardiac arrest
- inter- and intra-hospital transfer of patients for cardiological interventions.

Critical care:

- cardiac arrest
- reopening of chest in the unit
- accidental extubation
- preparation for transfers.

Design and implementation

- In-situ compared with simulation suite: In-situ simulation will have the benefit of environment familiarisation but the impact on patient care should be considered.
- Timing: use of an audit/educational day will allow the greatest number of staff to be involved. Induction days for incoming trainees are an alternative option but are likely to reduce the multidisciplinary approach. Prior announcement will potentially increase the likelihood that a session will go ahead but may reduce some of the benefit that may come from the surprise element.
- Equipment and personnel: engagement with local education departments may help with session design and implementation as well as the provision of equipment including high-fidelity manikins and spare consumables (eg laryngoscopes, endotracheal tubes). A minimum of two but preferably three people are recommended to facilitate a simulation session, with the following roles as a guide:
  - first person – introduces, directs a session and leads debrief.
  - second person – controls the manikin and adjusts the monitoring.
  - third person – assists with maintenance of fidelity by filling in missing multidisciplinary team roles.
- Session content: provide context via an initial background brief. Ensure that the outline of the session has been created, including the anticipated clinical course with all the necessary physiological parameters. Where required, imaging and bloods should be printed and given to the participants on request.
- Alinier has created a useful resource for the design and implementation of a simulation session.[7]

Feedback

Feedback is best given via a 'hot' debrief immediately after the simulation session. Areas to focus on include:

Technical skills:	Clinical knowledge
	Ability to use equipment
Non-technical skills:	Communication and handover between teams
	Situation awareness
	Leadership
	Team working
Organisation issues:	Staffing
	Standard operating procedures
	Functionality and availability of equipment

Any areas of risk highlighted should be noted and reported via the local governance chain.

Quality improvement methodology

- Simulation and multidisciplinary team teaching are good opportunities to get various members of the team together. New ideas can be developed and trialled in a low-risk environment.
- Processes such as handovers and transfers can be practised/drilled.
- Having different perspectives will ensure that ideas are viable and likely to make sustained improvement.

Mapping

ACSA standard: 2.5.6.2

Curriculum competences:
Core: CI_BK_31, CI_BK_34, CI_BS_03, CI_BS_04, CI_BS_06
Intermediate: CT_IK_09, CT_IK_24, CI_IS_01, CT_IS_02, RC_IS_05, RC_IS_07, TF_IK_06, TF_IK_08, TM_IS_06, TM_IS_09
Higher/Advanced: CT_HS_08, CT_HS_11, RC_HS_02, DI_HK_01, DI_HS_01, IS_K_05, IS_K_06, TM_HK_04, TM_HS_08, TM_HS_09, TM_AK_22

CPD matrix codes: 1B04, 1I02, 1I03, 2A06, 3G00

GPAS 2020: 18.1.4, 18.4.7, 18.5.5

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13.6 Pain control in thoracic surgery

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Why do this quality improvement project?

Good pain relief after thoracic surgery is essential to improving patient experience and outcomes. Pain after thoracic surgery, especially after thoracotomy, is severe. It has multiple implications, including the inability to adequately clear secretions by effective coughing, respiratory failure due to splinting, both of which predispose to postoperative chest infections.[1,2] In addition, thoracic surgery is generally performed on patients with multiple comorbidities including cardiorespiratory disease, predisposing them to poor outcomes. Thoracic surgery is also a high-risk surgery for the development of chronic pain, which is quoted to affect more than 50% of patients.[1,3] Adequate pain relief after thoracotomy may reduce the likelihood of developing chronic pain.

Background

Thoracic epidural analgesia has been considered the 'gold standard' for pain management after thoracotomy but many centres have moved to the use of paravertebral blocks as a lower-risk effective alternative. Regardless, severe ipsilateral shoulder pain and the prevention of the post-thoracotomy pain syndrome remain the most important challenges for post-thoracotomy pain management. Thoracic anaesthetists should consider using a multimodal approach to analgesia when treating patients undergoing thoracic surgery, using a combination of regional anaesthetic blockade and systemic analgesia, with both non-opioid and opioid medications and local anaesthesia blockade.[1,2]

Best practice

The RCoA Guidelines for the Provision of Anaesthetic Services for Cardiac and Thoracic Procedures highlighted the importance of clearly defining pain relief protocols for thoracic surgery patients.[4]

Analgesic options must be tailored for each patient after a discussion between the anaesthetist and surgeons about the best option with involving patients themselves. The anaesthetist should balance the risks and benefits for each technique.

Suggested data to collect

- Percentage of patients receiving intraoperative supplementary blocks either by anaesthetists or surgeons.
- Percentage of patients who have received thoracic epidural analgesia admitted to the high-dependency unit for at least 24 hours.
- Analgesic efficacy:
  - patient satisfaction in postoperative period – 90% of patients to be satisfied with analgesia on day 1 post-thoracotomy
  - pain scores, including effectiveness of pain relief on deep breathing
  - failure of technique
  - supplemental analgesia
  - opioid consumption.
- Percentage of delayed discharges due to insufficient pain control.
- Frequency and management of adverse effects.
- Percentage of patients requiring opioid patient-controlled anaesthesia post-thoracotomy.
- Other measures could include:
  - length of hospital stay
  - critical incidents or near misses in relationship to pain management and intraoperative blocks.

Quality improvement methodology

- Construct a driver diagram to identify areas which influence pain management. You can use this to produce change ideas.
- Management of acute pain post-thoracotomy:
  - A stakeholder group should be used to design the patient pathway and develop local pain protocols.
  - Produce supporting information aimed at patients, nursing, associated health professionals and medical staff. Why is this important and what is their role?
- Identification of chronic post-thoracotomy pain:
  - Process map the pathway of identifying patients at risk of developing chronic post-thoracotomy pain.
  - How are these patients are identified and by whom?
  - Where are the points that an intervention can be trialled?
  - Patient feedback and surveys are a good way to identifying issues important to them to ensure that any change implemented is sustained and meaningful.

Mapping

ACSA standards: 1.4.5.1, 3.1.1.2, 5.4.3.2, 5.4.1.5, 5.4.2.7, 5.4.2.8, 5.4.2.15

Curriculum competences:
Core: PO_BK_07, PO_BS_07, PM_BS_01, PM_BS_06, POM_BK_21, POM_BK_31, AR_BK_05, AR_BS_10, AR_BS_11
Intermediate: CT_IK_19, CT_IK_24, CT_IS_15, POM_IK_18
Higher: CT_HS_16, POM_HK_04, POM_HK_10, POM_HK_14

CPD matrix codes: 1D01, 1D02, 2E01, 3G00, 3E00

GPAS 2020: 4.1.11, 18.2.22, 18.2.24, 18.2.33, 18.1.8, 18.3.22, 18.2.31, 18.7.2

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13.7 Acute pain management after cardiac surgery

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Why do this quality improvement project?

Acute pain following cardiac surgery is common and is associated with increased risk of respiratory complications, a prolonged length of stay and chronic post-sternotomy pain.[1–4] Acute pain management has been the subject of clinical protocols but adherence to these protocols can be poor.[3,5]

Background

Acute pain post-surgical intervention should be overseen by an acute pain team.[6] Acute pain rounds should be conducted at least once a week by consultants with acute pain training. Other members of the acute pain team may conduct more frequent pain rounds but a consultant should always be available for advice.

For the acute pain service to be effective, patients with poor pain control must first be identified. The assessment of pain severity should be standardised and specified in protocols.[3] In practice, on the wards this often means assessing pain at the time of performing observations for the National Early Warning Score (NEWS) chart. In the critical care unit this scoring may occur more frequently.[7]

Best practice

- To optimise the treatment of postoperative pain, protocols should specify that prescriptions include multimodal regular and as-needed (PRN) analgesia.[3,5]
- To minimise the risk of accidental overdose, protocols should include initial use of mild, short-acting opioids before escalation to stronger long-acting opioids and this should be reviewed regularly.[8]
- Administration of PRN medication has been identified as a factor contributing to poor pain management in this setting.[3,5]
- Where pain relief is inadequate after initial treatment escalation to a pain specialist should be part of the pain protocol.[6]

Suggested data to collect

- Presence of a pain protocol including prescription of postoperative analgesia and recommendation for escalation to acute pain team.
- Weekly consultant-led acute pain rounds covering all acute pain patients.
- Prescription of regular and PRN simple analgesia, as per the local protocol.
- Appropriate use of mild/short-acting opioids before escalation to long-acting strong opioids.
- Pain assessed regularly on taking NEWS observations (critical care and ward).
- Frequency of appropriate administration of PRN analgesia with one hour of a pain score above mild.

Quality improvement methodology

- What are the barriers to patients accessing good pain relief? Ask patients, relatives, ward staff and acute pain teams for their views on how to improve. Are there any concerns among ward staff on prescribing strong opioids? How could you address their concerns?
- Draw a driver diagram of the local drivers to good pain relief, based on the views of your local team. An example could look like Figure 13.7.1.

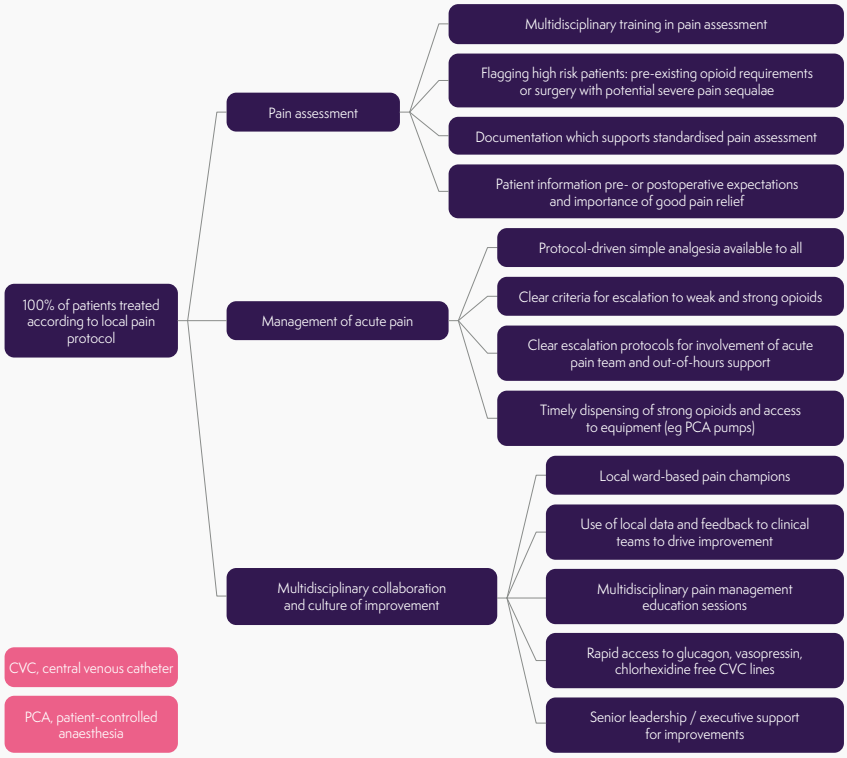

Figure 13.7.1: Driver diagram to improve outcomes and follow-up care of patients with suspected perioperative anaphylaxis.

Mapping

ASCA standards: 1.4.1.2, 1.4.5.4, 5.4.3.2, 5.4.1.5, 5.4.2.7, 5.4.2.8, 5.4.2.15

Curriculum competences:
Basic level: PO_BK_07, PM_BK_04, PM_BK_08
Intermediate level: PM_IK_01, AR_IS_03
Higher level: CT_HK_04, POM_HK_14, PM_HK_02, AR_HS_05, AR_HS_07, POM_HS_17

CPD matrix codes: 1D01, 1I05, 3E00, 3J02, 3G00

GPAS 2020: 4.1.11, 18.2.22, 18.2.24, 18.2.33, 18.1.8, 18.3.22, 18.2.31, 18.7.2

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13.8 Enhanced recovery after thoracic surgery: patient information, education, counselling and preoperative rehabilitation

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Why do this quality improvement project?

Regardless of the type of surgery, ERAS® Society guidelines recommend preadmission counselling and education. These efforts may reduce anxiety, improve recovery, enhance would healing and decrease hospital length of stay. A variety of approaches are acceptable, including personal counselling, printed materials and electronic media, alone or in combination.[1] Preoperative prehabilitation is the process of enhancing the functional and physiological capacity of an individual to enable them to withstand a stressful event, which may aid recovery after surgery.[2]

Background

Preoperative counselling helps to set expectations about surgical and anaesthetic procedures and may diminish fear, fatigue and pain and enhance recovery and early discharge.[3] Verbalised education, leaflets and multimedia information containing explanations of the procedure and cognitive interventions may improve pain control, nausea and anxiety after surgery and general anaesthesia.[4] Similar results have been demonstrated in patients provided with preoperative video information prior to lung resection.[5] Preoperative exercise and smoking cessation in patients undergoing lung resection due to lung cancer significantly improve pulmonary function and functional capacity, reduce postoperative morbidity and hospital length of stay. However, when exercises were performed only postoperatively, length of stay and postoperative morbidity did not reduce.[6,7]

Best practice

- Association of Anaesthetists: Consent for Anaesthesia.[8]
- RCoA Cardiothoracic Accreditation Standards Domain 5.[9]
- Guidelines for Enhanced Recovery after Lung Surgery: recommendations of the Enhanced Recovery After Surgery Society and the European Society of Thoracic Surgeons.[3]

Suggested data to collect

Assessing the distribution of preoperative management:

- Percentage of patients receiving information material, verbal information and counselling in the correct time frame before being actively involved in the enhanced recovery after surgery (ERAS) protocol.
- Percentage of patients receiving appropriate education including the attendance in preoperative clinics and 'surgery schools'.
- Percentage of suitable patients enrolled to the prehabilitation programmes before lung resection.

Assessing quality and suitability of preoperative management:

- Percentage of clinical pathway steps in the ERAS protocol clearly mentioned in patient information material.
- Percentage of preoperative rehabilitation measures validated against the most recent evidence for ERAS protocol preoperative rehabilitation.

Assessing the effectiveness of preoperative management:

- Percentage of patients satisfied with the information delivered in the preoperative period and their preferred materials.
- Percentage of ERAS protocols targets achieved among patients who had the set of information and received appropriate preoperative rehabilitation.

Quality improvement methodology

Patient information

- Patient information should be co-designed with patients, where possible, and certainly reviewed by patient groups before publication. Find out what concerns patients most want addressed prior to surgery and ensure that they are included in your information.
- Could your patient information be supported by website or video resources, as well as paper leaflets? Are your resources accessible to those who do not have English as a first language or have other access needs?

Prehabilitation

- Draw a process map of patient journey to identifying where patients can be invited; can this be done earlier in the pathway to facilitate more time for prehabilitation prior to surgery?
- Do prehabilitation education resources use behavioural psychology or 'nudge' principles to encourage behaviour change?[9]

Mapping

ACSA standards: 5.4.1.2, 5.4.1.6, 5.4.3.3
Curriculum competences:
Core: POM_BK_11
Intermediate: CT_IS_09, POM_IK_04, POM_IK_21
Higher/Advanced: CT_HK_01, CT_HS_12, CT_HS_13, POM_HK_02, POM_HK_04
CPD matrix codes: 1I05, 2A03, 3G00
GPAS 2020: 2.5.22, 2.5.12. 18.3.22, 18.9.1, 18.9.2, 18.9.3, 18.9.4, 18.1.8, 18.2.18, 18.2.20, 18.5.4, 18.2.31, 18.7.2

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13.9 Postoperative critical care provision in thoracic surgery

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Why do this quality improvement project?

Thoracic surgery impairs pulmonary function postoperatively and carries a higher pulmonary complication rate compared with most other surgeries. Therefore, optimisation of postoperative care in an intensive care setting aims to:

- reduce postoperative pulmonary complications
- reduce hospital stay
- reduce readmission rates to intensive care and high-dependency units
- reduce the number of deaths.

The use of integrated postoperative clinical pathways in thoracic critical care units allows the administration of evidence-based practice in a standardised manner.[1,2]

Background

Postoperative pulmonary complications contribute significantly to morbidity and mortality following thoracic surgery. The ageing patient population, with an increasing number of comorbidities, has required further focus in the optimisation of perioperative care and the identification of the high-risk patient. Preoperative risk factors such as increasing age, smoking status, cardiorespiratory comorbidities and poor pulmonary function are all associated with increased rate of postoperative complications.

The basics of postoperative care can significantly impact on the overall outcome of the patient and reduce complication rates. Postoperative strategies such as early mobilisation, regular chest physiotherapy, fluid and electrolyte management, regional anaesthesia, atrial fibrillation prevention and good management of chest drains can all reduce future respiratory complications.[3]

Best practice

The Guidelines by the Enhanced Recovery After Surgery (ERAS®) Society and the European Society of Thoracic Surgeons suggest measures that would be strong indicators for providing optimal postoperative care for the thoracic patient and improving outcomes.[1]

Suggested data to collect

Standards	Measures
Regional anaesthesia should ideally use paravertebral blocks and intercostal catheters in conjunction. These have been shown to be as effective as thoracic epidurals but carry a lower adverse effect profile.[4]	■ Percentage of patients who received intraoperative paravertebral blocks and/or intrapleural catheter.
Multimodal analgesia, including paracetamol, nonsteroidal anti-inflammatory drugs where appropriate and the judicious use of opioids. Ketamine can be used in patients with chronic pain.	■ Percentage of patients who received a multimodal analgesia prescription.
Fluid and electrolyte management- 2-3 ml/kg/hour of balanced crystalloids for initial fluid maintenance and aim for euvolaemia.	■ Percentage of patients who had balanced crystalloids and percentage of patients where enteral feeding was resumed on day 1 postoperatively.
Atrial fibrillation prevention and management: avoid acute withdrawal of beta blockers. Consider prophylaxis with diltiazem or amiodarone in the high-risk patient.	■ Percentage of patients who continued to use beta blockers in the postoperative period where appropriate.
There is no routine indication for urinary catheter use if preoperative renal function is normal.	■ Percentage of patients who had a urinary catheter inserted.

Chest drain management: avoid routine external suction on chest drain, digital drainage systems to allow early mobilisation and single chest tube use for lobectomies.	■ Measure: percentage of patients where chest drains were removed if serous fluid output less than 450 ml/24 hours.
Use of digital drainage system: early postoperative physiotherapy at least twice daily and early mobilisation day 1 postoperatively.	■ Percentage of patients who had twice daily physiotherapy and were mobilised on day 1 postoperatively.
Postoperative nausea and vomiting prophylaxis: risk stratification according to the Apfel score.	■ Percentage of patients who had Apfel score documented and postoperative nausea and vomiting treated.
Venous thromboembolism (VTE) prophylaxis from day 1 of admission to hospital.	■ Percentage of patients who had VTE prophylaxis prescribed from day.[1]
Documentation of complication monitoring: postoperative bleeding, bronchopleural fistula, persistent air leak, wound sites monitoring.[1]	

Quality improvement methodology

- Process map the critical care postoperative patient journey following thoracic surgery. Are there any concerns among ward staff on administering strong opioids? Highlight which patients should be admitted postoperatively to a critical care environment based on perioperative risk factors.
- Consider formulating a departmental clinical pathway for the postoperative management of thoracic patients in a critical care environment. The pathway could include subsections for nursing, surgical, medical and allied health professional care. Could you develop 'pain management champions' within these professional groups, to teach and encourage their peers?

Mapping

ACSA standards: 1.4.1.2, 1.1.3.1, 5.4.1.5, 5.4.2.7, 5.4.2.8, 5.4.2.9, 5.4.2.10

Curriculum competences:
Core: PO_BK_06, PO _BS_07, PO_BS_08, POM_BK_31, POM_BK_33
Intermediate: CT_IK_24, CT_IS_15, POM_IK_21
Higher: CT_HS_16, POM_HK_04, POM_HS_17

CPD matrix codes: 1I05, 3G00

GPAS 2020: 18.1.8, 18.2.3, 18.2.33, 18.2.20, 18.2.32, 18.5.4, 18.7.2, 18.9.2

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13.10 Postoperative delirium screening and management

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Why do this quality improvement project?

After cardiac surgery, patients diagnosed with delirium have a prolonged intensive care unit (ICU) stay and longer intubation times, higher risk for falls, increased length of stay in the hospital, higher likelihood of discharge to a nursing home or home with assisted care and prolonged inpatient physical therapy duration.[1] Delirium after coronary artery bypass graft surgery is also associated with increased mortality up to 10 years postoperatively.[2]

Background

The incidence of delirium after cardiac surgery in patients above 65 years is 21.4%. The stress associated with cardiac surgery, especially when cardiopulmonary bypass is used, leads to a systemic inflammatory response. When this occurs, the brain is susceptible to neuronal injury via neuroinflammation and the activation of microglia ensues which may be a key component to the development of delirium.[3] A review by Kotfis et al highlighted factors which are strongly associated with increasing the risk of developing delirium postoperatively.[4]

Non-pharmacological interventions such as reorientation, effective communication and maintenance of consistent sleep–wake cycles are considered first-line interventions for delirium. Second-generation antipsychotics were shown to decrease the incidence of postoperative delirium when administered prophylactically.[5]

Best practice

- A clinical pathway including detailing the whole perioperative pathway should be agreed. Where 'fast track' cardiac surgery is carried out there are agreed robust criteria for managing patients.[6]
- All patients should be assessed for delirium risk factors as part of a preoperative assessment. The National Institute of Health and Care Excellence guidelines suggest the risk factors scored should include: over 65 years of age, chronic cognitive decline or dementia, poor vision or hearing, severe illness and presence of infection. There are further risk factors listed on the American Geriatrics Society Expert Panel postoperative delirium best practices guideline.[8]
- Perioperative measures to prevent delirium:[8]
  - Medication review and appropriate medication management.
  - Adequate pain relief and regional analgesia and non-opioid analgesia where possible.
  - Daily postoperative rounding by the multidisciplinary team including elderly care liaison if appropriate.
  - Nutritional and fluid repletion enhancement.
  - Non-pharmacological prevention may include sensory aids (ensuring glasses, hearing aids or listening amplifiers), mobility enhancement (ambulating at least twice per day if possible), cognitive orientation and therapeutic activities (tailored to the individual).
  - Sleep enhancement (daytime sleep hygiene, relaxation, nonpharmacologic sleep protocol and night-time routine).
- Patients should be screened daily postoperatively. The confusion assessment method for the ICU (CAM-ICU) and the Intensive Care Delirium Screening Checklist are the most valid, sensitive and specific tools for detecting and monitoring delirium in adult ICU patients.[7]
- Postoperative delirium best practices guideline published by the American Geriatrics Society Expert Panel is used to equip the healthcare professional caring for older adults in the perioperative setting with a set of evidence-based recommendation statements regarding the optimal care of older adults with delirium.

Suggested data to collect

Assessment of delirium risks in before cardiac surgery:

- Percentage of patients who had documented risk assessment for the development of postoperative delirium.
- Percentage of patients having pharmacological assessment for medications with potential association with postoperative delirium.

Prevention of delirium:

- Percentage patients suitable for regional analgesia who have an epidural.
- Percentage of multidisciplinary team members who have had some teaching on delirium.

Screening for delirium perioperatively:

- Percentage of patients who had daily review and screening for delirium.

Assessing the effectiveness of postoperative delirium management:

- Percentage of patients with delirium receiving senior medical review and screening for sepsis.
- Percentage of patents with postoperative delirium achieving the fast track targets in relation to length of hospital stay.

Quality improvement methodology

- Write a process map detailing the patient pathway from referral to discharge home. At what point does screening occur and how are any risk factors managed? Could this be done earlier in the pathway? How are patients kept informed along the pathway?
- Form a multidisciplinary stakeholder group to look at patient pathways:
  - How are high-risk patients identified and what mechanisms for communication exist between professional groups (eg medication review by pharmacist, care of the elderly liaison etc)?
  - Are bedside guidelines and routes of escalation and communication clear for staff managing a delirious patient?
- Patient involvement is key to implementing any meaningful and lasting change. Consider recording and sharing some patient stories with your stakeholder group to illustrate the importance of delirium and its effect on patients and their families.
- What are learning and training opportunities on prevention and detection of delirium and can staff access them? Is there learning you can share from other part of the hospital (eg care of elderly or orthopaedic wards) or from visiting other centres?

Mapping

ACSA standards: 1.2.1.4, 1.2.1.5
Curriculum competences:
Intermediate: CT_IS_01
Higher: CT_HK_01, CT_HK_04, CT_HS_04
CPD matrix codes: 1I05, 2A03, 3G00
GPAS 2020: 18.1.8, 18.2.18, 18.2.20, 18.2.22, 18.5.3, 18.5.4, 18.9.1, 18.9.2

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Registered Charity No: 1013887 VAT Registration No: GB 927 2364 18 Registered Charity in Scotland No: SCO37737
Design and layout by the Royal College of Anaesthetists.

ISBN: 978-1-5272-6522-6