Royal College of Anaesthetists

Chapter 16

Guidelines for the Provision of Anaesthesia Services (GPAS)

Guidelines for the Provision of Anaesthesia Services for Trauma and Orthopaedic Surgery 2023

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Declarations of interest

All chapter development group (CDG) members, stakeholders and external peer reviewers were asked to declare any pecuniary or non-pecuniary conflict of interest, in line with the guidelines for the provision of anaesthetic services (GPAS) conflict of interest policy as described in the GPAS chapter development process document.

The nature of the involvement in all declarations made was not determined as being a risk to the transparency or impartiality of the chapter development. Where a member was conflicted in relation to a particular piece of evidence, they were asked to declare this and then, if necessary, remove themselves from the discussion of that particular piece of evidence and any recommendation pertaining to it.

Medicolegal implications of GPAS guidelines

GPAS guidelines are not intended to be construed or to serve as a standard of clinical care. Standards of care are determined based on all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. Adherence to guideline recommendations will not ensure successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgement should only be arrived at following discussion of the options with the patient, covering the diagnostic and treatment choices available. It is advised, however, that significant departures from the national guideline or any local guidelines derived from it should be fully documented in the patient's case notes at the time the relevant decision is taken.

Promoting equality and addressing health inequalities

The Royal College of Anaesthetists (RCoA) is committed to promoting equality and addressing health inequalities. Throughout the development of these guidelines we have:

- given due regard to the need to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant Protected Characteristic (as defined in the Equality Act 2010) and those who do not share it
- given regard to the need to reduce inequalities between patients in access to, and outcomes from healthcare services and to ensure services are provided in an integrated way where this might reduce health inequalities.

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GPAS Guidelines in context

The GPAS documents should be viewed as 'living documents'. The GPAS guidelines development, implementation and review should be seen not as a linear process, but as a cycle of interdependent activities. These in turn are part of a range of activities to translate evidence into practice, set standards and promote clinical excellence in patient care.

Each of the GPAS chapters should be seen as independent but interlinked documents. Guidelines on the general provision of anaesthetic services are detailed in the following chapters:

- Chapter 1: Guidelines for the Provision of Anaesthesia Services: The Good department
- Chapter 2: Guidelines for the Provision of Anaesthesia Services for the Perioperative Care of Elective and Urgent Care Patients.

These guidelines apply to all patients who require anaesthesia or sedation, and are under the care of an anaesthetist. For urgent or immediate emergency interventions, this guidance may need to be modified as described in Chapter 5: Guidelines for the Provision of Emergency Anaesthesia.

The rest of the chapters of GPAS apply only to the population groups and settings outlined in the 'Scope' section of these chapters. They outline guidance that is additional, different or particularly important to those population groups and settings included in the 'Scope'. Unless otherwise stated within the chapter, the recommendations outlined in chapters 1–5 still apply.

Each chapter will undergo yearly review, and will be continuously updated in the light of new evidence.

Guidelines alone will not result in better treatment and care for patients. Local and national implementation is crucial for changes in practice necessary for improvements in treatment and patient care.

Aims and objectives

The objective of this chapter is to promote current best practice for service provision in anaesthesia services for trauma and orthopaedic surgery. The guidance is intended for use by anaesthetists with responsibilities for trauma and orthopaedic surgery and healthcare managers.

This guideline does not comprehensively describe clinical best practice in anaesthesia for trauma and orthopaedic surgery, but is primarily concerned with the requirements for the provision of a safe, effective, well-led service. This service may be delivered by many different acceptable models. The guidance on provision of anaesthesia services for trauma and orthopaedic surgery applies to all settings where this is undertaken, regardless of funding. All age groups are included within the guidance unless otherwise stated, reflecting the broad nature of this service.

A wide range of evidence has been rigorously reviewed during the production of this chapter, including recommendations from peer-reviewed publications and national guidance where available. However, both the authors and the CDG agreed that there is a paucity of level 1 evidence relating to service provision in anaesthesia services for trauma and orthopaedic surgery. In some cases, it has been necessary to include recommendations of good practice based on the clinical experience of the CDG. We hope that this document will act as a stimulus to future research.

The recommendations in this chapter will support the RCoA's Anaesthesia Clinical Services Accreditation (ACSA) process.

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Scope

Target audience

All staff groups working in trauma, those attending trauma calls and orthopaedic surgery, including (but not restricted to) anaesthetists, operating department practitioners, anaesthesia associates, nurses, allied health professionals and pharmacy staff.

Target population

All ages of patients undergoing trauma and orthopaedic surgery.

Healthcare setting

All settings within the hospital in which anaesthesia services for trauma and orthopaedic surgery are provided.

Clinical management

Key components needed to ensure provision of high-quality anaesthetic services for trauma and orthopaedic surgery.

Areas of provision considered:

- organisation, staffing and administration including leadership, clinical governance, policies, major trauma, emergency orthopaedics and elective orthopaedics
- areas of special requirements including children, pregnant patients and older patients
- equipment, services and facilities
- training and education
- research, audit and quality improvement
- patient information.

Exclusions

- Provision of trauma and orthopaedic surgery services provided by a specialty other than anaesthesia
- Clinical guidelines specifying how healthcare professionals should care for patients
- National level issues.

General provision of critical care is outside the scope of this document. Further information, including definitions of levels of critical care can be found in the Faculty of Intensive Care Medicine and Intensive Care Society publication Guidelines for the Provision of Intensive Care Services 2022.

Introduction

Trauma remains the most common cause of loss of life in the under 40s age group in the UK, and as such major trauma centres (MTCs) and trauma units (TUs) have been established to receive patients of all ages and to improve outcomes.[1] Early anaesthetic involvement is beneficial at all stages, from the prehospital setting, to emergency departments (ED), operating rooms, interventional radiology suites, postoperative care units and the critical care environment. The need for significant anaesthetic input and support for these complex patients is an integral part of this pathway. Definitive fixation of all indicated fractures should be completed at the earliest possible opportunity.

Hip fracture is the most common condition presenting for emergency orthopaedic surgery in the UK with many patients aged over 65. These patients together with those requiring surgical intervention for fragility fractures present significant challenges and the input from a multidisciplinary team and early surgery is essential to achieve good outcomes in this population.

Primary arthroplasty surgery significantly improves the quality of life and the mobility of those affected. With the advancing age of our population and their increasing expectations, the number of patients requiring primary arthroplasty surgery and subsequent revision arthroplasty surgery continues to rise. This population is frequently older with co-existing medical conditions that need to be optimised prior to surgery, and benefits from a multidisciplinary team (MDT) approach and the use of standardised protocols.

Orthopaedic surgery in children is wide ranging. From closed fracture manipulation and casting, to complex long-bone and soft-tissue surgery or spinal correction of congenital or acquired conditions. These may be associated with neurological conditions, or specific syndromes that could pose challenges to those providing anaesthesia care.

Recommendations

The grade of evidence and the overall strength of each recommendation are tabulated in Appendix 1.

1 Organisation, staffing and administration

Medical leadership

1.1 Every department of anaesthesia should have a designated clinical lead (see Glossary) for anaesthesia services for trauma and a designated lead for anaesthesia services for orthopaedic surgery. This should be recognised in their job plan and they should be involved in multidisciplinary service planning and governance within the unit. They should have access to trust board through a governance structure with explicit pathways of communication.

1.2 Autonomously practising anaesthetists and intensivists should be involved in the planning of local trauma services. Those with defined responsibility for major trauma management should be engaged in the layout and logistics of the resuscitation room, interventional radiology and theatres suites.

1.3 Each department of anaesthesia should have an annual plan in place for the workload to be delivered safely and effectively.[2]

1.4 Organisations should explicitly recognise the 24/7 nature of trauma work which requires a specific organisational approach for standards to be achieved throughout the whole of the week.

1.5 The provision of a high-quality trauma and orthopaedic service should be an explicit aim of the hospital executive and senior staff team. This should be reflected in the hospital's published plans and by the provision of a management structure to support this aim.[3,4,5]

1.6 Hospital business plans should address the predicted growth in elective and non-elective demands due to expanding local population and an ageing population.[6] Planning should be based on accurate and timely demand and capacity modelling.[7]

Clinical governance

Clinical governance is covered in detail in Chapter 1: Guidelines for the Provision of Anaesthesia Services: The Good Department. The principles of governance described in the chapter are applicable to provision of services for trauma and orthopaedic surgery.

1.7 Regular multidisciplinary mortality and morbidity meetings should take place in all trauma centres and follow the guidance of the World Health Organization (WHO).[8]

1.8 Anaesthetists should be involved in multidisciplinary governance meetings. Perioperative outcome data should be discussed in these meetings.

1.9 Care pathways and care bundles for common procedures such as hip fracture improve outcomes. Anaesthetists should be involved in developing, delivering and evolving these pathways and bundles.

1.10 Governance meetings should take place across the entire trauma network at defined intervals. Besides individual case discussion, feedback information from the Trauma Audit and Research Network (TARN) should be disseminated, and mechanisms set in place to correct any problems identified.[1]

Policies

General policies detailed in Chapter 2: Guidelines for the Provision of Anaesthesia Services for Perioperative Care of Elective and Urgent Care Patients are relevant to provision of anaesthesia services for trauma and orthopaedic surgery.

1.11 Specific local policies pertinent to trauma and orthopaedic surgery should be developed by a multidisciplinary team including an anaesthetist, acute pain nurse, pharmacist, physiotherapist, critical care clinicians, surgeons and other relevant specialties.[9]

1.12 Local policies should be in agreement with relevant published national guidelines.

1.13 Local policies should be easily accessible to all staff caring for trauma and orthopaedic patients. These include but are not limited to:

- preoperative screening for complex pain issues and access to acute pain services and advanced pain management methods
- pain management pathways for patients with chest injuries
- supervision and monitoring of patients by competent clinical staff during surgery performed under peripheral nerve blocks, including in a block room or similar facility
- perioperative anticoagulation guidelines for safe placement of epidural and regional nerve block techniques[10]
- recognition and management of patients at risk of acute compartment syndrome[11]
- 'Stop Before You Block'[12,13,14,15]
- management of complications of regional anaesthesia including high spinal block and accidental dural puncture
- assessment and management of local anaesthetic systemic toxicity
- assessment and management of peripheral nerve injury
- post-procedure monitoring of epidurals, nerve blocks and continuous infusion analgesia on the ward, including follow-up care in hospital and after discharge
- protocol for whom to call for problems with postoperative pain relief

- venous thromboembolism prophylaxis after orthopaedic and trauma surgery.[16]

1.14 Units should use a delirium assessment tool and a delirium policy describing preventative measures and its management.[17]

1.15 There should be specific guidelines for assessing a suspected difficult airway in patients with spine and joint disease and for measuring lung function in patients with kyphoscoliosis.[18]

1.16 Patients at risk of acute compartment syndrome should be identified on admission to hospital or at the time of surgery, and the condition should be managed within agreed multidisciplinary protocols.[11]

2 Major trauma

Policies

2.1 Local policies should ensure that National Institute for Health and Care Excellence (NICE) recommendations and quality standards for major trauma services are met and should be agreed with the regional trauma network.[19,20]

2.2 There should be local policies in place to meet the quality standards developed by NICE for:[20]

- patients with major trauma who cannot maintain their airway and/or ventilation to have drug-assisted rapid sequence induction of anaesthesia and intubation within 45 minutes of the initial call to the emergency services
- patients who have had urgent three-dimensional imaging for major trauma have a provisional written radiology report within 60 minutes of the scan
- patients with open fractures of long bones, the hindfoot or midfoot have fixation and definitive soft tissue cover within 72 hours of injury if this cannot be performed at the same time as debridement
- patients with full in-line spinal immobilisation to have their risk of cervical spine injury assessed using the Canadian C-spine rule[21]
- MTCs to have a dedicated trauma ward for patients with multisystem injuries and a designated consultant available to contact 24 hours a day, 7 days a week.
- MTCs to have acute specialist services for rehabilitation after major trauma, and for children and older people.

2.3 Initial management should follow the adult trauma life support principles with management of airway, breathing and circulation, together with cervical spine stabilisation occurring in parallel rather than in sequence.[22] Local guidelines should be followed to ensure that the appropriate tier of trauma call response is made.

2.4 Pain management pathways should be followed for chest wall injuries including provision for early epidural or nerve blocks in patients with multiple rib fractures.[23]

2.5 Assessment and management for a cervical spine injury should follow pre agreed existing NICE and British Orthopaedic Association guidance.[24,25] Spinal clearance protocols should be embedded into practice.[26]

2.6 There should be a local protocol in place for emergency access to an operating theatre or intervention suite, to provide rapid intervention in life threatening or limb-threatening conditions.[27]

2.7 All acute hospitals should have a defined major incident plan. The plan should be built around the regional network of MTCs, TUs and local emergency hospitals (LEHs).[19]

Organisation

2.8 A structured system for recording and receiving information about trauma patients should be developed and implemented. Clear lines of communication to establish this prehospital documentation should be shared with senior nursing staff and trauma teams.[19,28]

2.9 Rapid and effective communication is crucial in emergency situations. Communication strategies should consider the use of technologies such as smart phones, and standardised methodology such as situation, background, assessment, recommendation.[29]

2.10 Patients who have sustained rib fractures should have an early multidisciplinary assessment involving multidisciplinary teams such as surgeons, pain services, critical care and physiotherapy to determine the optimal analgesia and definitive management options to minimise complications related to altered pulmonary mechanics, lung capacity and ventilation.

2.11 There should be a flexible approach to trauma list planning and management to accommodate emergency cases that need priority treatment. There should be a system in place to alert the theatre team of the arrival of an unstable patient with major trauma. Appropriately trained staff and facilities should be available to receive these patients at short notice.[18]

2.12 The trauma team should attend to all suspected major trauma, according to the predefined local criteria. The trauma team should also be present for paediatric and older patients (where appropriate), patients with unexpected findings on arrival and to receive patients following interhospital transfer.

2.13 The time interval between the injury and initiation of management should be considered for patients who have sustained trauma to improve patient outcomes.

2.14 The optimal destination for the majority of patients with major trauma is a MTC. A pre-hospital triage tool should be used to differentiate between patients who should be diverted to a MTC and those who could be taken initially to a TU for treatment.[19,30] Major trauma patients should only be taken to a TU if the patient needs a life-saving intervention that cannot be delivered by the pre-hospital team.

2.15 MTCs should have a clear point of contact to provide clinical advice via clearly identified pathways and local tier arrangement to other providers within the network. This includes advice during the pre-hospital stage and while patients are awaiting transfer to MTCs for definitive treatment.

2.16 The anaesthetist plays a key role in the multidisciplinary team who apart from being involved in airway management in major trauma patients, should provide input into the recognition and management of acute physiological derangement, haemorrhage, and shock.

2.17 Handovers for patients requiring emergency trauma surgery should be structured to ensure continuity of care. Handover protocols should include clear documentation of care delivered and the future treatment plan for the patient.[18,31]

Staffing

2.18 Anaesthesia for the emergency control of major traumatic haemorrhage, and other damage limiting interventions in the operating theatre or radiology intervention suite, should be consultant anaesthetist led. Where consultants are not resident, clear lines of communication and notification should be in place to allow early attendance to trauma calls.

2.19 A major trauma coordinator (or someone in a similar role) should be responsible for overseeing scheduled admissions, preparation and planning for surgery, and for coordination of care of trauma patients with other specialties including critical care and postoperative care.

Equipment, services and facilities

2.20 Immobilisation equipment including a range of appropriately sized semi rigid collars, head blocks, tape, a vacuum mattress and a scoop board should be available. Spinal clearance should be achieved as soon as clinically possible, to minimise discomfort and complications from prolonged immobilisation in patients who do not have spinal injuries.

2.21 In suspected spinal injury, hard spinal boards should only be used as a prehospital extrication device and not be used for transport.[32] A scoop stretcher or full-length vacuum mattress should be used for transfer.

2.22 Equipment for portable monitoring to level 3 standards and ventilation should be available in the ED resuscitation room.[33,34]

2.23 Point of care ultrasound (POCUS) should be available as it is a useful adjunct to the primary survey in acute trauma. Operators need to ensure that this procedure does not delay time to definitive imaging or intervention.[2,27,35]

2.24 Patients who have acute nerve or spinal cord compression should be referred immediately to a neurosurgeon or specialist spinal unit (where required).[36]

2.25 In MTCs with a high volume of patients, prethawed plasma should be immediately available.

2.26 For patients with complex trauma, including spinal cord injuries and traumatic brain injury, there should be rapid access to key professionals and regional specialists. Patients, relatives and carers should be directed to appropriate support groups where relevant e.g. the Spinal Injuries Association.[37]

2.27 An emergency operating theatre should be rapidly available at all times for major trauma patients. The available equipment should be suitable for a full range of emergency trauma procedures. Use of this theatre for non-urgent procedures should be tightly controlled. If the designated emergency theatre is occupied, there should be a robust, flexible and agreed backup plan to obtain an appropriate alternative theatre for the next emergency case.

2.28 The emergency operating theatre should be equipped with a radiolucent operating table that allows fluoroscopic imaging of all body parts without repositioning the patient.

2.29 In MTCs and TUs there should be a rapidly accessible imaging suite for patients with major trauma, with immediate access to specialised equipment for the management of difficult airways including physiological and gas monitoring. In addition, the room design should allow visual and technical monitoring of the patient by the anaesthetic staff.[38]

2.30 In MTCs and TUs, the resuscitation room receiving bays should be large enough to allow simultaneous emergency procedures to be performed by trauma team members.

2.31 Hospitals admitting patients with major trauma should have critical care to both Level 2 and 3 standards on site.[39] Portable invasive haemodynamic monitoring should be available to facilitate transfer to and from the critical care areas.

Transportation of the trauma patient

2.32 When transporting a trauma patient, the following should be available:

- appropriately trained and competent staff
- insurance (personal and medical indemnity)
- crash test compliant equipment
- ambulance booking procedures
- procedures for receiving patients
- communication between medical teams and families
- documentation and procedures for repatriation of staff and equipment once the transfer and handover are completed.[9,40,41]

2.33 Transport of patients within the hospital and between hospitals (e.g. transfers to major trauma, neurosurgical or paediatric centres) should be undertaken in a timely manner, without unnecessary delays, and in accordance with established guidelines and standards.[9,40,41,42,43] Hospital transfers may involve a retrieval service.

2.34 Local guidelines for patient transfers between referring hospitals, neurosurgical units and local ambulance services should be consistent with national guidelines for the safe transfer of the brain-injured patient.[44]

3 Emergency orthopaedics

Fragility hip fracture

3.1 For patients who have sustained hip fractures, femoral or fascia iliaca nerve blocks should be provided in the emergency department (ED) and at the time of surgery (provided that six hours has passed between blocks).[45]

3.2 Hospitals providing surgical treatment for hip fractures should have a formal pathway including prompt provision of analgesia (including nerve blocks) and hydration, preoperative assessment of high-risk patients by the anaesthetic team. In addition, orthogeriatrician input should be prioritised on orthopaedic trauma lists.[46,47,48,49]

3.3 Risk assessment should be performed in all patients with hip fracture. The Nottingham Hip Fracture score and National Hip Fracture Database Tool could be used to assess risk.[50] Frailty scores, the four 'A's test score for delirium and the Nottingham Hip Fracture Risk Score for Kidney Injury are useful organ-specific assessment tools.

3.4 Anaesthetists should facilitate surgery within 36 hours of a hip fracture.[51] Surgery should be delayed only if the benefits of additional medical treatment outweigh the risks of delaying surgery. The risks of delay associated with pain and immobility contribute to poor outcomes to a far greater extent than correction of an abnormality to a particular numerical value.[45]

3.5 Dedicated trauma operating lists should be scheduled daily, including weekends to meet local demands, and to ensure 36-hour targets for hip fracture are met. Extra provision during the day and in the evenings may be necessary to meet local demands and limit overnight operating.[52]

3.6 Unoperated hip fractures in older patients have a high mortality rate. Evidence shows that ASA4 patients assessed as American Society of Anaesthesiologists class 4 have a higher survival rate when managed surgically.[53] Hip fracture surgery should be considered for patients even in the presence of significant comorbidities. Provision for safe anaesthesia and recovery of these patients, including handover to ward teams, should be available to facilitate this.

3.7 Perioperative anaesthetic care for a patient who is older with a hip fracture should be standardised with the overarching goals of management being patient remobilisation, re-enablement and rehabilitation.

3.8 Anaesthesia (and surgery) for hip fractures should be undertaken by an appropriately experienced anaesthetist (and surgeon).

3.9 An anaesthetic job planned representative should attend regular multidisciplinary hip fracture management meetings and feedback any relevant learning points to departments of anaesthesia and individual anaesthetists, as appropriate.

3.10 Facilities to provide total hip replacement to hip fracture patients with limited comorbidities should be available seven days a week.

3.11 Standard protocols for unilateral fascia iliacus compartment blocks should be readily available and training, awareness and management of local anaesthetic toxicity should be ensured to allow timely delivery in the ED.[54]

3.12 There should be a formalised integrated pathway for high-risk trauma patients, such as hip fractures, which includes:[4,32,55,56]

- a clear diagnostic and management plan made on admission[53]
- a clear identification and documentation of comorbidities
- a clear preoperative assessment and optimisation plan by an anaesthetist and/or an orthogeriatrician[57]
- documentation of preoperative investigations and testing
- a reconciled list of medicines to assess the risk of existing medications (including anticoagulation) and the risk associated with stopping long-term medication[53,54,58]
- documentation of risk assessment, mortality risk, discussions with family and any other important decisions[24,32,59]
- informed consent for surgery including identification of decision-making proxies (i.e. a lasting power of attorney)[4,60]
- a plan for postoperative care.[4,60]

3.13 Agreed local guidelines should be in place and implemented on the following:

- compliance with best practice anaesthetic management protocols for hip fracture as recommended by the Association of Anaesthetists.[46,61]
- tailored World Health Organization (WHO) safety checklists to discuss the requirement for use of bone cement
- preoperative assessment for treatment escalation and cardiopulmonary resuscitation
- older people (>65 years) and/or frail people with long-bone and periprosthetic fractures should receive similar treatment as those with hip fracture.

3.14 Departments should develop protocols for reviewing patients with hip fracture postoperatively, to support continuing orthogeriatric care, and to learn from successes and problems as part of continuous quality improvement.[45]

4 Elective orthopaedics

Organisation and administration

Detailed recommendations for organisation and administration of anaesthesia services for elective surgery are detailed in Chapter 2: Guidelines for the provision of Anaesthesia Services for Perioperative Care of Elective and Urgent Care Patients.

4.1 There should be a preoperative assessment clinic for elective orthopaedic surgery.

4.2 The anaesthetist should contribute in the multidisciplinary perioperative care process which focuses on preoptimisation, patient education, standardised enhanced recovery pathways of care aimed at delivering early mobility, discharge, and early return to normal life.[46,62] The option of doing nothing should be considered where relevant.[63,64]

4.3 There should be multidisciplinary input for the preoperative assessment of high risk patients such as patients with cognitive disorders, chronic kidney disease, diabetes mellitus and ischaemic heart disease.[65,50] The anaesthetist should be involved in preoperative optimisation and prehabilitation plans.[62,60]

4.4 In patients aged over 65, frailty screening using an appropriate validated screening tool should be performed and documented early in the preassessment pathway. A screening tool used in combination with direct questioning should also be adopted to help identify patients with cognitive impairment and therefore increased risk of delirium.[66]

4.5 Patients should be screened for chronic pain and opioid use in the preoperative period. Preoptimisation should ensure optimal management of preoperative pain, psychological preparation, education, and expectation management.[49,67]

4.6 A perioperative management plan should be formulated for all patients and should include multimodal analgesia and intrathecal opioid sparing analgesic techniques.[68] Multimodal analgesic techniques should aim to provide optimal pain relief whilst minimising side effects such as sedation, postoperative nausea, and vomiting, and hypotension which might compromise early rehabilitation and recovery.[47,48,67]

4.7 There should be an enhanced recovery after surgery programme for suitable patients undergoing elective orthopaedic surgery as it improves early mobilisation, reduces length of stay, postoperative complications and mortality.[69]

4.8 Elective patients with major comorbidities or those undergoing complex or prolonged surgery should be scheduled earlier in the day, to allow time for postoperative stabilisation.

4.9 Elective orthopaedic operating lists should be separated from trauma lists, to allow efficiency, ensure safety, prevent cancellations and enable a flexible response for emergencies.

4.10 Hospitals should consider providing specific regional anaesthesia lists and using dedicated areas for performing peripheral nerve blocks.[70]

4.11 Elective orthopaedic units performing major inpatient surgery should have 24/7 access to all support services including acute pain services and critical care.

5 Equipment, facilities and services

Detailed recommendations for equipment, facilities and services of anaesthesia services for elective surgery are detailed in Chapter 2: Guidelines for the Provision of Anaesthesia Services for Perioperative Care of Elective and Urgent Care Patients.

Equipment

5.1 Patients for elective orthopaedic and planned trauma surgery should have their temperature checked preoperatively on the ward. Warming devices for patients should be available for use in the anaesthetic room, operating theatre, recovery unit and ED.[3]

5.2 A range of operating tables with attachments for spinal, thoracic, pelvic and limb trauma procedures should be available as appropriate.[71]

5.3 Tourniquets and inflation devices of suitable sizes should be available for upper and lower limb surgery requiring a bloodless field.

5.4 Cell salvage equipment should be available for cases where significant blood loss is anticipated.[72,73] Staff who operate this equipment should receive training in how to operate it, and should use it with sufficient frequency to maintain their skills.

5.5 A rapid infuser allowing the infusion of warmed intravenous fluids and blood products should be available in the anaesthetic room, operating theatre, recovery unit and ED.[74]

5.6 Equipment to facilitate haemodynamic and cardiac output monitoring should be available.

5.7 A standardised 'difficult airway trolley' should be immediately available in all areas where major trauma patients are received or managed to level 2 (or greater) standards of care. These should be equipped as defined in the Difficult Airway Society (DAS) guidelines.[5,75,76]

5.8 Patient positioning for elective and trauma orthopaedic surgery involves a variety of specialist equipment, tables and attachments. These should be suitable to care for patients across a wide weight range, with theatre personnel aware of the upper weight limits.[54,77]

Facilities

5.9 Primary and revision arthroplasty surgery, together with trauma surgery involving bone implants or internal fixation should be carried out in an operating theatre with multiple air changes per hour (e.g., laminar flow).

5.10 Where appropriate, point of care testing for haemoglobin, blood gases, lactate, ketones, coagulation and blood sugar should be available for patients with major trauma throughout the patient journey and those undergoing orthopaedic procedures associated with a risk of haemorrhage.[7] If near-patient testing is not available, laboratory testing should be readily and promptly available.[78]

5.11 Transport and distribution of blood and blood components at all stages of the transfusion chain must be maintained under appropriate conditions to ensure the integrity of the product.[56]

5.12 Appropriate blood storage facilities should be clearly identified and provided in close proximity to the emergency operating theatre.[52]

5.13 Tranexamic acid should be available for administration if major haemorrhage is suspected in a trauma patient within three hours of injury.[79,80,81]

5.14 Newer hemostatic agents and antidotes should be readily available to clinical teams for emergency and trauma surgery.[82]

5.15 There should be adequate provision of postoperative beds for orthopaedic and trauma patients to allow timely discharge of patients from theatre recovery areas.

5.16 A fully equipped high dependency unit of level 2 standards should be available on site for high-risk patients undergoing major orthopaedic surgery, including revision joint replacement and surgery involving instrumentation of the spine. If the hospital does not have a Level 3 facility, protocols should be in place to determine when and how to transfer to a hospital with a Level 3 facility. Alternatively, other models of enhanced postoperative care such as a post-anaesthesia care unit should be considered.

5.17 Clinical deterioration can be identified using early warning scores and mitigated by proactively reviewing patients at risk. Arrangements to seek critical care input in deteriorating patients in a timely manner should be in place.

6 Areas of special requirements

Children

Anaesthetists will often be part of the MDT responsible for the initial resuscitation and stabilisation of the critically ill or injured child, prior to transfer to a specialist centre. All hospitals with an ED will be exposed to high volumes of paediatric patients with low-energy transfer injuries. Detailed recommendations for paediatric services are described in GPAS Chapter 10: Guidelines for the Provision of Paediatric Anaesthesia Services 2022.

6.1 Staff should be vigilant for non-accidental injury in children with trauma injuries and should make enquiries of the circumstances around major trauma and ask if there are safeguarding concerns.

6.2 Healthcare workers, including the anaesthetist, must be aware of the local policy for child protection, and that they have an obligation to document and report any concerns to a responsible individual.[83]

6.3 Hospitals must have guidelines in place to ensure the safety of children admitted to hospital, to monitor injured children known to be at risk, and identify concerns arising from any injury or pattern of injuries.[84] They must provide the appropriate training related to these guidelines.

Pregnant patients

Trauma is a leading cause of non-obstetric mortality in pregnant patients.[4] Although the primary duty of care is to the mother, fetal and maternal wellbeing are inextricably linked. Standards for non-obstetric emergency procedures in pregnant patients are described in GPAS Chapter 5: Guidelines for the Provision of Emergency Anaesthesia Services.

6.4 A standardised approach should be taken when completing a trauma survey in pregnancy and a maternal-foetal trauma checklist should be considered as this lays the foundation for interdisciplinary collaboration in a stressful environment.[85]

6.5 Provision for fetal monitoring and emergency lower (uterine) segment caesarean section should be available if indicated in the ED.[86,87,88]

6.6 In pregnant orthopaedic trauma patients, diversion to a centre with obstetric and trauma expertise directly from the scene of an injury should be considered, to avoid delay of appropriate specialist care.[89]

Older patients

6.7 A patient-centred approach is preferred for documenting advanced care plans, which include overall treatment goals including resuscitation status. It should include discussing and planning treatments that should be considered, not just those that should be withheld.[18]

6.8 A fall of less than two metres is the most common mechanism of injury in older patients. Prehospital triage to aid early identification of severe injuries in older patients should be available to allow quick transfer from TU to a MTC for specialist investigation and intervention.[90]

6.9 Older patients who are admitted following trauma should have a comprehensive geriatric assessment. The use of frailty screening tools may facilitate more informed early decision making in older trauma patients.[91]

6.10 Protocols for end of life care should be in place to manage older patients with frailty who are unlikely to survive. The multidisciplinary team and patient's family or next of kin should be involved in these decisions.[92]

7 Training and education

7.1 All patients undergoing anaesthesia should be under the care of an autonomously practising anaesthetist whose name is recorded as part of the anaesthetic record.[4,93]

7.2 All anaesthetists providing anaesthesia for trauma and orthopaedics should have appropriate knowledge, skills, attitudes and behaviour in accordance with the RCoA training standards.[94]

7.3 Anaesthetists with a specific interest in orthopaedics and trauma should deliver regular theatre sessions to ensure the maintenance of their skills and experience.

7.4 Anaesthetists with responsibility for the intraoperative care of trauma patients should ensure that their skills and knowledge of current recommendations are up to date, particularly in the management of major haemorrhage.

7.5 MTC and TU anaesthetic departments should consider appointing anaesthetists with an interest in prehospital care (see Glossary). Anaesthetists who provide prehospital care outside the hospital setting should be qualified to do so.[95]

7.6 Anaesthetists who manage patients with major trauma should consider undertaking Advanced Trauma Life Support (ATLS), European Trauma Course or equivalent training, and should update their training at regular intervals.

7.7 Anaesthetists providing anaesthesia for trauma and orthopaedic surgery should learn and maintain expertise in a wide range of regional anaesthetic techniques, including central and peripheral neural blockade.[94]

7.8 All anaesthetists involved in the management of major trauma should understand the principles and techniques of haemorrhage control resuscitation to prevent the lethal diamond of hypothermia, acidosis, coagulopathy and hypocalcemia using low-volume fluid resuscitation, blood products and damage control surgery.[92,96,97]

7.9 Appropriately trained theatre staff should be available when treating patients with multiple injuries. They should be skilled and experienced in all surgical specialties that may present in the treatment of patients with multiple injuries.

7.10 Anaesthetic trauma theatre teams should be trained in the correct use of all essential anaesthetic theatre equipment used for trauma surgery.

7.11 Staff in the recovery area and in the wards who receive patients after surgery with epidural infusions, nerve blocks or intravenous opioid infusions (including patient controlled analgesia) should have received up to date formal training in caring for such patients.

7.12 Staff expected to top up medication for patients with epidurals and continuous nerve blockade should be trained in administration of such medications.

7.13 Anaesthetic practitioners involved in the administration of anticoagulant therapies should have current and up to date knowledge in their use.

7.14 There should be regular multidisciplinary in-situ simulation training for the initial management of major trauma care and resuscitation to standardise clinical practice. Simulation can improve technical and non-technical skills including communication and teamwork.[98]

7.15 Appropriate early referral to the acute pain services and use of regional analgesia should be considered in patients with chest trauma.[99]

7.16 The diagnostic and therapeutic applications of POCUS in trauma are expanding. There should be emphasis on quality training and a robust governance process for operators within the trauma multidisciplinary team.[100]

7.17 Major incident training exercises should take place at regular intervals.

7.18 Organisations should provide mandatory training relating to advance care planning and resuscitation policies and documents.[35,101]

7.19 Educational opportunities for anaesthetists in training in MTC and TU will undoubtedly occur during predictable job planned consultant direct clinical care sessions out of hours as a result of the nature of trauma. Hospitals in which anesthetists in training work a full or partial shift system should consider providing additional consultant programmed activities to allow training and supervision to take place in the evening.

7.20 Hospitals should consider training ED staff in acute pain management of both adult and paediatric patients with trauma, in particular using ultrasound-guided femoral nerve block or fascia iliaca block for hip fractures in elderly patients and femoral fractures in children.[41,102]

7.21 The definitive care of complex spinal and pelvic injuries requires early multidisciplinary specialist spinal (orthopaedic or neurosurgical surgery) and pelvic team discussion. The anaesthetist managing such cases should have appropriate training and experience in management of these complex patients including management of associated complications.

8 Research, audit and quality improvement

8.1 All sites should consider participating in active research studies on the National Institute for Health and Care Clinical Research Network portfolio for Trauma and Emergency Care.[103]

8.2 All MTCs should have a dedicated research lead with appropriate job planned time and should receive training on ethical and organisational issues.[104]

8.3 All clinicians involved in trauma care should be aware of active studies and consider completing good clinical practice training and participating in screening and recruiting of research participants.[103,105]

8.4 Opportunities for associate principal investigator roles should be encouraged.[103]

8.5 Trauma and orthopaedic surgery should be included in anaesthetic departmental audit programmes, including continuing audit of complications and adverse events. The trauma anaesthetists should have provision in their job plan to attend trauma MDT meetings for discussion regarding high risk patients.

8.6 All hospitals treating patients with hip fractures should participate in national audits, e.g., National Hip Fracture Database or the National Joint Registry to monitor its performance against national benchmarks, quality standards, and contribute to research. Outcomes from these audits should be discussed at governance meetings and distributed to anaesthetic staff.[106,107]

8.7 All hospitals receiving major trauma patients should contribute to the TARN, to monitor their performance against national benchmarks and quality standards and contribute to research.[1] Comparative data analysis and display on the national major trauma dashboard (via TARN) is invaluable for quality assurance.

8.8 MTCs and TUs in England should undergo regular peer reviews within the National Peer Review Programme with their performance being judged according to national major trauma measures.[108]

8.9 All new patients with spinal cord injuries should be referred through the NHS Spinal Cord Injury Service (NSCIS) and registered on the National Spinal Cord Injury Database.[28] The incidence of complications should be recorded.

8.10 There should be clear processes and policies for reporting and learning from near misses and critical incidents. National patient safety alerts should be communicated and actions agreed locally to reduce the risk of harm.

8.11 Nationally agreed key performance indicators should be used to monitor the performance of the pathways for hip fractures and major trauma and reviewed by a multidisciplinary committee including a trauma lead anaesthetist. In addition, local quality indicators should be developed proactively, to support continuing improvement of these services within organisations.

8.12 Impact of enhanced recovery pathways for elective surgery should be audited to focus beyond the length of stay to improve patient outcome and satisfaction.

8.13 Evaluation of patient-centred outcomes on pain management and quality of recovery in hospital and after discharge using a validated questionnaire can be a useful tool to guide quality improvement in care pathways.[109,110]

8.14 Organisations should have a service improvement team that coordinates national and local projects, and encourages a multidisciplinary approach to trauma and orthopaedic services. Data should be collected to provide high quality information to drive change and support service development. Good data, quality improvement tools and organisational support can create feedback strategies which drive improvement.[27]

9 Patient information

The Royal College of Anaesthetists has developed a range of Trusted Information Creator Kitemark accredited patient information resources that can be accessed from the RCoA website. Our main leaflets are now translated into more than 20 languages, including Welsh.

Information for patients, relatives and carers

9.1 Patients should have easy access to reliable sources of information (web based and written) for joint replacement surgery. Options for anaesthesia and analgesia, and potential benefits and risks of each option should be discussed with patients to support shared decision making.[46,111]

9.2 Patient information leaflets on hip fractures should be available for patients, relatives and carers.[112,113] The clinicians should collaborate with the patients in selecting the most suitable treatment option based on best available evidence and informed patient preferences.[63,114,115,116,117]

9.3 Enhanced recovery programmes for patients undergoing primary arthroplasty surgery should provide comprehensive details of the patient journey including MDT led hip and knee school and expectations in terms of postoperative physiotherapy and early mobilisation where necessary. Information provided should be comprehensive and should include details of regional anaesthesia.

9.4 When it is considered appropriate for a do not to attempt cardiopulmonary resuscitation in the event of a cardiopulmonary arrest (DNACPR) order, this should be discussed with capacitous patients, including those who have expressed their own wish not to be resuscitated.[118] In patients not without capacity to consent, every attempt should be made to discuss this with next of kin and/or patient advocates holding power of attorney (or an independent mental capacity advocate), according to local trust guidelines.

Consent

To give valid informed consent, patients need to understand the nature and purpose of the procedure. Detailed recommendations for consent are described in GPAS Chapter 2: Guidelines for the Provision of Anaesthesia Services for the Perioperative Care of Elective and Urgent Care Patients.

9.5 Informed consent may not be possible for many patients undergoing hip fracture and major trauma surgery because of delirium, dementia, altered conscious level, severe pain or the effects of sedative drugs. Patients should not be asked to sign a consent form if they do not have capacity to do so. Standard operating procedures must be compliant with the Mental Capacity Act 2005. A high level of integrity should be maintained, and good documentation is essential.[119,120,121]

9.6 All decisions concerning the consent process and treatment plans, including decisions about whether or not to operate, should be documented clearly, noting the risks, benefits and alternatives that were explained to the patient.[84,87]

10 Financial considerations

Part of the methodology used in this chapter in making recommendations that considers the financial impact for each of the recommendations. Very few of the literature sources from which these recommendations have been drawn have included financial analysis.

The vast majority of the recommendations are not new recommendations, but they are a synthesis of already existing recommendations. The current compliance rates with many of the recommendations are unknown, and so it is not possible to calculate the financial impact of the recommendations in this chapter. It is impossible to make an overall assessment of the financial impact of these recommendations with the currently available information.

11 Implementation support

The ACSA scheme, run by the RCoA, aims to provide support for departments of anaesthesia to implement the recommendations contained in the GPAS Chapters. The scheme provides a set of standards, and requires departments of anaesthesia to benchmark themselves against these standards using a self-assessment form available on the RCoA website. Every standard in ACSA is based on recommendation(s) contained in GPAS. The ACSA standards are reviewed annually and republished approximately four months following GPAS review and republication, to ensure that

they reflect current GPAS recommendations. ACSA standards include links to the relevant GPAS recommendations, for departments to refer to while working through their gap analyses.

Departments of anaesthesia are given the opportunity to engage with the ACSA process for an appropriate fee. Once engaged, departments are provided with a 'college guide', either a member of the ACSA committee or an experienced reviewer, to assist them with identifying actions required to meet the standards outlined in the document. Departments must demonstrate adherence to all 'priority one' standards listed in the document to receive accreditation from the RCoA. This is confirmed during a visit to the department by a group of four ACSA reviewers (two clinical reviewers, a PatientsVoices@RCoA reviewer and an administrator), who submit a report back to the ACSA committee.

The ACSA committee has committed to building a 'good practice library', which will be used to collect and share documentation such as policies and checklists, as well as case studies of how departments that have overcome barriers to implementation of the standards, or have implemented the standards in innovative ways.

One of the outcomes of the ACSA process is to test the standards and, by extension, the GPAS recommendations, to ensure that they are able to be implemented by departments of anaesthesia and consider any difficulties that may result from implementation. The ACSA committee has committed to measuring and reporting feedback of this type from departments engaging in the scheme back to the CDGs updating the guidance via the GPAS technical team.

Areas for future development

Following the systematic review of the evidence, the following areas of research are suggested:

- advanced pain relief techniques for trauma patients before surgery
- expanding national joint registry to include data on medical conditions
- expanding national joint registry to include data throughout patient journey from referral to 'years after surgery'
- research into clinical deterioration (both medical and surgical aspects) in patients waiting for elective surgery
- use of perioperative older persons services to enhance the perioperative assessment with a comprehensive geriatric review
- local gap analysis against GPAS standards – widened as national survey to identify national gap
- local audits to assess compliance with specific GPAS standards
- local compliance with GPAS standards and outcomes
- identification of high impact GPAS standards specific to trauma and orthopaedics
- minimum staffing tools for safe and effective staffing in trauma and orthopaedics.

Abbreviations

ACSA	Anaesthesia Clinical Services Accreditation
CDG	Chapter Development Group
DNACPR	Do not to attempt resuscitation in the event of a cardiopulmonary arrest
ED	Emergency department
GPAS	Guidelines for the Provision of Anaesthetic Services
MDT	Multidisciplinary team
MTC	Major trauma centre
NICE	National Institute for Health and Care Excellence
POCUS	Point of care ultrasound
RCoA	Royal College of Anaesthetists
SAS	Staff grade, associate specialist and specialty
TARN	Trauma Audit and Research Network
TU	Trauma unit
WHO	World Health Organization

Glossary

Autonomously practising anaesthetist – a consultant or a staff grade, associate specialist or specialty (SAS) doctor who can function autonomously to a level of defined competencies, as agreed within local clinical governance frameworks.

Clinical lead – doctors undertaking lead roles should be autonomously practicing doctors who have competence, experience and communication skills in the specialist area equivalent to consultant colleagues. They should usually have experience in teaching and education relevant to the role and they should participate in quality Improvement and continuing professional development activities. Individuals should be fully supported by their clinical director and should be provided with adequate time and resources to allow them to undertake the lead role effectively.

Prehospital care – auditing long term outcomes on fractured neck of femur and revision of major joint surgeries using a validated objective tool.

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Appendix 1: Recommendations grading

The grading system is outlined in the methodology section of this chapter. The grades for each of the recommendations in this chapter are detailed in the table below:

Recommendation Number	Level of Evidence	Strength of Recommendation
1.1	GPP	Strong
1.2	GPP	Strong
1.3	C	Strong
1.4	GPP	Strong
1.5	C	Strong
1.6	C	Strong
1.7	C	Strong
1.8	GPP	Strong
1.9	GPP	Strong
1.10	C	Strong
1.11	C	Strong
1.12	GPP	Strong
1.13	C	Strong
1.14	C	Strong
1.15	C	Aspirational
1.16	C	Moderate
2.1	C	Strong
2.2	C	Strong
2.3	C	Strong
2.4	C	Strong
2.5	C	Strong
2.6	C	Strong
2.7	C	Strong
2.8	C	Strong
2.9	A	Strong
2.10	GPP	Aspirational
2.11	C	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
2.12	GPP	Moderate
2.13	GPP	Aspirational
2.14	C	Strong
2.15	GPP	Moderate
2.16	GPP	Strong
2.17	C	Strong
2.18	GPP	Strong
2.19	GPP	Strong
2.20	GPP	Strong
2.21	C	Strong
2.22	C	Strong
2.23	C	Strong
2.24	C	Strong
2.25	GPP	Strong
2.26	C	Strong
2.27	GPP	Strong
2.28	GPP	Strong
2.29	C	Strong
2.30	GPP	Strong
2.31	C	Strong
2.32	C	Strong
2.33	C	Strong
2.34	C	Strong
3.1	C	Strong
3.2	C	Strong
3.3	C	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
3.4	C	Strong
3.5	C	Strong
3.6	C	Moderate
3.7	GPP	Strong
3.8	GPP	Strong
3.9	GPP	Strong
3.10	GPP	Strong
3.11	B	Strong
3.12	C	Strong
3.13	C	Strong
3.14	C	Strong
4.1	GPP	Strong
4.2	C	Moderate
4.3	C	Strong
4.4	C	Moderate
4.5	C	Moderate
4.6	C	Strong
4.7	C	Strong
4.8	GPP	Strong
4.9	GPP	Strong
4.10	C	Moderate
4.11	GPP	Strong
5.1	C	Strong
5.2	C	Strong
5.3	GPP	Strong
5.4	C	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
5.5	C	Strong
5.6	GPP	Strong
5.7	C	Strong
5.8	C	Strong
5.9	GPP	Strong
5.10	C	Strong
5.11	M	Mandatory
5.12	C	Strong
5.13	C	Strong
5.14	C	Strong
5.15	GPP	Strong
5.16	GPP	Strong
5.17	GPP	Strong
6.1	GPP	Strong
6.2	M	Mandatory
6.3	M	Mandatory
6.4	C	Strong
6.5	C	Strong
6.6	C	Strong
6.7	C	Strong
6.8	C	Strong
6.9	C	Strong
6.10	C	Strong
7.1	C	Strong
7.2	C	Strong
7.3	GPP	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
7.4	GPP	Strong
7.5	C	Strong
7.6	GPP	Strong
7.7	C	Strong
7.8	C	Strong
7.9	GPP	Strong
7.10	GPP	Strong
7.11	GPP	Strong
7.12	GPP	Strong
7.13	GPP	Strong
7.14	C	Strong
7.15	C	Aspirational
7.16	C	Strong
7.17	GPP	Aspirational
7.18	C	Strong
7.19	GPP	Aspirational
7.20	B	Strong
7.21	GPP	Moderate
8.1	C	Aspirational
8.2	C	Strong
8.3	C	Strong
8.4	C	Strong
8.5	GPP	Moderate
8.6	C	Strong
8.7	C	Strong
8.8	C	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
8.9	C	Strong
8.10	GPP	Strong
8.11	GPP	Strong
8.12	GPP	Strong
8.13	B	Strong
8.14	C	Strong
9.1	C	Strong
9.2	C	Strong
9.3	GPP	Strong
9.4	C	Strong
9.5	M	Strong
9.6	C	Strong

About these guidelines

Methodology

The process by which this chapter has been developed has been documented within the GPAS Chapter Development Process Document, which is available on request.

The evidence included in this chapter is based on a systematic search of the literature. Abstracts were independently screened by two investigators and reviewed against inclusion and exclusion criteria. Data were extracted by one investigator in accordance with predefined criteria. The review objective was to determine the key components needed to ensure provision of high-quality perioperative services for patients who have undergone surgery and/or interventions which involve anaesthesia.

Search strategy

Searches were performed on Embase (1980 to 2015), Ovid MEDLINE (1946 to present), CINAHL and Cochrane Library, for the literature search strategy, outcomes, databases, criteria for inclusion and exclusion of evidence (for the full Neuroanaesthetic services chapter search protocol please contact the RCoA). A hand search of the literature was also conducted by the authors using the reference lists of relevant original articles and review articles.

The literature search was performed in April 2022.

The authors and researcher independently reviewed the abstracts and titles of the studies found in the initial search. After agreement on the primary selection of papers, full-text versions were accessed and reviewed against the following predefined inclusion and exclusion criteria. The full-

text papers were also reviewed by the CDG for suitability. The final list of publications used can be found in the references.

Inclusion criteria

The literature review considered studies that included the following patient population with all of the inclusion criteria listed below:

- all patients undergoing elective or emergency anaesthesia
- all staff groups working within Neuroanaesthetic care, under the responsibility of an anaesthetic clinical director, including (but not restricted to) consultant anaesthetists, autonomously practising anaesthetists, anaesthetists in training, nurses, operating department practitioners, surgeons, pharmacists, general practitioners, radiologists and radiographers.

Exclusion criteria

The literature review used the following exclusion criteria:

- provision of neuroanaesthesia provided by a speciality other than anaesthesia.

Data extraction and analysis

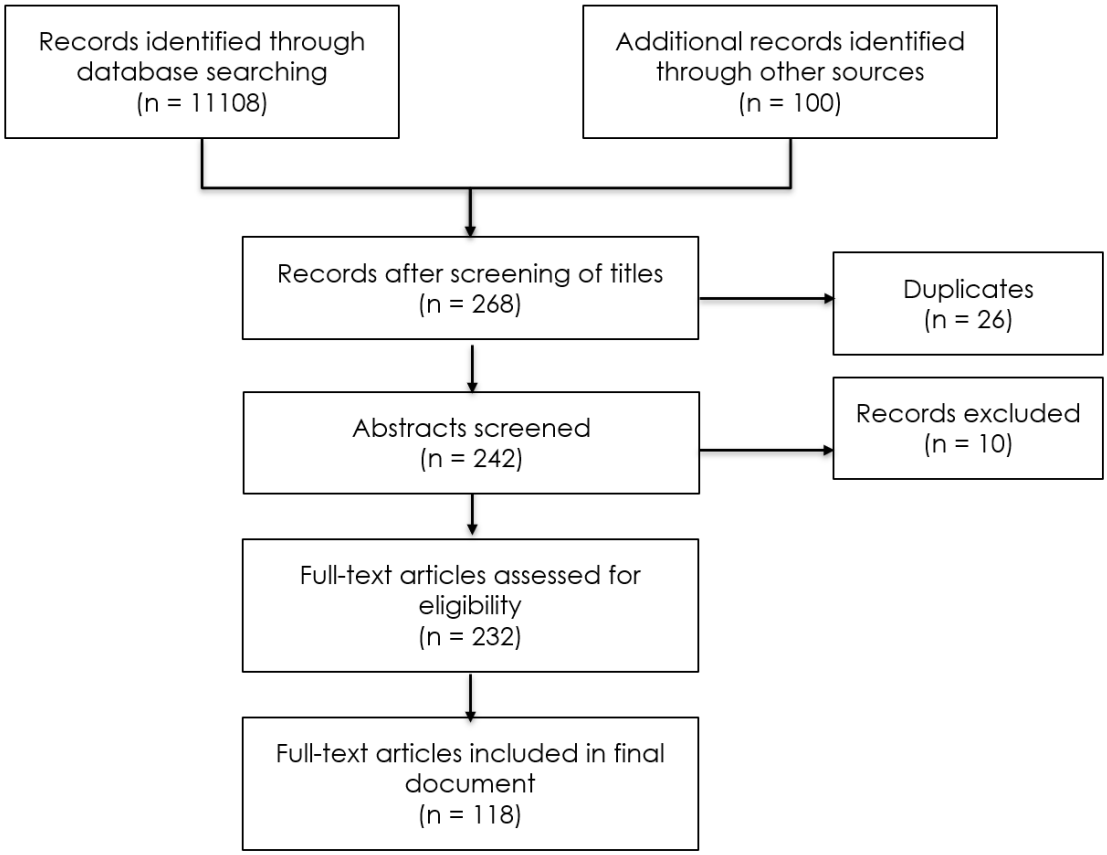
Data were extracted by the authors using a proforma. The study characteristics data included:

- the journal and country of publication
- the number of patients recruited into the study
- the study design
- patient characteristics
- outcome data
- the logic of the argument
- author's conclusions
- reviewer's comments.

The patient characteristics data extracted were: age, gender and type of surgery. The analysis considers studies that included any clinical outcome, including (but not restricted to) survival, length of stay – critical care or hospital, morbidity, adverse effects and complications.

The results of the literature review can be seen below:

Preferred Reporting Systems for Systematic Review and Meta-analysis (PRISMA) flow chart



The evidence that is included in this chapter has been graded according to a grading system adapted from NICE and outlined below:

Level	Type of evidence	Grade	Evidence
Ia	Evidence obtained from a single large/multicentre randomised controlled trial, a meta-analysis of randomised controlled trials or a systematic review with a low risk of bias	**A**	At least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation (evidence level I) without extrapolation
Ib	Evidence obtained from meta-analyses, systematic reviews of RCTs or RCTs with a high risk of bias	**B**	Well-conducted clinical studies but no high-quality randomised clinical trials on the topic of recommendation (evidence levels Ib, II or III); or extrapolated from level Ia evidence
IIa	Evidence obtained from at least one well-designed controlled study without randomisation		
IIb	Evidence obtained from at least one well-designed quasi-experimental study		
IIc	Evidence obtained from case control or cohort studies with a high risk of confounding bias		
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies		
IV	Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities	**C**	Expert committee reports or opinions and/or clinical experiences of respected authorities (evidence level IV) or extrapolated from level I or II evidence. This grading indicates that directly applicable clinical studies of good quality are absent or not readily available.
UG	Legislative or statutory requirements	**M**	This grading indicates that implementation of this recommendation is a statutory requirement, or is required by a regulatory body (e.g. CQC, GMC)
		GPP	Recommended good practice based on the clinical experience of the CDG.
Adapted from Eccles M, Mason J. How to develop cost-conscious guidelines. *Health Technology Assessment* 2001;5(16) and Mann T. Clinical guidelines: using clinical guidelines to improve patient care within the NHS. *Department of Health*, London 1996.			

Strengths and limitations of body of evidence

Most of the published evidence on perioperative care anaesthesia services is descriptive. There are publications describing aspects of this process based on expert opinion.

The limitations of the evidence are:

- the 'unmeasurables' (attitudes, behaviour, motivation, leadership, teamwork)
- few randomised controlled trials (RCTs); studies frequently use mixed populations of emergency and elective patients, or all emergency patients grouped together despite different underlying diagnoses
- papers often examine a single intervention within complex system or bundle
- papers are often examining small numbers and/or patients from a single centre
- poor use of outcome measures, frequently concentrating on easily measured short-term outcomes which are not patient centred
- generally, a paucity of long-term follow up
- there is no standard definition used of 'high risk'
- use of different risk-scoring systems
- decrease in outcome over time and geography when 'good papers' are used in quality improvement programmes
- application of international studies in systems with either more or less resources than the UK into NHS practice
- older studies may no longer be applicable within the NHS
- very few studies included any analysis of financial implications
- evidence was mainly based on literature graded III and IV.

Methods used to arrive at recommendations

Recommendations were initially drafted based on the evidence by the authors for the chapter. These were discussed with the CDG, and comments were received both on the content and the practicality of the recommendations. The level of evidence that was the basis for each recommendation was graded according to a grading system, and the recommendation was then graded taking into account the strength of the evidence and the clinical importance using a recommendations criteria form.

Recommendations were worded using the following system of categorisation:

Strength	Type of evidence	Wording
Mandatory	The evidence supporting the recommendation includes at least one with an 'M' grading	Wording should reflect the mandatory nature of the recommendation i.e. 'must'
Strong	Confidence that for the vast majority of people, the action will do more good than harm (or more harm than good)	Wording should be clearly directive 'should' or 'should not'

Weak	The action will do more good than harm for most patients, but may include caveats on the quality or size of evidence base or patient preferences	Wording should include 'should be considered'
Aspirational	While there is some evidence that implementation of the recommendation could improve patient care, either the evidence or the improvement is not proven or substantial	Wording should include 'could'
Equipoise	There is no current evidence on this recommendation's effect on patient care	Wording should include 'there is no evidence of this recommendation's effect on patient care'

Consultation

The chapter has undergone several rounds of consultation. The multidisciplinary CDG formed the first part of the consultation process. The authors and GPAS Editorial board identified key stakeholder groups. Where stakeholders are represented by an association or other medical college, they were asked to nominate delegates to join the CDG. The GPAS Chapter Development Process Document (available on request) explains the recruitment process for those CDG members who were not directly nominated. The CDG members were involved in drafting the recommendations, and were provided with an opportunity to comment on all subsequent drafts of the chapter.

The chapter underwent peer review. Peer reviewers were identified by the GPAS Editorial Board, Clinical Quality and Research Board (CQRB) or through the Clinical Leaders in Anaesthesia Network. Nominees were either anaesthetists of consultant grade or were nominated by a key stakeholder group. Nominees had not had any involvement in the development of GPAS to date and were asked to comment upon a late draft of the chapter.

Following peer review, the chapter was reviewed by the College's CQRB and the College's PatientsVoices@RCoA Committee. Comments from all groups were considered and incorporated into a consultation draft.

The consultation draft of this chapter was circulated for public consultation from TBC. As well as being made available on the College's website and promoted via Twitter and the President's newsletter to members, the draft was also circulated to all key stakeholder groups identified by the authors and the College. A list of organisations contacted by the College is available from the GPAS team at the College: GPAS@rcoa.ac.uk.

The editorial independence of GPAS

The development of GPAS is wholly funded by the Royal College of Anaesthetists. However, only the GPAS technical team and the GPAS researcher are paid directly by the College for their work on GPAS: the GPAS Editors' employing organisation receives 2 programmed activities (PA) backfill funding. All funding decisions by the College are made by the chief executive officer, in collaboration with the senior management team and College Council.

The authors of the chapters are all fellows of the Royal College of Anaesthetists. Members of College Council cannot act as chair of any CDG, as this individual has the deciding vote under the

consensus method of decision making used in the chapters. Where College Council members have been involved in chapter development, this has been declared and recorded.

All persons involved in the development of GPAS are required to declare any pecuniary or non-pecuniary conflict of interest, in line with the GPAS conflict of interest policy as described in the GPAS Chapter Development Process Document (available on request). Any conflicts of interest are managed on a case-by-case basis to maintain the transparency and impartiality of the GPAS document. The conflicts, and the way they were managed, are outlined at the beginning of the chapter.

The role of the GPAS Editorial Board and CQRB

The overall development of the entire GPAS document is overseen by the CQRB of the Royal College of Anaesthetists, which includes representatives from all grades of anaesthetist and from clinical directors, and which also has lay representation.

Responsibility for managing the scope of the document and providing clinical oversight to the project technical team is delegated by the CQRB to the GPAS Editorial Board, which includes individuals responsible for the various internal stakeholders (see above for membership). On the inclusion/exclusion of specific recommendations within each chapter, the Editorial Board can only provide advice to the authors. In the event of disagreement between the authors, the majority rules consensus method is used, with the GPAS Editor holding the deciding vote.

Both of these groups, along with the PatientsVoices@RCoA Committee, review each chapter and provide comment prior to public consultation and are responsible for signoff before final publication. In the event of disagreement, consensus is reached using the majority rules consensus method, with the chair of CQRB holding the deciding vote.

Updating these guidelines

This chapter will be updated for republication in January 2025.

Guidelines will be updated on an annual basis. The researcher will conduct the literature search again using the same search strategy to uncover any new evidence and members of the public will be able to submit new evidence to the GPAS project team. Where new evidence is uncovered, the lead author will decide whether the recommendations that were originally made are still valid in light of this new evidence.

If new evidence contradicts or strengthens existing recommendations, the authors decide whether or not to involve the remainder of the CDG in revising the recommendations accordingly.

If new evidence agrees with existing recommendations, then a reference may be added but no further action is required.

If there is no new evidence then no action is required.

This chapter is due to be fully reviewed for publication in January 2028.

Every five years guidance will be submitted to a full review involving reconvening the CDG (or appointment of a new, appropriately qualified CDG), and the process described in the methodology section of this chapter begins again.

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