Royal College of Anaesthetists

Chapter 15

Guidelines for the Provision of Anaesthesia Services (GPAS)

Guidelines for the Provision of Anaesthesia Services for Vascular Procedures

Consultation draft - November 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, 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.

GPAS guidelines in context

The GPAS documents should be viewed as 'living documents'. The development, implementation and review of the GPAS guidelines 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 *GPAS 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 *GPAS 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 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 by 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 arrangements. 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, staff grade, associate specialist and specialty (SAS) anaesthetists, anaesthetists in training, operating department practitioners and nurses.

Target population

All ages of patients undergoing vascular procedures.

Healthcare setting

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

Clinical management

Key components needed to ensure provision of high quality anaesthetic 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.

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 (defined below) 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 an autonomously practicing vascular anaesthetist, who has overall responsibility for the patient's care. Under certain circumstances, this could be an SAS doctor who is practising regularly in this subspecialist area under the provisions of the RCoA's guidance on the supervision of SAS doctors.[1]

1.3 It is recognised that staff involved 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 daytime theatre lists by appropriately trained staff.[2] There is evidence that the outcome after lower limb amputation is better when surgery is undertaken within normal working hours. [3,,4 ,5]

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

1.6 Departments should consider allocating two appropriately trained anaesthetists to work together to provide direct clinical care to patients undergoing complex major vascular procedures. Examples might include the exploration of infected aortic stent grafts or open thoraco-abdominal aneurysm repair.

1.7 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.[6]

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

1.9 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.

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

1.11 The combination of IPSs (Independent Pain Services) with other teams, such as critical care outreach may reduce adverse events and improve analgesia in complex vascular cases, albeit at the expense of an increased workload.[7]

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.[8,9] 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.[10,11,12]

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 regulate body temperature.[13,14]

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.[15,16]

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 24/7.

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. [17]

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 adequate levels of trained recovery room staff.[18]

2.14 Endovascular procedures involve significant potential exposure of the patient and staff to ionising radiation. Recommendations for facilities and training outlined in chapter 7 should be followed.[19] Suitable lead aprons and lead barriers, and eyewear 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 [20,,21,22]

The specific aims of preoperative vascular assessment are:

- to perform a risk assessment
- to facilitate shared decision making with the patient, including any discussions relating to post-operative outcomes, expectations and planning
- to allow aedequate time for referral and optimisation of coexisting medical conditions
- to permit consideration and institution of prevention measures, including:
  - Evaluation and interventions to support modification of risk factors (cessation of smoking, moderation of alcohol intake, weight management, nutrition and regular activity/exercise)
  - ensuring availability of access to appropriate support services (pharmacy and dietetics)
- to enable clinical decision making with the wider vascular team, including:
  - planning and preparation

- reviewing the risks and benefits of surgery
- establishing the best surgical options for an individual
- allowing for the timing of surgery and required facilities to be planned

General recommendations for preoperative assessment are described in chapter 2.[23]

3.1 Risk stratification based on clinical history may help guide management.[24] However, determination of a patient's functional capacity may be difficult if exercise tolerance is limited by peripheral vascular insufficiency, respiratory or other disease. [23,25] Clinical guidelines should be developed for further investigation, referral, optimisation, and management according to local facilities and expertise. [26]

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 options for patients.[27]

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 and cost effective impact in terms of shared decision-making and clinical outcomes for those patients who undergo vascular surgery[28,29]. This is a growing area of clinical practice, which is directly benefiting the vascular surgical population. Consideration should be given to involving the POPS (Proactive Care of Older People) team early within the process.

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.[30]

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.[31]

4.4 Some anaesthetists may have responsibility for management of major vascular surgical cases on an occasional or out-of-hours basis. Departments 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 Training in Vascular Aanaesthesia forms part of the optional Specialist Interest Areas. In Specialist Vascular units a local training module should be considered for anaesthetists in training according to their grade, supervised by a nominated educational lead. This programme should develop understanding of the widespread nature of cardiovascular disease, optimisation and risk stratification, as well as perioperative management. The RCoA revised training curriculum 2021 provides explicit detail of the requirements for a Specialist Interest Area in Vascular Anaesthesia.[32]

4.6 Where cardiopulmonary exercise testing is used it is recommended that appropriate training, accreditation and infrastructure is in place to facilitate this.[33,34]

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.[20]

5.2 Where organisational infrastructure is lacking to safely undertake major or complex vascular cases, e.g. where no critical care bed or vascular anaesthetist is available, clinical staff should not be pressured 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 attendance at multidisciplinary team meetings and preoperative assessment clinics.

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

5.6 The following guidelines should be held and be easily accessible:

- management of lumbar drains
- postoperative management of blood pressure following a carotid endarterectomy (CEA)
- emergency ruptured AAA.[35, 26]

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; they are rather 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.[36] Regular audit or evaluation of the following aspects of vascular patient care may include:

- survival of 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 of 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 It is recommended that individual vascular anaesthetists register with, and contribute to, the UK national audit database (National Vascular Registry),[36] 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 initiatives 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, provides a set of standards based on the recommendations contained in the GPAS chapters. As part of the scheme, departments of anaesthesia self-assess against the standards and undertake quality improvement projects to close the gap. Support is provided by the RCoA in the form of the good practice library, which shares documents and ideas from other departments on how to meet the standards. Further advice can be obtained from the ACSA team and department's assigned College guide.

The ACSA standards are regularly reviewed on at least a three yearly basis to ensure that they reflect current GPAS recommendations and good practice. This feedback process works both ways and the ACSA scheme regularly provides CDGs with comments on the GPAS recommendations, based on departments' experience of implementing the recommendations.

Further information about the ACSA scheme can be found here: www.rcoa.ac.uk/safety-standards-quality/anaesthesia-clinical-services-accreditation

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 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.[37]

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. The RCoAs BRAN process (benefits, risk, alternatives, doing nothing) may be followed to guide the discussion.

Areas for future development

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

- 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 practising 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 expertise 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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