

Chapter 7

GUIDELINES FOR THE PROVISION OF anaesthetic services

ACSA REFERENCES

[7.1.1](#)
[7.1.3](#)
[7.1.4](#)
[7.1.5](#)
[7.2.1](#)
[7.2.2](#)
[7.2.3](#)
[7.2.4](#)
[7.2.6](#)
[7.2.7](#)
[7.3.1](#)
[7.3.2](#)
[7.3.3](#)
[7.3.4](#)
[7.3.5](#)
[7.3.6](#)
[7.3.8](#)

Anaesthesia services for care in the non-theatre environment 2014

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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.

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Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

Summary

- Anaesthetic services in the non-theatre environment include life support and resuscitation, as well as the provision of sedation and anaesthesia for patients in the intensive care unit, radiology department, emergency department (ED), endoscopy, cardiac catheter laboratories and for those undergoing cardioversion, electroconvulsive therapy (ECT), and intra- and inter-hospital transfer during critical illness.
- The risks associated with anaesthesia in the non-theatre environment should be minimised by proper planning and anaesthetic service provision. Where appropriate, the guidelines for anaesthesia in remote sites should be followed.¹ Whenever possible all anaesthetic equipment should be standardised across all areas providing anaesthetic services.
- There should be a named lead anaesthetist responsible for each of the principal services provided outside the main operating theatres.
- Monitoring and anaesthetic equipment should comply with the national standards stipulated for use in operating theatres.² These should include the routine use of capnography in any situation where anaesthesia is induced. Continuous capnography should be used for all patients undergoing moderate or deep sedation, and should be available wherever any patients undergoing anaesthesia or moderate or deep sedation are recovered.³ In areas where X-rays or other radiation is used, slave monitors in screened areas should be provided.
- Where general anaesthesia is provided, dedicated trained assistance for the anaesthetist is essential.⁴ It is of particular importance in the non-theatre environment that the whole team participate in a safety briefing and use the appropriate version of the WHO checklist and venous thromboembolic (VTE) assessment.⁵⁻⁶
- An appropriate location and staff for the post-anaesthesia recovery of the patient must be identified.⁷
- Inter- or intra-hospital transport of the unconscious or anaesthetised patient should meet published standards.⁸ Emergency and critically ill patients must be resuscitated and stabilised before transfer.⁸⁻⁹
- Regular audit of anaesthesia or sedation in the non-theatre environment should be performed for quality assurance.¹⁰⁻¹¹

Introduction: the importance of anaesthetic services in the non-theatre environment

- The demand for anaesthetic expertise outside the operating theatre is increasing. The complexity and diversity of the cases has also increased as interventional radiological procedures replace major surgical procedures, for example, coiling replacing open subarachnoid aneurysm repair and endovascular aneurysm repair (EVAR) replacing open aortic aneurysm repair.
- Many of the procedures are undertaken in geographically remote locations, for example electroconvulsive therapy (ECT) in isolated psychiatric units. Such environments require appropriate staffing levels, skill mix and facilities.¹
- A wide range of services require anaesthetic support outside the operating theatre. This list is not exclusive but the commonest areas are:
 - ▼ the radiology department for both emergency and routine diagnostic procedures (CT and MRI). Interventional procedures such as neuroradiology are being performed with increasing frequency
 - ▼ the emergency department for critically ill or injured patients
 - ▼ the psychiatric unit for ECT
 - ▼ the coronary care unit for cardioversion
 - ▼ the dental department for both sedation and anaesthesia
 - ▼ the cardiac catheter laboratory for haemodynamically unstable patients undergoing percutaneous coronary intervention, and children undergoing investigation and treatment
 - ▼ the endoscopy unit for sedation
 - ▼ the radiotherapy department for planning and treatment of adults and children undergoing radiotherapy
 - ▼ the intensive care unit
 - ▼ inter- and intra-hospital transport of critically ill patients.
- The patients include those who are emergency cases and critically ill patients, paediatric patients (often with complex medical conditions) and patients with learning disabilities who may otherwise not tolerate procedures, such as dental extractions.
- These standards are relevant to, but do not specifically focus on, intensive care units or inter-hospital transport because these environments are covered in other standards documents.

Levels of provision of service

1 Staffing requirements

- 1.1 It is essential that a dedicated, skilled anaesthetic assistant with an appropriate nationally recognised qualification is available in locations outside the operating theatre where help may not be immediately available to the anaesthetist should difficulties arise. Unfortunately it is often in these more challenging, less frequently used environments that recommended standards are not met. It must be stressed that 'the safe administration of anaesthesia cannot be carried out single-handedly; competent and exclusive assistance is necessary at all times.'⁶
- 1.2 If sedation is performed without an anaesthetist present, a designated, appropriately trained individual should be responsible for monitoring the patient and keeping records. This should be their sole responsibility⁹ and comply with the Trust's sedation policy.

Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

- 1.3 If patients are cared for in an isolated/single specialty unit there must be appropriate medical cover and nursing care.
- 1.4 If patients are recovered from anaesthesia or sedation in an isolated unit, they should receive care to the same standard as that required in an operating theatre post-anaesthetic care unit (PACU).⁷ For major procedures, such as endovascular aneurysm repair (EVAR), which may require prolonged recovery, this may mean transferring the patient to the main PACU in the hospital.
- 1.5 In areas where anaesthesia or sedation are carried out frequently, a named consultant anaesthetist should be involved in developing the service, the training and revalidation of staff, and ensuring that safety standards and audit are appropriate.¹⁰⁻¹²

2 Equipment, support services and facilities

- 2.1 Any environment in which patients receive anaesthesia or sedation must have full facilities for resuscitation available, including a defibrillator, suction, oxygen, airway devices and a means of providing ventilation. All patient trolleys should be capable of being tipped into the head down position and be easily transferred to the rest of the hospital. Access to lifts for easy trolley transfer must be available.
- 2.2 The anaesthetist must ensure that an adequate supply of oxygen is available before starting any procedure. Many of the sites where anaesthesia is provided outside the main operating theatres do not have piped oxygen; if anaesthesia is provided frequently in such a location, the use of the location should be reviewed or piped oxygen provided. Where piped oxygen is available, back-up cylinders must always be available.
- 2.3 Ideally, anaesthetic equipment should be standardised throughout the hospital. Remote anaesthesia locations have often suffered from having older equipment not in use elsewhere. This is not acceptable and the location should be reviewed.
- 2.4 **Drugs**
Wherever anaesthesia or sedation is undertaken, a full range of emergency drugs including specific reversal agents such as naloxone and flumazenil must be available. In remote locations where anaesthesia is undertaken, drugs to treat rare situations, such as dantrolene for malignant hyperpyrexia, should be immediately available. Emergency drug stores, and individual drugs retained for rare events, should be checked regularly for expiry dates.
- 2.5 **Environment**
Many remote locations are not designed specifically for the management of anaesthetised patients. There may be radiological equipment that makes access to, or visualisation of, the patient difficult. The room may be darkened to provide optimal image viewing, but hinder direct observation of the patient. Many of the tables upon which radiological procedures are undertaken do not tip. Imaging equipment arms may move around the patient with the risk of dislodgement of airway tubing, lines and monitoring equipment. The environment may be deliberately cooled to provide optimal operating conditions for equipment or operators, posing a particular problem when managing paediatric patients. The anaesthetist must consider all of these factors when planning anaesthesia. Simple solutions to be considered include the availability of a torch to record notes and observe the patient, the provision of warming equipment for all patients, and transport incubators for babies.
- 2.6 **Safety**
Patient safety is, as always, of paramount importance, and particular attention should be paid to teamwork, communication and the use of checklists when working in less familiar environments.⁵ At the team briefing an explicit plan should be agreed for getting help if needed.

Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

There are also environmental hazards for staff to consider, such as radiation exposure, magnetic resonance (MR) fields and lack of scavenging. Pregnant personnel may be particularly at risk in these environments and should follow local occupational health policy. All staff should complete a screening questionnaire before entering the magnetic field of an MR system.

2.7 In remote off-site locations, such as psychiatric hospitals where anaesthesia is provided for ECT, advanced plans should be made to manage patient transfer if required.

2.8 Pre-admission assessment guidelines and protocols

Many patients having elective procedures outside the operating theatre can be managed as day cases and should be assessed accordingly in conjunction with local guidelines. More complex patients require assessment to at least the same standard as required for surgery.¹³ If there is any concern about the safety of the procedure being undertaken at a remote location, for example, ECT in a psychiatric hospital, then arrangements should be made to perform the procedure in an operating theatre environment.

3 Areas of special requirement

3.1 Children

Children should be managed always in line with RCoA recommendations.¹⁴ Children presenting for anaesthesia outside the operating room may present particular challenges because procedures required are likely to be for diagnostic imaging (MR or CT) or radiotherapy. These children may, therefore, have complex medical conditions requiring repeated treatments or investigations, and specialist assessment and expertise. There is debate as to whether children undergoing MR or CT are best managed with anaesthesia or sedation. Guidance for paediatric sedation should be developed for the local context by a multidisciplinary team;¹⁵⁻¹⁶ sedation for children in a district hospital is very different to that in a specialist children's centre. Paediatric sedation should be managed in accordance with recognised guidelines.¹⁷

3.2 The emergency department (ED)

Patients requiring anaesthesia in the emergency department are frequently critically ill or injured, and may be in extremis. Their physiological derangement and sensitivity to anaesthetic agents, coupled with the potential for increased difficulty in tracheal intubation, requires the presence of an anaesthetist with the competence to manage these challenges in a timely and effective manner. NCEPOD commented in their 2007 report¹⁸ that patient care for critically ill and injured patients may be compromised by inexperienced doctors providing anaesthesia, compounded by a lack of trained assistance, inadequate supervision and problems with availability of drugs and equipment.

The College of Emergency Medicine recognises that emergency physicians should have the requisite skills to manage an airway in the first 30 minutes of admission.¹⁹ Many emergency patients are managed with rapid sequence induction by emergency physicians,²⁰ most of whom are senior doctors. Such procedures should only be undertaken by doctors with adequate training and experience in anaesthetic agents and airway management. The safe management of these vulnerable patients depends on close liaison between emergency physicians and anaesthetists to ensure that clear guidelines are in place, emergency department support staff are trained to assist with intubation and that audit and discussion of complications is undertaken regularly. A designated consultant anaesthetist should be responsible for ensuring that services meet the recommendations laid out here and in other guidelines.^{10-11,21}

Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

Failed intubation is more common in the emergency department.¹⁹ The 4th National Audit Project 'Major complications of airway management' (NAP4) (March 2011) raised particular concerns about complications of airway management in ICU and the emergency department. At least one in four major airway complications reported to NAP4 was from the ICU or the emergency department. Common factors included unrecognised oesophageal intubation or unrecognised displacement of tracheal tubes or tracheostomy tubes after patient movement, intervention, or during transport. Capnography was frequently absent or a flat capnography trace due to airway displacement was misinterpreted during cardiopulmonary resuscitation. The absence of capnography, or the failure to use it properly, contributed to 80% of deaths from airway complications in the ICU and 50% of deaths from airway complications in the emergency department.³ Difficult intubation equipment, waveform capnography and training for the management of the emergency airway must be available.¹⁹⁻²⁰ As airway management in the ED can be particularly challenging, dedicated trained assistance should be provided. Use of an emergency checklist for intubation should be considered.²¹

Hospitals need to ensure that their anaesthesia and/or intensive care services are staffed to a level, that allows them to respond in a timely manner to care for emergency patients in the ED. The RCoA Audit guidelines make recommendations about response times for anaesthetists to the ED.²² Local response times should be audited and standards set.

Other considerations for the management of the critically ill patient in the ED are:

- the ability of equipment to warm or cool rapid infusions of fluid or blood
- the easy availability of a blood gas analyser to monitor arterial blood gases in the emergency department
- many of these patients will require inter-hospital transfer to the regional trauma centre and local and national guidelines for transfer should be followed.⁸⁻⁹ Transfer of patients within the hospital to ICU, radiology or the operating theatre will require a tipping transfer trolley equipped with a portable defibrillator, oxygen cylinders, suction, a transport ventilator, infusion pumps and monitoring with adequate battery life. All equipment must be checked regularly
- documentation, to the standard used in the operating theatre, should be kept for all cases and this should include the grade and specialty of the doctor performing and supervising the anaesthetic.

3.3 The radiology department

The frequency with which complex procedures are carried out in the radiology department is increasing. Patients requiring general anaesthesia in the radiology department may have life-threatening conditions. The radiology department represents a more difficult environment in which to give an anaesthetic than an operating theatre.¹² Staff should be aware of the environmental challenges and exposure to ionising radiation should be kept to a minimum by the use of screens or lead-gowns; remote slave monitors in screened viewing areas should be provided and staff should remain as distant from the imaging source as possible if they must remain in the X-ray environment.

Patients who are moved from the emergency department for investigation must be stable before transfer. The anaesthetist accompanying the patient must be senior enough to manage all eventualities in an isolated environment and should be accompanied by dedicated trained assistance.

Equipment for induction, maintenance and emergence from routine general anaesthesia should be available at all times and of similar quality to that available in the operating theatre. Radiology tables do not tilt into a head down position. The patient may therefore require induction, or emergence from anaesthesia on a tipping trolley.

Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

Trainee anaesthetists must be familiarised with equipment and the location of resuscitation devices in the radiology department as part of their induction to a new hospital; they will frequently be the anaesthetist accompanying patients for emergency scans.²³

MRI

Guidelines are available for the management of patients in the Magnetic Resonance Suite.²⁴⁻²⁵ Essential points to be considered are:

- anaesthetic equipment that is used in the MRI scanning room must be MR compatible
- remote monitoring of the patient with slave screens is essential to allow the anaesthetic team to monitor the patient from outside of the magnetic field
- particular consideration must be given to the problems of using infusion pumps. All non-essential pumps and equipment must be removed from the patient before entering the magnetic field
- all staff taking a patient to MR should understand the unique problems caused by monitoring and anaesthetic equipment in this environment. It is not acceptable for inexperienced staff unfamiliar with the MR environment to escort or manage a patient here, particularly out of hours
- the patient and all staff should have an MR safety and exclusion questionnaire completed before entering the magnetic field
- in the event of an adverse incident in the MRI scanning room, the patient should be removed from the scanning room without delay; immediate access to an anaesthetic preparation room or resuscitation area is essential.

Interventional radiology

If a radiology department provides an emergency interventional service for which general anaesthesia may be required, plans for staffing this anaesthetic service should be made, particularly outside of normal working hours.²⁶⁻²⁸ Procedure specific agents such as those required to manipulate coagulation, intracranial pressure and arterial blood flow, should be immediately available. Interventional vascular radiology may involve treating unstable patients with severe haemorrhage. Such patients may include those with significant gastrointestinal bleeding or patients with post partum haemorrhage.²⁹ Equipment to deal with these patients must be easily available. This includes that necessary to introduce and monitor invasive vascular catheters, rapid infusion devices, blood and fluid warming devices and patient warming devices. The hospital's major haemorrhage protocol should be displayed in a visible location and periodically rehearsed.

Cardiac catheter laboratories

Anaesthetists are requested to provide services for an increasing number of cardiological procedures, pacemaker box changes, lead extractions, defect closures, revascularisations and TAVIs. Exactly the same conditions apply as for the radiology department with some additional conditions. A separate set of full anaesthetic patient monitoring, including ECG, is recommended in addition to the cardiologist's arrangements, which can be unreliable, with a remote slave monitor in the screened viewing area. These cardiac patients are often at high risk of cardiac arrest and the facilities and adequate space for managing this possibility should be optimised and frequently rehearsed. On rare occasions cardiopulmonary bypass may be required and the catheter laboratory should have sufficient space, medical gas outlets and electrical sockets etc to meet this demand. Anaesthetists should be aware of their radiation exposure in cardiac catheterisation laboratories and ensure they use all protective gowns and screens, and wear exposure monitoring badges if requested to do so.

Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

3.4 Anaesthesia for electroconvulsive therapy (ECT)

Anaesthesia provided for ECT is frequently performed in remote locations and its conduct may directly influence the efficacy of treatment. Ideally, anaesthesia should be performed by a consultant; the guidance provided for anaesthetic provision in remote sites should be followed.¹ The unit should have been assessed and accredited by the ECT accreditation service (ECTAS for England and Wales, Scottish ECT Accreditation Network for Scotland).^{30–31} Anaesthetists must have a specialised knowledge of the effect of concurrent medication, anaesthetic agents and anaesthetic techniques on the conduct and efficacy of ECT, as well as the specific anaesthetic contraindications.³²

There must be a named consultant responsible for provision of the service in each anaesthetic department^{1,30} and a consultant must be responsible for determining the optimal location for provision of anaesthesia for patients of ASA III or above.¹ Contingency plans for transfer to an acute facility must also be in place.¹

Minimum standards specific to ECT include the provision of a treatment room and a recovery room.³² Whilst an anaesthetic machine may not be required, there must be a flow-controlled oxygen supply, either by pipeline or cylinder with a reserve supply immediately available.³² Equipment for managing the airway, including the difficult airway, emergency drugs and resuscitation equipment must all be available. Standards for monitoring and recovery are stipulated by the AAGBI and must be adhered to for all ECT cases.

It is recommended that patients refrain from driving for 24 hours after anaesthesia. However, the DVLA³³ has recommended that patients should cease to drive during the acute phase of a severe psychiatric illness because of possible cognitive impairment. This includes patients receiving a course of ECT.

3.5 Anaesthesia for direct current (DC) cardioversion

Patients requiring DC cardioversion may present as emergency or elective cases. The disturbance of physiological rhythm, the reduction in cardiac performance and the risk of embolic phenomena all place these patients at risk of serious complications when undergoing both anaesthesia and DC shock.

Precautions prior to embarking on DC cardioversion should include the immediate availability of emergency anaesthetic drugs, resuscitation and external pacing equipment.^{2,34} Resuscitation equipment should be checked and monitoring applied prior to induction of anaesthesia.^{2,34} Recent serum electrolytes, in particular potassium and preferably magnesium, as well as the patient's anticoagulation status and a recent ECG should all be checked prior to embarking on anaesthesia.^{13,34} A pre-procedure echocardiogram is likely to provide useful information.³⁵

The optimal anaesthetic technique is undergoing review and results from the Cochrane group are still pending at the time of this update.³⁶ Current evidence would indicate prolonged recovery times and post-procedural confusion following the use of midazolam and diazepam.^{36–39}

The anaesthetist should not be responsible for performing the cardioversion; an appropriately trained physician, cardiologist or supervised nurse specialist is responsible for this role.

3.6 Anaesthesia for radiotherapy

Anaesthesia may be required for radiotherapy to facilitate patient positioning and to alleviate pain. Due to the unique nature of the procedures involved in radiotherapy, the remoteness of the location and the lack of direct access to the patient, only anaesthetists familiar with the therapy should embark on anaesthesia for these patients.⁴⁰⁻⁴¹ Anaesthetists must be familiar with the adverse effects of high concentrations of oxygen in the presence of some anti-neoplastic agents and adjust their technique accordingly. Facilities for recovering patients may be unavailable, so that either the anaesthetist must be available until the patient is fully recovered, or transfer to the main theatre recovery area should be organised. Tumours of the lower body may be amenable to regional anaesthesia,⁴¹ and so equipment and facilities to instigate, monitor and manage regional blockade must be available.

Paediatric cases warrant the presence of an experienced paediatric anaesthetist.

3.7 General anaesthesia and sedation for dental procedures

General anaesthesia for dentistry must be administered only by anaesthetists in a hospital setting; this stipulation resulted from a DH report reviewing general anaesthesia and conscious sedation in primary dental care⁴² which found that deaths were still occurring despite an earlier report which aimed to improve standards in dental surgeries. There are recent comprehensive guidelines for the management of children referred for dental extractions under general anaesthesia.⁴³

Dentists are allowed to administer conscious sedation in dental surgeries. There are clear guidelines on the standards that must be met to ensure patient safety in these circumstances.⁴⁴

3.8 Gastrointestinal procedures

Many of the initial concerns relating to the safety of patients receiving sedation and anaesthesia outside operating theatres related to gastrointestinal endoscopy.¹⁰ Despite marked improvements in procedures this is still a high risk area; the British Society of Gastroenterology states that there is no room for complacency.⁴⁵ Half of the claims from the American Society of Anaesthesiologists Closed Claims database (1970–2001)⁴⁶ relating to sedation outside the operating theatre, stem from procedures performed within the gastrointestinal suite. The causative mechanism of patient insult was inadequate oxygenation or ventilation. Anaesthetists are not usually involved in the routine sedation of patients for endoscopy; indeed many centres now use nurse sedationists. The British Society of Gastroenterology guidelines should be followed.⁴⁵ Anaesthetic involvement may be requested for high risk patients including those with potential GI bleeding. In these circumstances full general anaesthesia with rapid sequence induction and intubation in an operating theatre may be the safest option.

In some countries sedation with propofol has been used for complex GI procedure such as endoscopic retrograde cholangiopancreatography. It is the view of the RCoA and the British Society of Gastroenterology that sedation for such complex procedures with propofol should be the responsibility of a dedicated and appropriately trained anaesthetist.⁴⁷

Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

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Guidance on the provision of services for anaesthetic care in the non-theatre environment 2014

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