

Chapter 14

Guidelines for the Provision of Anaesthesia Services (GPAS)

Guidance on the Provision of Services for Neuroanaesthesia and Neurocritical Care 2016

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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

- Neuroanaesthesia should only take place in a designated neuroscience centre.
- There should be sufficient numbers of clinical programmed activities in consultants' job plans to provide cover for all elective neurosurgical operating lists and interventional neuroradiology sessions, and also to provide adequate emergency cover.¹
- Staffing levels in the operating theatre should be sufficient to allow neuroanaesthetists to work in teams during long and complex operations.²
- There should be a designated consultant lead for critical care/neurocritical care and sufficient consultant sessions to provide daytime and out-of-hours cover.³
- There should be sufficient numbers of critical care beds for neurosurgery to allow timely access for patients from within an agreed geographical area. Management of critically ill patients outside the critical care unit should take place only in exceptional circumstances.³
- Protocols should be in place for management of ventilated patients from other units who, although not requiring full admission, require neuroanaesthetic or critical care input (e.g. for MRI scans and other specialist tests) whilst in the specialist centre.
- The care of patients with head injuries is an integral part of neuroanaesthesia and neurocritical care. Units accepting head-injured patients must have specific arrangements in place, including evidence-based protocols, appropriately trained staff and sufficient resource to allow timely access for those requiring life-saving surgery.^{3,4,5,6}
- Protocols, appropriate facilities and audit processes should be in place for transfer of critically ill neuroscience patients between hospitals, and within neuroscience units.^{7,8}
- Specific consideration should be given to the provision of anaesthetic services for paediatric imaging and neurosurgery, although life-saving emergency procedures may need to be performed in an adult unit prior to transfer.^{9,10}
- The provision in neurocritical care of specialist nurses for advice on organ donation ensures donation is considered in all end-of-life decisions, as well as providing bereavement counselling and support.¹¹

Introduction: the importance of neuroanaesthesia and neurocritical care services

- Anaesthesia for neurosurgery (neuroanaesthesia) is based in recognised neuroscience centres, which allow grouping together of the interrelated specialties required to support neurosurgery. These centres, whether they are in specialist, teaching or district general hospitals, should provide neurosurgical, neurological, neuroradiological and neurocritical care and other supporting specialist and general services necessary for the management of patients with neurological disease.
- The provision of adequate numbers of neurocritical care beds is a prerequisite for the delivery of such specialist services.³
- The centralisation of neuroscience practice is essential to ensure critical mass for delivery of efficient and high-quality clinical care. The pace of development, and the scope of procedures being undertaken in neurosurgery and interventional neuroradiology, continues to increase the specialist nature of neuroanaesthesia and neurocritical care.
- The clinical service should provide:
 - anaesthesia for neurosurgery – intracranial, complex spinal and associated surgery
 - anaesthesia for neuroradiology – diagnostic and interventional procedures including MRI.
- In units where there is a co-located neurocritical care unit, the department may also be responsible for providing clinical service cover to:
 - neurocritical care – pre- and post-operative management of complex elective cases and the management of critically ill patients, such as those with severe head injury, intracranial haemorrhage or severe neurological disease and those who develop systemic complications secondary to their neurological condition.

Levels of provision of service

1 Staffing requirements

Neuroanaesthesia

- 1.1 The organisation of cover for neuroanaesthesia and, where appropriate, neurocritical care, requires a specific group of consultant anaesthetists (neuroanaesthetists/intensivists) who may be part of, or closely affiliated with, a general department of anaesthesia and intensive care. A neuroanaesthesia service requires adequate provision of consultant programmed activities to support elective and emergency workload.¹
- 1.2 There should be immediate availability of a resident anaesthetist for 24 hours each day, to manage post-operative and emergency patients. In neuroscience units with a substantial caseload, this will require the provision of a resident anaesthetist dedicated to this group of patients. Out of hours, consultants should be available for immediate telephone advice and be able to attend the hospital within 30 minutes.
- 1.3 There should be sufficient programmed activities to ensure consultant cover of all neurosurgical operating lists and interventional neuroradiology sessions. Initiatives such as 'managing the flow' and the advent of thrombectomy may require additional planning to ensure timely emergency cover.¹²¹³ Adequate arrangements for cross-covering annual and study leave should be incorporated into consultants' job plans. Adequate consultant cover is also required to provide general anaesthesia and sedation for diagnostic radiology sessions, including computed tomography (CT) and magnetic resonance imaging (MRI) scans.
- 1.4 Consultants working in neuroanaesthesia should have sufficient regular programmed activities within this field to ensure that their specific skills and experience are maintained. A minimum of two or more sessions per week is likely to be required to fulfil this requirement. Evidence of case mix and relevant continuing professional development to maintain skills in those areas will be required for appraisal and revalidation.
- 1.5 Allocation of a single neuroanaesthetist to an operating list with long neurosurgical cases is insufficient and a team of anaesthetists should service long and complex operations.² Comprehensive handover arrangements must be in place to ensure continuity of care during long cases.

Neurocritical care

- 1.6 The Royal College of Nursing suggests that the nurse:patient ratio for a patient requiring level 3 and level 2 care should be 1:1 and 1:2 respectively, but the actual nursing establishment to support neurocritical care services may be higher.⁵ It may not be possible to leave level 2 patients with neurological disorders alone, even when they are physiologically normal, and an allowance to cover the need for closer supervision of such patients should be made when calculating the nursing establishment.
- 1.7 Allied health professionals are key members of the multiprofessional team and a sufficient establishment is crucial to the delivery of high-quality neurocritical care services and early rehabilitation input.
- 1.8 Consultants responsible for the care of neuroscience patients requiring critical care support should have the training, knowledge, skills and experience needed to treat this group of patients, irrespective of whether the services are provided in a dedicated neurocritical care unit or within the context of a general intensive care unit. There should be a designated lead consultant for neurocritical care (or director of neurocritical care if a separate unit) and this consultant should have programmed activities allocated to this function.
- 1.9 Although the management of patients requiring neurocritical care is closely shared with the neurosurgical team, a minimum of ten daytime clinical consultant programmed activities is required to cover a small neurocritical care unit (four to eight beds). In larger units, it may be necessary for two consultants to be available during weekdays for all or part of the day.
- 1.10 However, the consultant establishment for neurocritical care should be reviewed locally so that it reflects local conditions, including the skill mix of other members of the multiprofessional team. It has been recommended that, in large and busy units, there may be a requirement for up to 30 consultant programmed activities per week.³
- 1.11 In large units, it may be appropriate to allocate consultant programmed activities to provide support to patients throughout the hospital via an outreach service.
- 1.12 There should be a resident doctor with appropriate skills and competencies immediately available for neurocritical care 24 hours each day.
- 1.13 Staffing levels must be sufficient to enable an appropriately qualified and experienced doctor and trained assistant to accompany critically ill patients during transfer between neurocritical care and operating theatres, CT and MRI scanners and angiography suites. New initiatives, such as becoming part of a major trauma centre, may require additional staffing.

2 Equipment, support services and facilities**Equipment**

- 2.1 There is a high incidence of difficult intubation in neurosurgical units carrying out complex cervical spinal surgery. Specific equipment to manage the difficult airway, including the provision of sufficient numbers of fiberoptic laryngoscopes, should be available.
- 2.2 Equipment should be available for the safe administration of total intravenous as well as inhalational anaesthesia. Processed electroencephalography (EEG) monitors such as bispectral index (BIS) or entropy, as well as neuromuscular monitoring equipment (e.g. train-of-four [TOF]) should be available.
- 2.3 Those units conducting functional neurosurgery or surgery for correction of scoliosis should have the appropriate equipment for intra-operative neurophysiological testing.
- 2.4 With the increasing incidence of obesity in the population, appropriate-sized mattresses and fixings should be available for positioning those patients for neurosurgery.
- 2.5 The monitoring of patient temperature and the equipment needed to manipulate it should be available.

Support services

- 2.6 The demand for critical care beds in neuroscience centres is high and the actual number and configuration of level 3 and level 2 beds should be determined locally. However, capacity should be sufficient to allow access by critically ill patients in an appropriate time scale, e.g. within four hours for those who require life-saving surgery. The Society of British Neurological Surgeons recommends the provision of ten designated level 2 and level 3 beds per million population for neurosurgical patients, and the Association of British Neurologists additionally estimates that between five and seven neurocritical care beds per million population are required to support the care of neurology patients.³
- 2.7 A 24-hour acute pain service should be available for post-operative neurosurgical patients.
- 2.8 Post-operative recovery facilities, with appropriately trained staff and equipment, should be available out of normal working hours to all emergency neurosurgical patients undergoing surgery and who do not require critical care.¹⁴
- 2.9 Twenty-four hours a day, neuroradiology support should be provided for interpretation of neuroimaging. Online review of CT scans from referring hospitals and within the neuroscience centre should be available locally, and consideration should be given to the provision of remote access for all consultants who provide cover to neurocritical care out of hours.
- 2.10 There should be on-site laboratory provision, or point-of-care testing, for arterial blood gases, serum electrolytes and activated clotting time and/or thromboelastography, to allow safe management of patients in the operating theatre during endovascular procedures, and on the neurocritical care unit.
- 2.11 Rapid access to other biochemical and haematological investigations, blood transfusion and cerebrospinal fluid microscopy should also be provided.
- 2.12 Expert neuropathological expertise should be available on request, with the ability to carry out 'frozen section' examinations on site.
- 2.13 On-site neurophysiological support should be available seven days per week to support the management of patients in intensive care requiring continuous electroencephalographic monitoring to manage their treatment.¹⁵
- 2.14 Pre-admission clinics for elective neurosurgery should be available, with input from the department of neuroanaesthesia.
- 2.15 For stand-alone neuroscience centres, local arrangements should be in place for specialist opinion and review of patients by other disciplines. Named consultants should be identified in 'core' specialties, to facilitate such liaison. There should be same-day availability of cardiac echo investigations (including transoesophageal echo) and ultrasound scanning. To avoid the transfer of critically ill patients, this should be provided at the bedside for patients on the neurocritical care unit.
- 2.16 Understanding of the Mental Capacity Act and the role of independent mental capacity advocates should be evident.¹⁶
- 2.17 Each unit should have a specialist nurse for organ donation embedded, to ensure that it is considered in end-of-life care, and to provide bereavement counselling and support.¹¹

Guidelines

- 2.18 Neurocritical care outcome can be improved by the delivery of management guidelines based on expert consensus. All members of the neurocritical care multiprofessional team should input to the development of local protocols, which should cover all the common pathologies managed by that unit. Protocols for the management of severe head injury are particularly important and guidance for management in the acute phase should be developed in collaboration with clinicians from referring hospitals.
- 2.19 Local guidelines should be agreed between clinicians in the neuroscience unit and referring hospitals for transfer and repatriation of patients, and audited as a routine.

Facilities

2.20 Critically ill patients often require transfer to and from the operating theatre, CT and MRI scanners and angiography suites. Theatres, the intensive care unit and radiological facilities should therefore be in the closest possible proximity and preferably on the same floor. Adequate provision should be made for monitoring patients during such transfer. Local guidance should be developed for the intra-hospital transfer of critically ill neuroscience patients, based on guidance from the Intensive Care Society.⁸

3 Areas of special requirement**Children**

- 3.1 Whether in a dedicated paediatric neurosurgical unit or not, every child requiring elective neurosurgery should have care delivered by an anaesthetist or anaesthetists who possess the relevant competencies as demanded by the patient's age, disease and co-morbidities. New appointees to consultant posts with a significant or whole-time interest in paediatric neuroanaesthesia should have successfully completed 'Advanced Level' training in paediatric anaesthesia as defined in the CCT in anaesthesia (August 2010).
- 3.2 In a true emergency situation involving a child requiring urgent neurosurgery for a deteriorating condition admitted to an 'adult-only' neurosurgical service, the most appropriate surgeon, anaesthetist and intensivist available would be expected to provide life-saving care, including emergency resuscitation and surgery.¹⁰
- 3.3 All children under the age of 16 years requiring neurocritical care should be managed in a paediatric intensive care unit.
- 3.4 Detailed guidance for the management of children has been issued and applies equally to those requiring neurosurgical intervention (see [Chapter 10: Guidance on the Provision of Paediatric Anaesthesia Services 2016](#)).

4 Training and education

- 4.1 The specialist nature of neuroanaesthesia dictates that it is a consultant-delivered specialty. Trainees have an initial exposure to the specialty in a clinical attachment during years ST3 or ST4 of intermediate-level training. Following the principle of spiral learning, a further clinical attachment occurs during higher or advanced training (ST5–ST7), with longer attachments for those wishing to follow a career in the specialty. Because of the limited time that trainees spend in the specialty, schools of anaesthesia should develop structured training programmes to cover all core topics. Successful completion is based on workplace-based assessments of the skills and knowledge required. Trainees should, therefore, also be encouraged to attend other training opportunities within the neuroscience unit, such as grand rounds, radiology and pathology case conferences, and mortality and morbidity meetings.
- 4.2 The use of simulation training (e.g. for critical incident scenarios) should be actively encouraged for all members of the multidisciplinary team.
- 4.3 Fellowship posts should be identified to allow additional training for those who wish to follow a career in neuroanaesthesia or neurocritical care. These should be suitable for trainees who wish to take time out of training programmes, or for those who are post-CCT. Such posts should provide similar or enhanced levels of teaching, training and access to study leave as regular training posts.

5 Research, audit and quality improvement

- 5.1 Departments of neuroanaesthesia and neurocritical care should be encouraged to develop research interests, even if not part of an academic department. Research collaboration with other neuroscience disciplines is good practice. Taking part in national anaesthesia and critical care projects such as the RAIN (Risk Adjustment In Neurocritical care) study is to be encouraged.
- 5.2 Audit programmes should be developed locally but should include continuous audit of transfer of brain-injured patients, neurocritical care capacity and demand, rates of unplanned admission and readmission to the intensive care unit, and the caseload of trainees. Collaborative audit with the other neuroscience disciplines should also be encouraged, and some morbidity and mortality meetings should be joint with neurosurgeons. In general, local practice should be audited against national and expert consensus guidelines.
- 5.3 Departments should be encouraged to maintain active link personnel for the Neuroanaesthesia and Critical Care Society of Great Britain and Ireland, to facilitate national audit and dissemination of information.

6 Organisation and administration

- 6.1 Much of neurosurgery involves acute work with a high degree of urgency. The provision of associated services must recognise this need and inappropriate delay cannot be allowed to occur as a result of lack of key personnel or facilities. Laboratory services, neuroradiology and availability of operating theatre time must all be organised to cope with these demands.
- 6.2 Departments of neuroanaesthesia and neurocritical care, even if part of a large general department, must be provided with adequate secretarial and administrative support. Consultants with lead responsibility for neuroanaesthesia and neurocritical care should have programmed activities allocated to this function. Appropriate levels of administrative support, including data collection and analysis, should be available for neurocritical care.
- 6.3 Consultants in neuroanaesthesia and neurocritical care should be involved in planning neuroscience services at a local and regional level.
- 6.4 A lead consultant responsible for patient transfer should be identified both in the neuroscience unit and in referring hospitals.

7 Patient information

- 7.1 Each department should provide written information specific to neurosurgical procedures, including relevant risks. Information for relatives of patients requiring neurocritical care should also be available, including contact details of relevant charities and helplines.

References

- 1 Guidance on the 2003 (new) contract and job planning for consultant anaesthetists. AAGBI, London 2005 (<http://bit.ly/1nZYdmE>).
- 2 Fatigue and the anaesthetist (expanded web version). AAGBI, London 2005 (<http://bit.ly/1omZl7j>).
- 3 Neuroscience critical care report – progress in developing services (Gateway Ref: 3236). DH, London 2004 (<http://bit.ly/1pjXUEG>).
- 4 Report of the working party on the management of patients with head injuries. RCS Eng, London 1999.
- 5 Guidance for nurse staffing in critical care. RCN, London 2003.
- 6 Head injury: triage, assessment, investigations and early management of head injury in infants, children and adults (Clinical Guideline 56). Developed by the National Collaborating Centre for Acute Care (partial update of Clinical Guideline 4). NICE, London 2007 (<http://bit.ly/WQ0lTi>).
- 7 Recommendations for transfer of patients with brain injury. AAGBI, London 2006 (<http://bit.ly/1lDt6NX>).
- 8 Guidelines for the transport of the critically ill adult (3rd Edition). ICS, London 2011 (<http://bit.ly/1kXecFZ>).
- 9 Children's neurosurgical specification standards. NHS Specialised Services, 2011 (<http://bit.ly/1rRqscv>).
- 10 Joint statement from the Society of British Neurological Surgeons and the Royal College of Anaesthetists regarding the provision of emergency paediatric neurosurgical services. RCoA, London 2010 (www.rcoa.ac.uk/node/1946).
- 11 Organs for transplant: a report from the Organ Donation Taskforce. DH, London 2008 (<http://bit.ly/1t3Yl7a>).
- 12 Subarachnoid Haemorrhage: Managing the Flow. NCEPOD, London 2013 (<http://bit.ly/1OUzXTV>).
- 13 Standards for providing safe acute ischaemic stroke thrombectomy services. BASP, 2015 (<http://bit.ly/1QOyCzA>).
- 14 Immediate Post-anaesthesia Recovery 2013. *Anaesth* 2013;**68**:288–297.
- 15 Claasen J et al. Recommendations on the use of EEG monitoring in critically ill patients: consensus statement from the neurointensive care section of the ESICM. *ICM* 2013;**39**:1337–1351.
- 16 Mental Capacity Act Resource. *Social Care Institute for Excellence*, 2015 (<http://bit.ly/1RrOLhV>).



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