

## Chapter 15

# Guidelines for the Provision of Anaesthesia Services (GPAS)

## Guidance on the Provision of Vascular Anaesthesia Services 2016

### Authors

Dr J P Thompson, Leicester Royal Infirmary

Professor G R Danjoux, James Cook University Hospital,  
Middlesbrough

Dr A Pichel, Manchester Royal Infirmary

In association with the **Vascular Anaesthesia Society of Great Britain and Ireland (VASGBI)**

When considering the provision of anaesthesia, the Royal College of Anaesthetists recommends that the following areas should be addressed. The goal is to ensure a comprehensive, quality service dedicated to the care of patients and to the education and professional development of staff. The provision of adequate funding to provide the services described should be considered. These recommendations form the basis of the standard expected for departmental accreditation.

## Summary

- Vascular surgical services are recognised as having a high priority in the UK and outcomes are being monitored. National quality improvement programmes have been introduced, with the explicit remit of improving mortality from aortic aneurysm repair,<sup>1</sup> and lower limb amputation.<sup>2</sup>
- Anaesthesia for all patients undergoing major vascular surgery should be provided by a consultant experienced in vascular anaesthesia.
- Anaesthetists undertaking major vascular surgical cases should be supported by adequately trained assistants,<sup>3</sup> who work regularly in the vascular theatres.
- Vascular anaesthetists should have some managerial responsibility and should be involved in planning decisions that affect the delivery of vascular services.
- Adequate level 2 and level 3 critical care facilities must be available on site for all patients undergoing major vascular surgery.<sup>1,4,5</sup>
- Anaesthetists should be fully involved in decision-making for patients undergoing major vascular surgery. This includes access to facilities for adequate pre-operative assessment. Ideally, this should be within the setting of a formal pre-operative assessment clinic, which should be adequately staffed and supported and have allocated sessional programmed activities.<sup>4</sup>
- Provision should be made for those who may cover vascular emergencies, but do not have regular sessions in vascular anaesthesia, to spend time in a supernumerary capacity with a consultant anaesthetist who has a regular vascular commitment.
- Units undertaking major vascular anaesthesia should nominate a named lead clinician to assist dialogue and relationships with vascular surgeons, radiologists and other appropriate specialists. Departments should facilitate joint audit and management meetings between these parties.
- Multidisciplinary team decision-making should be undertaken, to allow planned, appropriate management of all high-risk cases. Where regional or national guidance exists, this should be followed.<sup>1,2</sup>
- Patients undergoing major vascular surgery should have access to a multidisciplinary, acute pain management service.<sup>6,7,8</sup>
- Facilities should be available to conserve blood (for example, cell salvage or acute normovolaemic haemodilution)<sup>9</sup> and be supported by the facilities to manage major haemorrhage.<sup>10</sup>
- Local guidelines should ensure the appropriate administration of blood and coagulation products immediately if required.<sup>11,12,13,14,15</sup>

## Introduction: the importance of vascular anaesthesia services

- Vascular anaesthesia encompasses a number of operations ranging from short day case procedures (such as varicose vein surgery) to prolonged complex major arterial surgery. The majority of patients requiring major arterial surgery are elderly, with a high incidence of cardiovascular and respiratory disease.<sup>16,17,18,19</sup>
- Because of these factors, pre-operative evaluation of patients presenting for vascular surgery presents many challenges.
- The vascular anaesthetist has particular expertise in pre-operative risk assessment, and formal anaesthetic assessment should be part of the decision-making process for patients contemplating high-risk major vascular surgery.
- There is evidence that outcome after major arterial surgery is related to the caseload of both surgeons and anaesthetists. It has been suggested that individual anaesthetists should not be caring for very small numbers of patients undergoing major elective and emergency aortic or carotid surgery. Anaesthetic departments should review the allocation of vascular cases, in order to ensure optimal concentration of experience and expertise.<sup>4</sup>
- Major vascular surgery includes a significant urgent and emergency workload. The ability to provide emergency cover means that facilities and expertise should be available 24 hours per day. Staffing and resources should also be planned and funded to allow for unpredictable changes in service requirements for urgent vascular procedures.
- Aortic surgery carries high risks of morbidity and mortality,<sup>18,19</sup> which are greater after emergency than elective procedures.<sup>2</sup> Patients undergoing open aortic surgery require post-operative level 2 or level 3 critical care, and these facilities must be available before elective surgery is contemplated.
- If elective aortic aneurysm surgery is cancelled because of a lack of critical care resources or ward beds, the patient may be exposed to risk of aneurysm rupture.<sup>20,21</sup> It has been recommended that surgery should be undertaken within eight weeks of the decision to operate.<sup>14</sup>
- 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 complex aortic pathology (e.g. juxta-renal, supra-renal and thoraco-abdominal aortic aneurysms). Vascular anaesthetists should be cognisant of the available options for such patients and be involved in the decision-making for their treatment.
- Following published evidence that the outcome from abdominal aortic aneurysm (AAA) surgery was significantly worse in the UK than comparable countries, a national Abdominal Aortic Aneurysm Quality Improvement Programme (AAAQIP) was introduced to encourage standards of best practice and reduce national mortality.<sup>1</sup> The most recently published report has confirmed that standardisation of care through the AAAQIP has resulted in mortality outcomes superior to those initially targeted by 2013 (2.4% versus 3.5% respectively).<sup>22</sup>
- Delay in performing carotid endarterectomy also increases the risk of death or disabling stroke, particularly in symptomatic patients. Current evidence suggests surgery should be performed within two weeks of initial symptoms.<sup>23</sup>
- Access to diagnostic radiological services may be accorded a lower priority than access for patients with suspected cancer.<sup>4</sup> Treatment delays for major vascular surgery may lead to death or permanent disability; therefore, patients with vascular disease should be accorded a similar priority to other groups of patients.
- Thoracic or thoraco-abdominal aortic surgery may involve collaboration with cardiac surgeons or the use of extracorporeal circulation. These uncommon or especially high-risk procedures should only be performed in specialist centres with the experience, skills and facilities to manage them successfully.
- Increasing numbers of vascular procedures are undertaken by radiologists.<sup>24,25</sup> However, the risks of anaesthesia in such frail patients remain and may be compounded by an unfamiliar or remote environment.
- Lower limb amputation is required in a significant proportion of patients who undergo peripheral vascular reconstruction for acute or chronic limb ischaemia. Mortality and morbidity are very high after major amputation.<sup>26</sup> To reduce the risks, it is recommended that major amputation surgery should be performed within routine working hours, with care provided by experienced clinicians.<sup>2</sup>

## Levels of provision of service

### 1 Staffing requirements

- 1.1 Vascular surgery is performed in many hospitals in the UK, ranging from district general to specialist units in large teaching hospitals. Recent evidence suggests that larger-volume units achieve better outcomes following AAA and other major arterial surgery. As a result, there is national pressure to concentrate vascular services in larger centres.<sup>5</sup> The Vascular Society recommends that centres undertaking AAA surgery should perform a minimum of 100 elective interventions (open and endovascular repair) in each three-year period.<sup>1</sup> Data entry to the National Vascular Registry is mandatory for both standard and complex aortic intervention. There are data fields directly relating to peri-operative anaesthetic care (i.e. pre-operative assessment, multidisciplinary team [MDT], anaesthesia techniques and analgesia). It is essential that the vascular anaesthetist ensures the accuracy of data submitted.
- 1.2 Vascular anaesthesia is increasingly recognised as a sub-specialty within its own right, and has its own specialist society.<sup>27</sup> The skills and knowledge required by all anaesthetists involved in the care of vascular surgical patients overlap with those in other areas of sub-specialisation. Risk assessment and optimisation of co-existent medical conditions in the high-risk patient prior to major surgery is an integral component of this skill set. In the peri-operative period, the vascular anaesthetist requires appropriate skill and knowledge with regard to invasive cardiovascular monitoring, cardioactive or vasoactive drugs, strategies for peri-operative organ protection (renal, myocardial and cerebral), the management of major haemorrhage and the maintenance of normothermia.
- 1.3 Additional skills required in specialist units include expertise in spinal cord protection, visceral perfusion and one-lung ventilation. In units designated as complex endovascular centres, additional programmed time should be provided to vascular anaesthetists delivering this service, to allow them to engage with the complex MDT, provide training to allied specialties and provide adequately staffed pre-operative assessment clinics. The pre-operative 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. It is inappropriate that these decisions are devolved to trainees, and vascular anaesthetists involved in regular pre-operative risk assessment require the appropriate time and facilities to undertake and support these activities (see 2.1).
- 1.4 The workload generated by urgent and elective vascular pre-operative assessment referrals should be acknowledged by appropriate recognition in terms of consultant programmed activities within a department, whether or not a formal clinic operates.
- 1.5 A vascular anaesthetist should be nominated as lead clinician for vascular anaesthesia. This role should include close collaboration with the wider vascular team and other specialists (for example, radiologists, cardiologists, renal and respiratory physicians), attendance at vascular multidisciplinary meetings,<sup>1</sup> promotion of local evidence-based guidelines and co-ordination of joint audit and research.
- 1.6 An anaesthetist who understands the implications for vascular anaesthesia should be a member of the hospital or trust transfusion committee.
- 1.7 Anaesthesia for major vascular surgery of moderate complexity can be performed by experienced trainees under the supervision of a consultant. However, trainees who are not directly supervised should not undertake major vascular cases in high-risk patients or where surgery or anaesthesia is complex. There should be a named consultant anaesthetist responsible for every vascular surgical case. A non-consultant non-trainee anaesthetist, e.g. Staff Grade, Associate Specialist and Specialty Doctors, could be the named anaesthetist on the anaesthetic record if local governance arrangements have agreed in advance that, based on the training and experience of the individual doctor and the range and scope of their clinical practice, the non-consultant non-trainee anaesthetist can take responsibility for patients themselves in those circumstances, without consultant supervision.<sup>28</sup> These considerations also apply to vascular patients who require major lower limb amputation after unsuccessful interventions at limb salvage or reperfusion.

- 1.8 When major arterial surgery is performed, the anaesthetist must be assisted by a fully trained anaesthetic assistant who has specific training and experience in vascular anaesthetic practice.
- 1.9 Additional trained theatre staff are required where cell salvage techniques are utilised.<sup>29</sup>
- 1.10 Adequate numbers of trained critical care staff must be available before undertaking major aortic surgery in patients who will require level 2 or 3 care.
- 1.11 For more minor procedures, patients may be initially managed after surgery in a recovery unit or post-anaesthesia care unit. Appropriate numbers of trained staff must be available to manage these patients on a one-to-one basis; staff should be trained in the use of invasive cardiovascular monitoring. Facilities to provide continued level 1 care should be available on a 24-hour basis.
- 1.12 Appropriate numbers of medical, nursing and other staff should be available to facilitate transfer of emergency patients to alternative or more specialised vascular units if required.
- 1.13 Where vascular surgical procedures are performed in the radiology department, requirements in terms of anaesthetic assistance and post-operative nursing are identical to those of patients undergoing vascular surgery in the operating theatre suite.

## 2 Equipment, support services and facilities

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

### Pre-operative assessment facilities

- 2.1 A vascular pre-operative assessment clinic provides the ideal environment for risk assessment, patient referral and optimisation in advance of surgery. Regular sessional time and programmed activities should be made available to adequately fulfil these requirements.
- 2.2 The clinic should be consultant led, with adequate nursing, secretarial support, and office space.
- 2.3 The clinic should be supported by immediate access to baseline investigations such as blood tests, electrocardiography (ECG) and chest radiology.
- 2.4 Funding should be made available for the purchase of simple clinical equipment, which may influence risk analysis during the clinic visit. This includes pulse oximetry, spirometry and blood gas analysis.
- 2.5 Appropriate time should be allocated to individual patients, for risk assessment and informed discussion of complex issues relating to patient care.
- 2.6 Clinicians involved in vascular pre-operative assessment should have ready access to senior colleagues in other specialties such as cardiology, respiratory medicine, nephrology or radiology, who can facilitate specialised or invasive investigations and provide specialist input for certain cases. These referrals should be prioritised so that undue delays to surgery are avoided. Locally drawn-up referral criteria will facilitate this process.
- 2.7 Where vascular services are centralised, many patients may live at distant locations. Transport facilities should be available for patient convenience.

### Equipment

- 2.8 Major vascular surgery often requires the use of large amounts of ancillary equipment that is usually not required by other surgical specialties. This includes radiological equipment, rapid blood transfusion devices, cell salvage devices, additional monitoring and infusion devices, and occasionally extra-corporeal circulation devices. Vascular theatres should be of adequate size to safely utilise this equipment, with additional storage capacity.
- 2.9 Sufficient space should be available where patients are anaesthetised, to perform invasive monitoring and regional anaesthesia techniques in a safe and sterile manner.
- 2.10 A portable ultrasound machine should be available to facilitate safe placement of invasive lines used for monitoring purposes.

- 2.11 If anaesthesia is induced in an anaesthetic room, then the monitoring should be of similar specification and condition to that used in the operating theatre.
- 2.12 All theatres where aortic surgery is performed should have the capability to perform cell salvage and/or normovolaemic haemodilution.<sup>9</sup> Essential equipment includes a rapid fluid-infusion device, fluid- and patient-warming devices, and infusion pumps.
- 2.13 Facilities and equipment to perform one-lung ventilation must be available when thoracoscopic or thoraco-abdominal procedures are performed.
- 2.14 Equipment must be available nearby for rapid blood gas analysis, tests of coagulation and the measurement of haematocrit and blood glucose. The provision of near-patient biochemistry testing is highly desirable.<sup>12</sup>

#### Dedicated endovascular aortic repair (EVAR) facilities

- 2.15 There is an increasing trend for endovascular aortic surgery to be performed in the radiology suite, because high-quality imaging equipment is static and located there. It is essential that where EVAR procedures are performed, such facilities should be of theatre specification, to facilitate safe provision of anaesthesia, surgical cut-down and conversion to open repair, should the need arise.
- 2.16 The Medical Devices and Healthcare Regulatory Agency has recommended that the standards of anaesthesia facilities, equipment, near-patient testing and assistance should be equivalent to those for conventional operating theatres, including post-operative recovery.<sup>30</sup>
- 2.17 These facilities should ideally be sited within or directly adjacent to the existing theatre complex.
- 2.18 However, it is recommended that all complex endovascular procedures should ideally be carried out in a dedicated hybrid endovascular operating theatre.

#### Support services

- 2.19 On-site pharmacy services are required for the provision of necessary routine and emergency drugs, including sterile pre-mixed drug solutions for regional analgesia and patient-controlled analgesia.
- 2.20 Acute pain-management services should be available for all patients undergoing major vascular surgery, with facilities for both post-operative patient-controlled analgesia and epidural analgesia services in the ward setting. Sufficient equipment and support must be available for all patients requiring such post-operative pain relief at all times.
- 2.21 Recovery from major vascular surgery may be prolonged, and units must be supported by suitable rehabilitation services, including physiotherapy, occupational therapy and prosthetics services.
- 2.22 Physiotherapy services should be available 24 hours a day.
- 2.23 As with all anaesthesia services, medical engineering technicians are required to maintain, repair and calibrate anaesthetic machines, monitoring, measurement and infusion equipment.
- 2.24 Haematology and biochemistry services must be available to provide rapid analysis of blood and other body fluids and to make blood and blood products for transfusion available without delay, according to clinical need.
- 2.25 Facilities should be available for the rapid and appropriate provision of blood and blood products for all major vascular cases. Hospitals should ensure that personnel directly involved in the distribution and administration of blood and blood components are qualified and are provided with timely, relevant and updated training.<sup>10,31</sup>
- 2.26 Protocols and guidelines should be drawn up locally for the management of major haemorrhage, so that necessary blood products and drugs are available without delay.<sup>11,13,14,15</sup> This should be facilitated through the trust or hospital transfusion committee.

## 3 Areas of special requirement

### Pre-operative assessment

- 3.1 The pre-operative evaluation of patients presenting for vascular surgery presents particular challenges because of the incidence of co-existing disease, in particular cardiorespiratory disease, diabetes and renal disease, and an assessment of the benefit and risk to an individual with or without a surgical intervention is essential.<sup>19</sup> All patients undergoing elective major vascular surgery should be seen well in advance of planned surgery, to enable appropriate risk analysis.
- 3.2 Determination of a patient's functional capacity is important to aid risk assessment,<sup>19,32</sup> but this may be difficult if exercise tolerance is limited by peripheral vascular insufficiency, respiratory or other disease. Risk stratification based on clinical history may help guide management.<sup>33</sup> Guidelines should be drawn up based on the best available evidence for further investigation, referral, optimisation and management.
- 3.3 Where facilities are available, pre-operative cardiopulmonary exercise testing should be used to help establish functional capacity and aid risk stratification. An increasing evidence base is now available to support its use in both the vascular<sup>34,35,36,37</sup> and non-vascular setting, where available.<sup>38</sup>
- 3.4 The aims of pre-operative vascular assessment should be to assist risk assessment and the decision to perform surgery, to establish the best surgical options for an individual (for example deciding between open and endovascular surgery), to allow optimisation of co-existing medical conditions, to permit consideration and institution of secondary prevention measures, and to allow timing of surgery and required facilities to be planned. In order to fully achieve these aims, a properly resourced multidisciplinary pre-operative assessment clinic is required.
- 3.5 Clinicians involved in vascular pre-operative assessment should have ready access to other specialists and tools for non-invasive risk assessment. Local expertise and facilities vary, and the precise type of assessment tool used is probably less important than the local expertise.<sup>39,40</sup>
- 3.6 Short- and long-term outcome in vascular patients can be improved by certain lifestyle changes (cessation of smoking, weight reduction, regular exercise) and pharmaceutical therapies.<sup>41,42,43</sup> The pre-operative assessment clinic should be used as an opportunity to implement these, and should therefore be operated by senior clinicians able to assess the need for such interventions, with access to appropriate support services (pharmacy, dietetics, smoking-cessation services).

### Peri-operative monitoring

- 3.7 Patients undergoing major vascular surgery may suffer major blood loss or fluid shift. Usually, peri-operative invasive cardiovascular monitoring is indicated, and appropriate facilities, equipment and expertise should be available in all cases. Cardiovascular instability and myocardial ischaemia are common during major vascular procedures and are associated with a worse outcome.<sup>44,45</sup> Specific 5-lead ST segment ECG monitoring and non-invasive cardiac output monitoring should be available routinely,<sup>19,38</sup> and other monitoring modalities (transoesophageal echocardiography) may be required for certain cases. Transoesophageal echocardiography may be useful in the identification of thoracic aortic pathology, successful deployment of thoracic stent grafts, and detection of early complications.
- 3.8 Surgery may be prolonged and lead to heat loss. Peri-operative hypothermia has a number of adverse physiological effects and is associated with worse outcome in the short and long term.<sup>46</sup> Hypothermia is usually preventable by manipulation of the ambient temperature, in conjunction with the use of appropriate patient- and fluid-warming devices.
- 3.9 The considerations regarding monitoring, expertise, trained assistance and hypothermia are important whatever the location of the vascular intervention. This is particularly relevant when procedures are performed in a radiology suite, as the environment may be unfamiliar. It is important that all facilities required for peri-procedural care are of the same standard as the operating theatre environment. This includes recovery facilities and post-operative care.

**Post-operative facilities**

- 3.10 Units should possess adequate critical care facilities to provide appropriate level 2 or level 3 care. It should be ensured that the identified level of care is available in advance of commencing individual major vascular cases.
- 3.11 Some patients undergoing vascular surgery, such as aortic surgery or procedures associated with the use of radiological contrast media or large blood loss, are at increased risk of peri-operative acute kidney injury.<sup>47</sup> Post-operative renal failure is associated with a poor prognosis. Facilities to provide renal-replacement therapy on site are highly desirable. Where this is not possible, staffing, relationships and guidelines should be in place to facilitate transfer to a unit where renal support can be provided.
- 3.12 Units performing major vascular surgery should incorporate a fully staffed and functional acute pain-management team, with the facility to provide post-operative epidural analgesia services in the ward setting.
- 3.13 Post-operative pain services must be continuously audited and evaluated.
- 3.14 Recovery from major vascular surgery may be prolonged, and units must be supported by suitable rehabilitation services, including physiotherapy, occupational therapy and prosthetics services.

**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, consultant 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 Much of the knowledge, skills and attitudes required to successfully manage high-risk patients undergoing major vascular surgery are not specific to the sub-specialty. However, it is recognised that the outcome following major vascular surgery may be better if provided by those with a specialist interest.<sup>4</sup> While all senior anaesthetists should have appropriate experience of relevant areas, such as in the management of major haemorrhage, or use of invasive monitoring and vasoactive drugs, this may not reflect their current practice. Some such individuals do not have a regular vascular anaesthesia commitment, but may be expected to provide emergency cover, particularly out of hours. Funded arrangements must be in place to enable all consultants and career grade staff providing occasional vascular anaesthesia cover to participate in appropriate CPD, including occasional accompanied sessions with vascular anaesthesia colleagues. Notwithstanding this, all anaesthetists must recognise and work within the limits of their professional competence.
- 4.4 An appropriate training programme should be in place for trainee anaesthetists, according to their grade. This programme should develop understanding of the widespread nature of cardiovascular disease, as well as peri-operative management. The RCoA revised training curriculum (2010) provides explicit detail of the requirements.<sup>48</sup>
- 4.5 All vascular anaesthetists should be able to undertake appropriate pre-operative clinical risk assessment based on a sound knowledge of the individual patient's pathophysiology, available clinical evidence, and local outcome data.
- 4.6 Those providing assistance for the anaesthetist should be trained to the standards recommended by the AAGBI.<sup>3</sup>



## 5 Research, audit and quality improvement

- 5.1 All departments undertaking major vascular surgical cases should organise regular interdisciplinary audit meetings with vascular surgeons and radiologists, in addition to departmental clinical governance meetings.<sup>1</sup>
- 5.2 Multidisciplinary team meetings provide the ideal forum for agreeing a planned team-based strategy for the management of high-risk cases, e.g. patients with abdominal aortic aneurysmal disease. Where regional or national guidance is available, e.g. AAAQIP, it is recommended that this is followed.<sup>1,2</sup>
- 5.3 In addition to auditing adverse events and patient outcome, departments should audit delays or cancellations in major elective vascular surgery.
- 5.4 Individual consultants are encouraged to contribute to the UK national audit database (National Vascular Registry), 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.
- 5.5 Departments should facilitate the collection of data required for anaesthetists undertaking major vascular cases to keep a personal logbook.

## 6 Organisation and administration

- 6.1 Secretarial and administrative support should be available to facilitate patient referrals for pre-operative assessment, within and outside the confines of a formal pre-operative assessment clinic.
- 6.2 Cancellation of patients requiring major elective vascular surgery can have serious physical, as well as psychological, consequences for the patient. Departments should provide elective vascular theatres with appropriately trained staff; senior vascular surgeons and anaesthetists should be available to provide a service that reliably covers the needs for planned surgery throughout the year. Funding and provisions should be made to honour these commitments, with adequately trained individuals to cover for sickness, annual and professional or other leave.
- 6.3 Patients requiring major vascular surgery frequently require level 2 or level 3 care post-operatively. The funding and provision of critical care beds must be planned to meet the demands of the service and avoid unnecessary cancellations. Appropriate planning can also improve the use of theatre resources. Patients may present with conditions requiring urgent surgery, which is often best performed on the next available daytime list. Departments should ensure that theatre time is identified and that senior anaesthetists are available to facilitate the above recommendations.
- 6.4 Daytime vascular urgent or emergency lists should be organised and staffed by senior anaesthetists and surgeons working to a fixed sessional pattern and who have no conflicting clinical commitments. There is evidence that the outcome after lower limb amputation surgery is better when surgery is undertaken within normal working hours.<sup>2</sup>
- 6.5 Individuals should not be pressurised into undertaking major vascular cases if any of these resources or expertise are not available.
- 6.6 When very long surgical procedures are scheduled on a regular basis, it will be necessary to arrange the funding and resources to support long-duration lists.

## 7 Patient information

- 7.1 Patients undergoing major vascular surgery are at significant risk of major complications, including death.<sup>19</sup> All patients should be able to come to an informed decision about the relative risks and possible benefits of any planned surgical intervention. It is recommended that a specialist in vascular anaesthesia be involved both in assessing an individual patient's general medical condition and fitness for surgery, and in the decision to perform surgery. This is particularly important in the highest-risk cases, and if surgery is declined by any of the parties involved.
- 7.2 All major complications should be explained to the patient, in an appropriate setting and in a language they can understand. Explanations should include the consequences of these complications (e.g. renal failure requiring dialysis, stroke causing disability).
- 7.3 Options for post-operative pain relief and their risks should be discussed with the patient by the anaesthetist.
- 7.4 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.
- 7.5 Departments should be able to provide written information leaflets explaining the planned procedure and the possible risks.
- 7.6 The above evaluations and discussions are ideally held in the context of a pre-operative assessment clinic, and the facilities to support this should be provided.

## References

- 1 National abdominal aortic aneurysm quality improvement programme: interim report. VSGBI, London 2011 (<http://bit.ly/1un2xpK>).
- 2 Quality improvement framework for amputation guidance. VSGBI, London 2012 (<http://bit.ly/1RVObyD>).
- 3 The anaesthesia team 3. AAGBI, London 2010 (<http://bit.ly/1mo43nw>).
- 4 Abdominal aortic aneurysm: a service in need of surgery? NCEPOD, London 2005 (<http://bit.ly/1RVOhiR>).
- 5 Provision of services for patients with vascular disease. VSGBI, London 2012 (<http://bit.ly/1RVOq5Z>).
- 6 Pain management services: good practice. Royal College of Anaesthetists and The Pain Society. *FPM*, London 2003 (archived – copy available on request from The Faculty of Pain Medicine).
- 7 Report of the working party on pain after surgery. Royal College of Surgeons of England and the Royal College of Anaesthetists. RCoA, London 1990 ([www.rcoa.ac.uk/node/2218](http://www.rcoa.ac.uk/node/2218)).
- 8 Practice guidelines for acute pain management in the perioperative setting: a report by the American Society of Anesthesiologists task force on pain management. Acute pain section. *Anesthesiol* 2004;**100**:1573–1581.
- 9 Torella F et al. Acute normovolemic hemodilution and intra-operative cell salvage in aortic surgery. *J Vasc Surg* 2002;**36**:31–34.
- 10 Better blood transfusion. Safe and appropriate use of blood (HSC 2007/001). DH, London 2007 (<http://bit.ly/1IDHrdj>).
- 11 Hardy JF, de Moerloose P, Samama CM. Massive transfusion and coagulopathy: pathophysiology and implications for clinical management. *Can J Anesth* 2006;**53**:S40–S58.
- 12 British committee for standards in haematology, blood transfusion task force. Guidelines for the use of fresh-frozen plasma, cryoprecipitate and cryosupernatant. *Br J Haematol* 2004;**126**:11–28.
- 13 Mallett SV et al. Reducing red blood cell transfusion in elective surgical patients: the role of audit and practice guidelines. *Anaesth* 2000;**55**:1013–1019.
- 14 Erber WN, Perry DJ. Plasma and plasma products in the treatment of massive haemorrhage. *Best Prac Res Clin Haematol* 2006;**19**:97–112.
- 15 Stainsby D, MacLennan S, Hamilton PJ. Management of massive blood loss: a template guideline. *Br J Anaesth* 2000;**85**:487–491.
- 16 Hertzner NR et al. Coronary artery disease in peripheral vascular patients: a classification of 1000 coronary angiograms and results of surgical management. *Annals of Surgery* 1984;**199**:223–233.
- 17 Hertzner NR et al. Late results of coronary bypass in patients with peripheral vascular disease, II: five-year survival according to sex, hypertension and diabetes. *Cleveland Clin J Med* 1987;**54**:15–23.
- 18 Mangano DT. Perioperative cardiac morbidity. *Anesthesiol* 1990;**72**:153–184.
- 19 Fleisher LA et al. ACCF/AHA focused on perioperative beta blockade incorporated into the ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for non-cardiac surgery. *J Am Coll Cardiol* 2009;**54**:13–118.
- 20 UK small aneurysm trial participants. Risk factors for aneurysm rupture in patients kept under ultrasound surveillance. *Annals of Surgery* 1999;**230**:289–297.
- 21 Bown MJ et al. A meta-analysis of 50 years of ruptured abdominal aortic aneurysm repair. *Br J Surg* 2002;**89**:714–730.
- 22 Outcomes after elective repair of infra-renal abdominal aortic aneurysm. VSGBI, London 2012 (<http://bit.ly/1ITfkX>).

- 23 Stroke and transient ischaemic attack in over 16s: diagnosis and initial management (CG68). *NICE*, London 2008 (<http://bit.ly/1jV5435>).
- 24 EVAR trial participants. Endovascular aneurysm repair versus open repair in patients with abdominal aortic aneurysm (EVAR trial 1): randomised controlled trial. *Lancet* 2005;**365**:2179–2186.
- 25 Cronenwett JL. Endovascular aneurysm repair: important mid-term results. *Lancet* 2005;**365**:2156–2158.
- 26 Ploeg AJ et al. Contemporary series of morbidity and mortality after lower limb amputation. *Euro J Vasc Endovasc Surg* 2005;**29**:633–637.
- 27 The Vascular Anaesthesia Society of Great Britain and Ireland, London ([www.vasgbi.com](http://www.vasgbi.com)).
- 28 Supervision of SAS and other non-consultant anaesthetists in NHS hospitals. RCoA, London 2015 ([www.rcoa.ac.uk/node/19676](http://www.rcoa.ac.uk/node/19676)).
- 29 Blood transfusion and the anaesthetist: intra-operative cell salvage. AAGBI Safety Guideline. AAGBI, London 2009 (<http://bit.ly/1nGj4HM>).
- 30 Delivering an endovascular aneurysm repair (EVAR) service. Joint working group to produce guidance on delivering an endovascular aneurysm repair (EVAR) service. MHRA, London 2010 (<http://bit.ly/1Qv9LSP>).
- 31 The Blood Safety and Quality Regulations 2005. *The National Archives*, London (<http://bit.ly/Usb0aG>).
- 32 Chassot P-G, Delabys A, Spahn DR. Preoperative evaluation of patients with, or at risk of, coronary artery disease undergoing noncardiac surgery. *Br J Anaesth* 2002;**89**:747–759.
- 33 AHA/ACC Guideline on Perioperative Cardiac Evaluation and Management of Patients Undergoing Non-Cardiac Surgery. A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2014;**64**(22):e77–e137.
- 34 Hartley RA et al. Preoperative cardiopulmonary exercise testing and risk of early mortality following abdominal aortic aneurysm repair. *Br J Surg* 2012;**99**(11):1539–1546.
- 35 Prentis JM et al. Submaximal exercise testing predicts perioperative hospitalization after aortic aneurysm repair. *J Vasc Surg* 2012;**56**(6):1564–1570.
- 36 Grant SW et al. Cardiopulmonary exercise testing and survival after elective abdominal aortic aneurysm repair. *Br J Anaesth* 2015;**114**(3):430–436.
- 37 Hollingsworth A, Danjoux G, Howell SJ. Cardiopulmonary exercise testing before abdominal aortic aneurysm surgery: a validated risk prediction tool? (Editorial). *Br J Anaesth* 2015;**115**(4):494–497.
- 38 Hennis PJ, Meale PM, Grocott MPW. Cardiopulmonary exercise testing for the evaluation of perioperative risk in non- cardiopulmonary surgery. *Postgrad Med J* 2011;**87**:550–557.
- 39 Mantha S et al. Relative effectiveness of four preoperative tests for predicting adverse cardiac outcomes after vascular surgery: a meta-analysis. *Anesth Analg* 1994;**79**:422–433.
- 40 Fleisher LA. Perioperative management of the cardiac patient undergoing noncardiac surgery. In Barash PG (ed). *Cardiol Clin* 1995;**13**(2):149–161.
- 41 Sucko et al. Statin therapy after infrainguinal bypass surgery for critical limb ischaemia is associated with improved five-year survival. *J Vasc Surg* 2015;**61**(1):126–133.
- 42 De Martino et al. Perioperative management with antiplatelet and statin medication is associated with reduced mortality following vascular surgery. *J Vasc Surg* 2014;**59**(6):1615–1621.
- 43 Gray C et al. Statins promote residual aneurysm sac regression following endovascular aortic aneurysm repair. *Vasc Endovasc Surg* 2014;**48**(2):111–115.
- 44 McCann RL. Silent myocardial ischemia in patients undergoing peripheral vascular surgery. *J Vasc Surg* 1989;**9**:583–587.
- 45 Landsberg G et al. Importance of long-duration postoperative ST-segment depression in cardiac morbidity after vascular surgery. *Lancet* 1993;**341**:715–719.
- 46 Hypothermia: prevention and management in adults having surgery (CG65). *NICE*, London 2008 (<http://bit.ly/1jV7NjK>).
- 47 Sear JW. Kidney dysfunction in the postoperative period. *Br J Anaesth* 2005;**95**:20–32.
- 48 Curriculum for CCT in Anaesthetics. RCoA, London 2010 ([www.rcoa.ac.uk/node/230](http://www.rcoa.ac.uk/node/230)).



Royal College of Anaesthetists

Churchill House, 35 Red Lion Square, London WC1R 4SG  
020 7092 1500 | [www.rcoa.ac.uk/gpas2016](http://www.rcoa.ac.uk/gpas2016) | [gpas@rcoa.ac.uk](mailto:gpas@rcoa.ac.uk)

© The Royal College of Anaesthetists (RCoA)