Chapter 15
Guidelines for the Provision of Anaesthesia Services for Vascular Procedures

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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 GPAS conflict of interest policy as described in the GPAS chapter development process document.

Declarations were made as follows:

- one member of the chapter development group was involved in producing one of the items of evidence.

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 removed themselves from the discussion of that particular piece of evidence and any recommendation pertaining to it.

Medico-legal 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 on the basis of 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 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 cited under 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 guidelines for the provision of anaesthetic services (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 of GPAS:

- Chapter 2: Guidelines for the provision of anaesthesia services for preoperative assessment and preparation
- Chapter 3: Guidelines for the provision of anaesthesia services for intraoperative care
- Chapter 4: Guidelines for the provision of anaesthesia services for postoperative care

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 GPAS chapters 2–5 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 vascular anaesthesia. The guidance is intended for use by anaesthetists with responsibilities for service delivery and healthcare managers.

This guideline does not comprehensively describe clinical best practice in vascular anaesthesia, but is primarily concerned with the requirements for the provision of a safe, effective, well-led service, which may be delivered by many different acceptable models. The guidance on provision of vascular anaesthesia 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 vascular anaesthesia. 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.

Scope

Target audience

All staff groups working in vascular procedures, including (but not restricted to) consultant anaesthetists, specialty doctor and associate specialist (SAS) anaesthetists, anaesthetists in training, operating department practitioners and nurses.

Target population

All ages of patients undergoing vascular procedures.

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Healthcare setting

All settings within the hospital in which anaesthesia services for vascular procedures are provided.

Clinical management

- Key components for the provision of anaesthesia services for vascular procedures
- Key components needed to ensure provision of high quality anesthetic services for vascular procedures
- Areas of provision considered:
  - Levels of provision of service, including (but not restricted to) staffing, equipment, support services and facilities
  - Areas of special requirement, such as preoperative assessment and elderly patients
  - Training and education
  - Organisation and administration
  - Research and Audit
  - Patient Information

Exclusions

- Provision of vascular anaesthesia services by a specialty other than anaesthesia.
- Clinical issues that will not be covered:
  - clinical guidelines specifying how healthcare professionals should care for patients
  - national-level issues.

Introduction

Vascular services are recognised as having a high priority in the UK. Publication of evidence that the outcome from abdominal aortic aneurysm (AAA) surgery was significantly worse in the UK than comparable countries,[1] and the 2005 NCEPOD Report "AAA a service in need of surgery", led to a national Abdominal Aortic Aneurysm Quality Improvement Programme (AAAQIP) being introduced to encourage standards of best practice and reduce national mortality.[2] Standardisation of care has resulted in improvements in survival following AAA repair which are now superior to initial targets.[3] The increasing use of complex endovascular stent grafts in patients assessed as high risk for open aortic surgery has added a new level of complexity to decision-making for patients with aortic pathology. Vascular anaesthetists may need to acquire additional knowledge and skills in areas such as spinal cord protection within the sphere of this growing work load and be cognisant of the implications and available options for such patients. Such procedures may require vascular anaesthetists to provide clinical care in the hybrid theatres or the interventional radiology suite.[4,5,6] The majority of patients requiring arterial surgery are elderly and have a high incidence of cardiovascular, renal and respiratory disease.[7,8,9,10]

A very large proportion of vascular surgery is urgent in nature. This is commonly highlighted in patients who require revascularisation, major lower limb amputation or carotid endarterectomy. Current evidence suggests that carotid endarterectomy should be performed within two weeks of initial symptoms.[11]

Similarly data from the UK National Vascular Registry, a NCEPOD Report and the recent nationwide GIRFT report revealed poor outcomes in patients undergoing major lower limb amputation and considerable delays in treatment.[12,13,19] A current best practice guideline has been published on major lower limb amputation and this was followed by a best practice clinical care pathway.[13,14] These reports have implications for departments who provide a vascular anaesthesia service.

There is evidence that outcome after arterial surgery is related to the caseload of both surgeons and anaesthetists and that individual anaesthetists should not be caring for very small numbers of patients undergoing major elective and emergency aortic or carotid surgery.[4,15,16] These recommendations have been one of many important drivers for continued centralisation of vascular services in the UK due to a reportedly strong relationship between case volume and patient outcome. These are national issues which affect the clinical and organisational delivery of vascular anaesthesia services.

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Following the reconfiguration and centralisation of vascular services within NHS hospitals in England, services should be part of a wider regional network. Within the network 'arterial' and 'non-arterial' centres exist to provide a comprehensive service to a population of at least 800,000.[17] All arterial procedures, including endovascular, can only be provided in designated arterial centres.

Again these reports and changes in practice have important implications for the safe provision of vascular anaesthesia services.

Recommendations

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

1 Staffing requirements

1.1 In all hospitals undertaking major vascular anaesthesia a vascular anaesthetist should be appointed clinical lead (see glossary) to manage service delivery. This should be recognised in their job plan and they should be involved in multidisciplinary service planning and governance within the unit.

1.2 Anaesthesia for all patients undergoing major vascular surgery should be provided by or directly supervised by an anaesthetist suitably qualified, trained and experienced in vascular anaesthesia. This will usually be a consultant vascular anaesthetist, who has overall responsibility for the patient's care. Under certain circumstances, this could be a Staff Grade, Associate Specialist or Specialty (SAS) doctor who is practising regularly in this subspecialist area under the provisions of the RCoA's guidance on the supervision of SAS doctors.[18]

1.3 It is recognised that staff invoved in providing care for out-of-hours vascular emergencies may differ from those involved in routine daytime care. It is essential that all staff who might potentially be involved in perioperative care of the emergency vascular surgical patient are trained and competent in the aspects of care for which they are responsible. There should be provision for such staff to attend and assist in the daytime care of routine major vascular cases to update their skills and knowledge, with appropriate recognition in their respsective job plans.

1.4 Where possible urgent and emergency vascular cases should be performed on day time theatre lists by appropriately trained staff and equipment available.[19] There is evidence that the outcome after lower limb amputation surgery is better when surgery is undertaken within normal working hours.[13,20,21]

1.5 Anaesthetists undertaking major vascular surgical cases should be supported by adequately trained assistants who work regularly in the vascular theatres.

1.6 The preoperative assessment and decisions regarding the risks of vascular surgery are often complex and time-consuming and require detailed discussions with the patient and other colleagues. Patients undergoing major vascular surgery should ideally be assessed by a vascular anaesthetist. Regular sessional time and programmed activities should be made available for anaesthetists to fulfil these requirements.[22]

1.7 In units designated as complex arterial centres, additional programmed time should be provided to vascular anaesthetists delivering this service to allow them to engage with the multidisciplinary team (MDT) and provide support to allied specialties.

1.8 Where endovascular procedures are being performed in the radiology department, perioperative anaesthetic support should be identical to that provided for patients undergoing vascular surgery in the operating theatre suite.

1.9 Staff with skills including expertise in spinal cord protection, monitoring of anticoagulation, visceral perfusion and one-lung ventilation should be available in specialist units.

2 Equipment, Services and Facilities

The following equipment, support services and facilities are required for the efficient and safe functioning of the vascular anaesthesia service.

Equipment

2.1 Major vascular surgery often requires the use of large amounts of ancillary equipment. This should be available in vascular theatres and operated by appropriately trained staff. Equipment should include

radiological equipment, rapid fluid infusers, cell salvage machines and extra-corporeal circulation devices where appropriate.

2.2 Advanced monitoring equipment should be available in the vascular theatre to monitor the function of the cardiovascular system.[Error! Bookmark not defined.,9,23] This may include monitoring of invasive pressures, cardiac ischaemia, and cardiac output.

2.3 Equipment and facilities should be available to manage major haemorrhage. This may include intraoperative cell salvage and other blood conservation techniques.[24,25,26]

2.4 Transoesophageal echocardiography (TOE) may be useful in the identification of thoracic aortic pathology, successful deployment of thoracic stent grafts and detection of early complications. When required, TOE should be performed by certified practitioners with expertise in its use and interpretation.

2.5 Units undertaking vascular surgery in which spinal cord or cerebral ischaemia is a significant risk factor should consider having the appropriate equipment for intraoperative neurophysiological monitoring. Examples include monitoring of evoked potentials, cerebral perfusion and function, CSF pressure and drainage.

2.6 Equipment to perform one-lung ventilation should be available when thoracoscopic or thoraco-abdominal procedures are performed.

2.7 The impact of perioperative hypothermia may be more pronounced in vascular patients. Equipment should be available to monitor and maintain normothermia. [27,28]

2.8 Equipment should be immediately available for rapid blood gas analysis, near-patient tests of coagulation, e.g. Thromboelastograph and Activated Clotting Time, and the measurement of haemoglobin and blood glucose.[29,30]

2.9 All relevant staff should be appropriately trained in the use of the above equipment.

Facilities

2.10 Vascular theatres should be of adequate size to facilitate the use of this equipment safely, with additional storage capacity.

2.11 Facilities to provide postoperative level 1 and 2 care should be available on a 24-hour basis.

2.12 In centres performing arterial surgery, adequate level 2 and 3 critical care facilities should be available onsite to facilitate both routine and emergency workloads. This should include the ability to provide renal replacement therapy.[2]

2.13 Where anaesthesia is provided for endovascular procedures the anaesthetic facilities and equipment should be equivalent to those of a modern operating theatre environment. This includes post-anaesthesia recovery facilities with the adequate levels of trained recovery room staff.[31]

2.14 Endovascular procedures involve significant potential exposure of the patient and staff to ionising radiation. Recommendations for facilities and training outlined in the GPAS chapter 7 should be followed.[32] Suitable lead aprons, lead barriers and eye wear and dose meters should be available for the anaesthetic team in such an environment.

3 Areas of Special Requirement

Preoperative assessment and preparation

The preoperative evaluation of patients presenting for vascular surgery presents particular challenges because of the incidence of coexisting disease, in particular cardiovascular, respiratory, renal disease, and diabetes.[4,33,34]

The specific aims of preoperative vascular assessment are:

- to perform a risk assessment
- to allow referral and optimisation of co-existing medical conditions
- to permit consideration and institution of prevention measures

- this includes lifestyle evaluation and interventions to support modification of risk factors (cessation of smoking, weight management, nutrition and regular activity/exercise)
- access to appropriate support services (pharmacy and dietetics) should be available.

- to enable clinical decision making with the wider vascular team. This includes
  - planning and preparation
  - to review the risks and benefits of surgery
  - to establish the best surgical options for an individual
  - to allow the timing of surgery and required facilities to be planned.
- To facilitate shared decision-making with the patient.

General recommendations for preoperative assessment are described in GPAS chapter 2.[35]

3.1 Risk stratification based on clinical history may help guide management.[36] However, determination of a patient's functional capacity may be difficult if exercise tolerance is limited by peripheral vascular insufficiency, respiratory or other disease.[10,35] Clinical guidelines should be developed for further investigation, referral, optimisation and management according to local facilities and expertise. [37]

3.2 To guide clinical decision making, cardiopulmonary exercise testing should be considered for patients undergoing aortic surgery to establish functional capacity, and the presence and severity of cardiopulmonary disease. Test results may also be helpful in guiding collaborative decision making as to the most appropriate treatment option for patients.[38]

Elderly patients

Increasing numbers of elderly patients are undergoing vascular surgery. There is evidence that a comprehensive geriatric assessment targeting syndromes such as frailty and sarcopenia have a positive impact in terms of shared decision making and clinical outcomes for those patients who undergo vascular surgery. This is a growing area of clinical practice which is directly benefiting the vascular surgical population.

4 Training and Education

4.1 Anaesthetists with an appropriate level of training should manage patients undergoing major elective vascular surgery.

4.2 In order to maintain the necessary knowledge and skills, vascular anaesthetists should have a regular commitment to the specialty, and adequate time must be made for them to participate in relevant multidisciplinary meetings and continuing professional development (CPD) activities. This should include the facility and resources to visit other centres of excellence, in order to exchange ideas and develop new skills where appropriate.

4.3 Vascular anaesthetists should have the appropriate skills and knowledge regarding invasive cardiovascular monitoring, cardioactive or vasoactive drugs, strategies for perioperative organ protection (renal, myocardial and cerebral), the management of major haemorrhage and the maintenance of normothermia.[39]

4.4 Some anaesthetists may have responsibility for management of major vascular surgical cases on an occasional or out of hours basis. The department of anaesthesia should ensure that opportunities are made available for these anaesthetists to maintain appropriate skills and knowledge. Notwithstanding this, all anaesthetists must recognise and work within the limits of their professional competence.

4.5 A local training module should be provided for trainee anaesthetists according to their grade, supervised by a nominated educational lead. This programme should develop understanding of the widespread nature of cardiovascular disease, optimisation, risk stratification as well as perioperative management. The RCoA revised training curriculum (2010) provides explicit detail of the requirements.[40]

4.6 Where cardiopulmonary exercise testing is used it is recommended that appropriate training, accreditation and infrastructure is in place to facilitate this.[41,42]

5 Organisation and Administration

5.1 Departments should ensure that vascular anaesthetists and support staff are available to provide a year round service. This should include prospective cover for sickness and planned leave.[4]

5.2 Where organisational infrastructure is lacking to safely undertake major or complex vascular cases e.g. no critical care bed or vascular anaesthetist available, clinical staff should not be pressurised into proceeding with surgery.

5.3 Under circumstances where prolonged or complex vascular procedures are scheduled on a regular basis, appropriate agreement, planning, funding and resources should be in place.

5.4 Programmed time should be available in job plans to support appropriate attendance at multidisciplinary team meetings and preoperative assessment clinics.

5.5 Paticipation in morbidity and mortality meetings, governance meetings, audit and development of local protocols should be supported in the job plans.

5.6 The following guidelines should be held and easily accessible:

- management of lumbar drains
- postoperative management of blood pressure following a carotid endarterectomy (CEA)
- emergency ruptured AAA.

6 Financial Considerations

Part of the methodology used in this chapter in making recommendations is a consideration of 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 being widely accepted into future practice. It is impossible to make an overall assessment of the financial impact of these recommendations with the currently available information.

7 Research, audit and quality improvement

7.1 All departments undertaking major vascular surgical cases should organise regular multidisciplinary audit meetings with vascular surgeons and radiologists. These should occur in addition to departmental clinical governance meetings.[43] Regular audit or evaluation of the following aspects of vascular patient care may include:

- Survival and complications in patients undergoing surgery including review of unexpected outcomes
- Survival in patients treated non-surgically e.g. abdominal aortic aneurysm including cause of death, where appropriate
- Compliance with recommended national guidance timeframes e.g. VSQIP, including reasons for delay or cancellations to major elective cases
- Techniques and quality of perioperative pain management for elective and emergency cases
- Utilisation of intraoperative blood conservation strategies and impact on blood component usage
- Impact of MDT process on clinical decision-making in patient management
- Patient reported outcome and experience measures with the vascular service.

7.2 Individual vascular anaesthetists are encouraged to contribute to the UK national audit database (National Vascular Registry),[43] which incorporates a section dedicated to ‘anaesthesia’ as developed

between the Vascular Anaesthesia Society of Great Britain and Ireland and partnership organisations. The systems needed to provide the necessary data should be available and supported.

7.3 Departments should facilitate the collection of data required for anaesthetists undertaking major vascular cases to keep a personal logbook.

7.4 Where new quality improvement initiaves are being considered for patients undergoing vascular procedures, an appropriately conducted impact evaluation is recommended before commencement. This should involve all local stakeholders likely to be affected, ideally including patient representatives. An appropriately conducted pilot evaluation, with clearly defined outcome measures, may be appropriate prior to consideration of full-scale implementation.

8 Implementation Support

The Anaesthesia Clinical Services Accreditation (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 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' (a member of the RCoA working group that oversees the process), 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 lay reviewer and an administrator), who submit a report back to the ACSA committee.

The ACSA committee has committed to building a 'good practice library' (GPL), 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.

9 Patient Information

9.1 It is important to engage in a shared decision making process with patients to discuss the risks and benefits of scheduled or elective major vascular surgery. Details should be explained to the patient in an appropriate setting and in a language they can understand. Patient information materials should be made available to support the patient's decision with regard to choices on anaesthesia and analgesia.

9.2 These discussions should occur well in advance of planned surgery to allow reflection and informed decision-making. All such discussions should be documented, although it is still necessary to give relevant explanations at the time of the procedure.

9.3 Options for anaesthesia and all aspects of perioperative care, including risks and benefits, should be discussed with the patient by the responsible anaesthetist.

Areas for Future Development

Following the systematic review of the evidence, the following areas are recommended for further research:

- Comprehensive geriatric assessment for vascular procedures
- Implementation of prehabilitation programmes.

Abbreviations

AAA	Abdominal Aortic Aneurysm
AAAQIP	Abdominal aortic aneurysm quality improvement programme
ACSA	Anaesthesia Clinical Services Accreditation
BP	Blood pressure
CDG	Chapter Development Group
CEA	carotid endarterectomy
CPD	continuing professional development
CSF	Cerebrospinal fluid
GPAS	Guidelines for the Provision of Anaesthetic Services
NCEPOD	National Confidential Enquiry into Patient Outcome and Death
NICE	National Institute for Health and Care Excellence
MDT	Multidisciplinary team
RCoA	Royal College of Anaesthetists
SAS	Staff Grade, Associate Specialist or Specialty Doctor
TOE	Transoesophageal echocardiography
VSQIP	Vascular Services Quality Improvement Programme

Glossary

Clinical Lead	SAS 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 CPD activities. Individuals should be fully supported by their Clinical Director and be provided with adequate time and resources to allow them to effectively undertake the lead role.
Immediately	Unless otherwise defined, 'immediately' means within five minutes
Vascular anaesthetist	An anaesthetist with regular sessional committment to major arterial surgery who has developed experitise in preoperative cardiovascular risk assessment, has specific knowledge of the principles underlying the main index vascular procedures and who maintains regular CPD in the field of vascular anaesthesia.

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40 CCT in Anaesthetics, Higher Level Training, August 2010 (Edition 2), Annex D (version 1.8, D36-37 (bit.ly/2KSkdUE)

41 Levett DZH, Jack S, Swart M *et al.* Perioperative Cardiopulmonary Exercise Testing (PCPET): consensus clinical guidelines on indications, organisation, conduct and physiological interpretation of PCPET. *Br J Anaesth* 2018; 120: 484-500

42 NHS England. Shared decision making. https://www.england.nhs.uk/shared-decision-making/

43 National Vascular Registry. www.vsqip.org.uk

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
1.01	GPP	Strong
1.02	C	Strong
1.03	GPP	Strong
1.04	B	Strong
1.05	GPP	Strong
1.06	B	Strong
1.07	GPP	Weak
1.08	GPP	Strong
1.09	GPP	Strong
2.01	GPP	Strong
2.02	C	Strong
2.03	B	Strong
2.04	GPP	Equipoise
2.05	GPP	Weak
2.06	GPP	Strong
2.07	C	Strong
2.08	C	Strong
2.09	GPP	Strong
2.1	GPP	Aspirational
2.11	GPP	Strong
2.12	C	Strong
2.13	C	Strong
2.14	C	Mandatory
3.01	B	Strong
3.02	GPP	Weak
4.01	GPP	Strong
4.02	GPP	Strong
4.03	GPP	Strong
4.04	GPP	Strong
4.05	C	Strong
4.06	C	Strong
5.01	B	Strong
5.02	GPP	Strong
5.03	GPP	Equipoise
5.04	GPP	Aspirational
5.05	GPP	Strong
7.01	C	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
7.02	C	Strong
7.03	GPP	Strong
7.04	GPP	Weak
9.01	GPP	Strong
9.02	GPP	Strong
9.04	GPP	Strong

About these guidelines

Methodology

The process by which this chapter has been developed has been documented within the GPAS chapter development process document.

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 vascular surgery 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 vascular 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 September 2017.

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 Chapter Development Group (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 vascular surgery, under the responsibility of an Anaesthetic Clinical Director, including (but not restricted to) Consultant Anaesthetists, Trainee Anaesthetists, Nurses, Operating Department Practitioners, Surgeons, Pharmacists, General Practitioners, Radiologists and Radiographers

Exclusion criteria

The literature review used the following exclusion criteria:

- Provision of a vascular service provided by a speciality other than anaesthesia

Data Extraction and Analysis

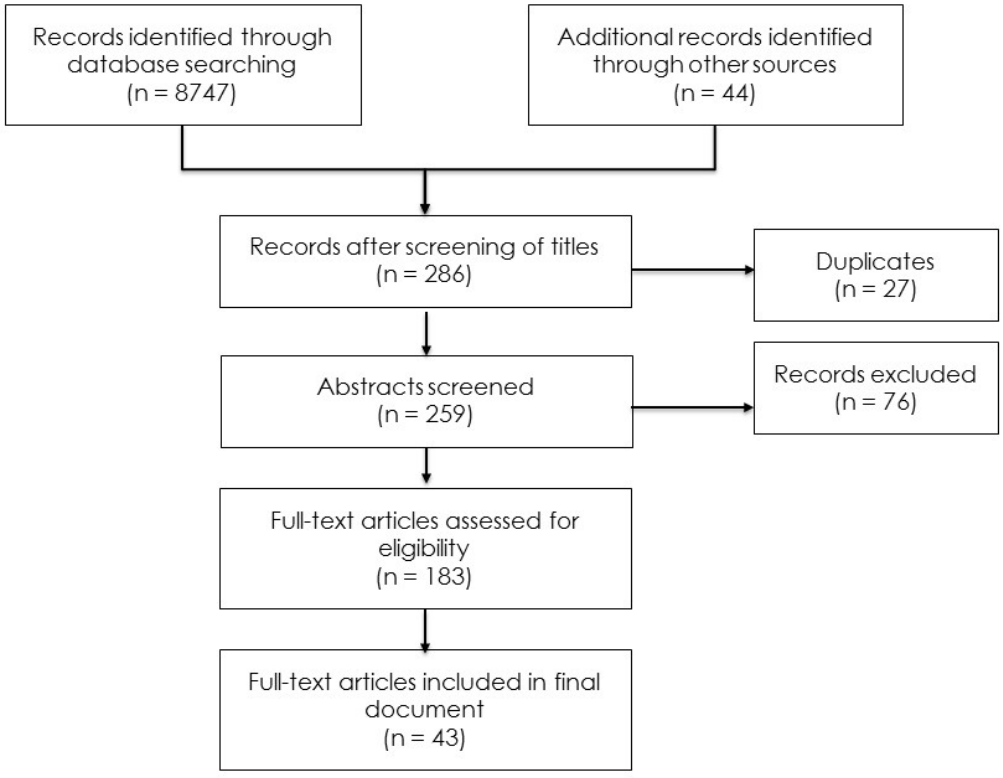
Data were extracted by the authors using a proforma. The study characteristics data included:

- 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 (eg 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 inpatient pain 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 (see GPAS Chapter Development Process Document). 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, ie '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 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 authors or GPAS Editorial Board. 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 Clinical Quality and Research Board (CQRB) along with the College's Lay 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 3 December 2018 – 4 January 2019. 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 solely funded by the Royal College of Anaesthetists. However, only the GPAS technical team and the GPAS researcher are paid by the College for their work on GPAS. All funding decisions by the College are made by the CEO, 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. 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, clinical directors and 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 College's Lay 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 2020.

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 2024.

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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