

Chapter 18

Guidelines for the Provision of Anaesthesia Services (GPAS)

Guidance on the Provision of Anaesthesia Services for Thoracic Procedures 2023

Consultation Draft November 2022

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

Aims and objectives

The objective of this chapter is to promote current best practice for service provision in thoracic anaesthesia services. The guidance is intended for use by anaesthetists with responsibilities for service delivery and healthcare managers.

This guideline does not comprehensively describe clinical best practice in thoracic anaesthesia services 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 thoracic anaesthesia services applies to all settings where this is undertaken, regardless of funding. All age groups are included within the guidance unless otherwise stated, reflecting the broad nature of these services.

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 thoracic anaesthesia services. 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 thoracic anaesthesia, 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 thoracic anaesthesia.

Healthcare setting

All settings within the hospital in which thoracic anaesthesia are provided.

Clinical management

Key clinical issues that will be covered:

Key components needed to ensure provision of high quality anaesthetic services for thoracic 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 paediatric patients, critically ill patients and pregnant patients
- training and education
- research and audit
- organisation and administration

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- patient information.

Exclusions

Provision of thoracic anaesthesia services provided by a specialty other than anaesthesia.

Clinical guidelines specifying how healthcare professionals should care for patients.

This guideline relates only to critically ill patients undergoing procedures in the operating theatre. A significant proportion of patients requiring thoracic surgery may need pre or post-operative critical care.

General provision of critical care is outside the scope of this document. Further information, including definitions of levels of critical care can be found in the Faculty of Intensive Care Medicine and Intensive Care Society publication, [Guidelines for the Provision of Intensive Care Services](#).

Introduction

Thoracic anaesthesia services are provided for patients undergoing thoracic procedures. To reflect current practice, these guidelines have been more clearly divided to identify areas of differing requirement.

Thoracic surgery may include surgery on the lungs (including lung transplantation), pleura, thymus, oesophagus and other thoracic structures, as well as the chest wall. Less invasive video assisted surgery is now mainstream practice for most types of surgery, but particularly for those patients with effusions, pneumothoraces and tumours. Robotic thoracic surgery is increasingly available for lung resection. Surgery for patients who have sustained trauma to the thorax is becoming more common and may be integrated into major trauma centres. Interventional large airway services are frequently provided alongside thoracic surgery. Tracheobronchial surgery for congenital abnormalities of the large airways in children is a supraregional service.

Anaesthesia for lung transplantation or major tracheobronchial surgery may sometimes require the use of extracorporeal techniques such as cardiopulmonary bypass. There is an expanding use of extracorporeal membrane oxygenation for acute lung injury that may involve anaesthetists in defined centres.

Recommendations

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

1 Staffing requirements

1.1 Availability of two consultant anaesthetists, or a consultant and senior trainee or SAS doctor should be considered for more complex procedures, such as lung resection requiring ECMO.¹

1.2 Continuity of care should be a priority in prolonged cases and when this is not possible, a formal documented process with some overlap should be in place for handover of clinical care from one anaesthetist to another.²

1.3 The complexity of some cases necessitates anaesthetic involvement in multidisciplinary team meetings and this activity should be reflected in job plans.

1.4 Consultant or autonomously practicing anaesthetists in thoracic units should be responsible for the provision of service, teaching, protocol development, management, research and quality improvement. Adequate time should be allocated in job plans for these activities.

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

1.5 Each unit should have a designated clinical lead (see glossary) anaesthetist for thoracic anaesthetic services. This should be recognised in their job plan and they should be involved in multidisciplinary service planning and governance within the unit.

1.6 An appropriately trained consultant or autonomously practising anaesthetist should be available at all times, through a formal thoracic or cardiothoracic anaesthetic on-call rota, particularly if lung transplantation is performed.

1.7 Wherever thoracic anaesthesia and surgery are performed there should be a resident anaesthetist available at all times.

1.8 When thoracic surgery is performed with the aid extra-corporeal life support (ECLS), a trained perfusion scientist must be present in the operating room until ECLS is terminated with arrangements for their return in an emergency..

2 Equipment, services and facilities

Equipment and monitoring

2.1 The same level of equipment should be available for thoracic surgery as is available in general theatres as specified in chapter 3. Additional specialty specific monitoring is required and is detailed below.³

2.2 The standard of monitoring in the operating theatre should allow the conduct of safe anaesthesia for surgery as detailed by the Association of Anaesthetists standards of monitoring.⁴ Quantitative neuromuscular monitoring is beneficial during Robotic assisted thoracic surgery (RATS) to avoid inadvertent patient movement and injury.

2.3 Specific equipment for securing the patient in lateral decubitus position should be available. This may include a shoulder roll, head ring, Carter Brayne arm support, arm boards and table supports for the front and back of the patient. Straps or elastic tape should also be available where used routinely.

2.4 Pillows or similar padding should be available and used to ensure pressure and stress areas are adequately padded.

2.5 Commonly forced air warmers, patient under blankets, fluid warmers, foil hats and temperature monitoring should be available.

2.6 The patient table should be capable of movements to support the appropriate positioning of the patient for thoracic surgery.

2.7 Flowtron boots or equivalent should be available to support peripheral circulation of patients under anaesthesia in extreme positions.

2.8 Flexible fibreoptic bronchoscopy should be immediately available for all cases where lung isolation is used.⁵

2.9 A range of equipment to facilitate lung isolation should be available. This may include left and right double lumen tracheal tubes, bronchial blockers, dual lumen tracheostomy tubes,⁶ and airway exchange catheters.⁷

2.10 Specific bougies designed for use with double-lumen tracheal tubes or airway exchange catheters should be available.

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- 120 2.11 Clamps or specialised angle pieces should be available to isolate the lung during surgery.
- 121 2.12 Continuous positive airway pressure (CPAP) circuits should be available for management of
122 hypoxia during one lung ventilation.
- 123 2.13 Anaesthetic assistants whether nurse or ODP should be trained in the preparation of this
124 specialist equipment to be able to support the anaesthetist in the delivery of lung isolation
125 and one lung ventilation.
- 126 2.14 The anaesthetic machine should have a ventilator capable of meeting the requirements for
127 protective lung ventilation.
- 128 2.15 Dedicated equipment for jet ventilation should be available for interventional airway
129 procedures.⁸ Appropriate fittings should be checked and available for connection to rigid
130 bronchoscopes. It should include an US machine for blocks.
- 131 2.16 A variety of blocking needles and catheters and appropriate infusion or elastomeric pumps
132 for delivery of local anaesthetic. Protocols should be in place for delivery and monitoring of
133 these infusions.
- 134 2.17 A fluid warmer allowing the transfusion of warmed blood products and intravenous fluids
135 should be available.⁹
- 136 2.18 A rapid infusion device should be readily available and considered for the management of
137 major haemorrhage.⁹
- 138 2.19 A cell salvage service should be available for cases where massive blood loss is anticipated
139 and for patients who decline blood products. Staff who operate this equipment should
140 receive training and use it frequently to maintain their skills.
- 141 2.20 Ultrasound should be available for the placement of vascular catheters and should be
142 available for regional anaesthesia techniques as well as vascular catheter insertion..¹⁰
- 143 2.21 During the transfer of the patient at the end of surgery to the postoperative care unit there
144 should be access to electrocardiogram (ECG), blood pressure monitoring, pulse oximetry,
145 disconnection alarm for any mechanical ventilation system, fractional inspired oxygen
146 concentration, and end-tidal carbon dioxide.⁴ The vast majority of thoracic patients are
147 extubated on table. Some do not have/require arterial monitoring or inspired oxygen
148 concentration. The monitoring should be appropriate for the procedure, the patient and the
149 distance/time to reach the post operative unit.

150 Facilities

- 151 2.22 Designated thoracic, or cardiothoracic wards should be considered.
- 152 2.23 Thoracic surgery should ideally be performed in dedicated operating rooms. It is unlikely that
153 an operating room will be kept available at all times for emergencies. Local arrangements for
154 urgent and emergency cases should be in place.
- 155 2.24 RATS should be delivered in a theatre with adequate capacity to allow comfortable
156 movement of staff around the patient and robot, to safely accommodate all of the
157 additional equipment including robot, operating console and monitoring stack, and to allow
158 sufficient space for rapid removal of the robot in an emergency to facilitate resuscitation.

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- 159 2.25 After major thoracic surgery, patients should be transferred to an appropriately sized,
160 equipped and staffed post-anaesthetic recovery area. Planned or emergency access to ICU
161 or HDU should be available.¹¹
- 162 2.26 Non-invasive ventilation facilities should be available in the immediate postoperative period,
163 for example bilevel positive airway pressure (BiPAP), continuous positive airway pressure
164 (CPAP) and high-flow nasal oxygen therapy (HFNO). HFNO should be available in theatres for
165 induction and support of anaesthesia as required.¹²
- 166 2.27 Thoracic surgery units should develop an ERAS programme.^{13,14}
- 167 2.28 Preoperative assessment clinics should be established to optimize patient preparation for
168 surgery and reduce same day cancellations. Smoking cessation support should be available
169 to all Thoracic patients.
- 170 **Support services**
- 171 2.29 Thoracic surgery should be supported by a specialist pain service. Pain relief protocols should
172 be clearly defined for thoracic surgery patients.¹⁵
- 173 2.30 Physiotherapy services should be available during the preoperative preparation and
174 postoperative care of patients undergoing thoracic surgery. to discuss anaesthetic
175 risk/consent in pre-assessment clinic rather than on the day of admission/surgery.
- 176 2.31 Access to measurements of cardio-respiratory function should be available for patients
177 undergoing thoracic surgery, including a facility for cardiopulmonary exercise testing and
178 access to echocardiography.
- 179 2.32 There should be immediate access to expert radiology advice, x-ray facilities and
180 computerised axial tomography services for patients undergoing thoracic surgery.
- 181 2.33 All anaesthetic equipment should be checked before use in accordance with the
182 Association of Anaesthetists published guidelines. Anaesthetic machine checks should be
183 recorded in a log and on the anaesthetic chart.¹⁶
- 184 2.34 Where possible, point of care or near patient testing should be used for blood gas analysis,
185 measurement of electrolytes and blood sugar, haemoglobin and coagulation. This might
186 include platelet mapping, thromboelastography or thromboelastometry.¹⁷
- 187 2.35 Immediate access to expert haematology advice, haematology laboratory services and
188 blood products should be available.

189 3 Areas of special requirement

190 Children

- 191 3.1 Children undergoing thoracic procedures have special requirements and the responsibility
192 for their care should ideally lie with a dedicated paediatric anaesthetist, particularly a
193 cardiothoracic or thoracic paediatric anaesthetist.¹⁸ Surgery should only be performed in a
194 specialist tertiary paediatric centre.
- 195 3.2 Paediatric thoracic surgical patients should be cared for in a unit designed and equipped to
196 care for paediatric patients and staffed by appropriately trained nurses. Such a unit should
197 meet the standards defined for paediatric critical care, including adequate arrangements
198 for retrieval and transfer of patients.^{19,20}

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

199 3.3 Anaesthetists should be aware of legislation and good practice guidance²¹ relevant to
200 children and according to the location in the UK.^{22,23,24,25} These documents refer to the rights
201 of the child, child protection processes and consent.

202 **Transplant patients**

203 This includes patients undergoing heart or lung transplantation, and patients who have previously
204 received a transplant who require further thoracic surgery.

205 3.4 Consultants or autonomously practicing anaesthetists providing anaesthesia for lung
206 transplantation should have appropriate training and substantial experience of advanced
207 cardiorespiratory monitoring and support.

208 3.5 Thoracic anaesthetists working in non-transplant centres should be familiar with the principles
209 of the anaesthetic management of patients who have previously undergone lung
210 transplantation.²⁶

211 3.6 Patients undergoing lung transplantation may be under the age of 18 years. Anaesthetists
212 must be aware of legislation and good practice guidance relevant to young and vulnerable
213 adults.²¹²⁷ Children undergoing transplantation should be cared for in a paediatric centre.

214 3.7 Facilities should be available for the storage, administration and routine monitoring of
215 immunosuppressive medication.

216 3.8 Access to specialist support services such as diabetic medicine and dietetics for patients with
217 cystic fibrosis should be available.

218 **Pregnant patients**

219 Patients requiring thoracic surgery during pregnancy will typically be undergoing an urgent or
220 emergency intervention. Indications include chest trauma.

221 3.9 Thoracic anaesthetists should be familiar with the normal physiological effects of pregnancy
222 and the general principles of obstetric anaesthesia.

223 3.10 Where thoracic surgery is scheduled to occur immediately after Caesarean section, there
224 should be early involvement of obstetricians, specialist obstetric anaesthetists, neonatal
225 paediatricians and midwifery services.

226 3.11 Equipment, services and facilities should be equivalent to those found in an obstetric unit.²⁸

227 3.12 Whenever possible, escalation in care should ideally not lead to the separation of mother
228 and baby.

229 **Chronic thromboembolic pulmonary hypertension patients**

230 3.12 A subgroup of patients with chronic thromboembolic pulmonary hypertension (CTEPH) will
231 benefit from surgery and should be managed in designated national centres. Currently only
232 one UK centre provides specialist surgical intervention for patients with CTEPH.

233 **Extracorporeal membrane oxygenation**

234 3.13 The use of extracorporeal membrane oxygenation (ECMO) for the management of adults
235 with severe respiratory failure is centralized in a number of specialist cardiothoracic centres.
236 Anaesthetists often institute ECMO and support retrieval of patients from non-specialist
237 hospitals. Anaesthetists providing ECMO should be suitably trained.²⁹

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- 3.14 ECMO support may be used to provide procedural support for selected thoracic surgical procedures such as central airway surgery or severe broncho-pulmonary fistulae – such provision requires specialist care and should be centralised to appropriate centres.

Preassessment

- 3.15 In recent years there has been a trend towards assessment of elective patients in preadmission clinics, typically one to two weeks before surgery. This allows routine paperwork and investigations to be completed before admission, permits 'same day' admission and reduces the likelihood of delays or cancellation.³⁰ Anaesthetists should be part of the preadmission clinical pathway, including implementing interventions to promote enhanced recovery, this activity should be reflected in job plans.^{3,31,32,33}
- 3.16 Patients listed for thoracic surgery should have timely access to pre-operative investigations such as lung function and echocardiography, particularly for tumour resection surgery.

4 Training and education

- 4.1 Thoracic anaesthesia is a 'key unit of training' in both the 2010 intermediate level training in anaesthesia³⁴ and in the newer 2021 Curriculum Stage 2³⁵. Trainee anaesthetists should be of appropriate seniority to be able to benefit from this area of training. Stage 3 training of the 2021 Curriculum also requires trainees to be proficient in inserting double lumen airways and bronchial blockers which may require further thoracic surgery experience to complete.³⁶
- 4.2 All trainees should be appropriately clinically supervised at all times.³⁷
- 4.3 Trainees should have an appropriate balance between thoracic anaesthesia and ICU training based on their individual requirements.³⁸
- 4.4 Consultant or autonomously practising anaesthetists intending to deliver anaesthesia for thoracic surgery should have received training to a higher level in thoracic anaesthesia. This should be undertaken as a Special Interest Area in Stage 3 training for a period of 3 - 6 months in a recognised training centre.³⁶ Those providing critical care for cardiothoracic surgical patients should have received training as described by the Faculty of Intensive Care Medicine (see Cardiothoracic Critical Care, section 1.6 Guidelines for the Provision of Intensive Care Services (GPICS)).³⁹
- 4.5 Consultant or autonomously practicing anaesthetists intending to follow a career in paediatric thoracic or cardiothoracic anaesthesia should have higher training in general paediatric anaesthesia of at least one year followed by a specialist training period of an appropriate duration in the subspeciality.
- 4.6 All staff should have access to adequate time, funding and facilities to undertake and update training that is relevant to their clinical practice, including annual mandatory training such as basic life support.
- 4.7 Fellowship posts should be identified to allow additional training for those who wish to follow a career in thoracic anaesthesia to help ensure there are adequate numbers of skilled anaesthetists in the specialty. These should be suitable for trainees who wish to take time out of training programmes, or for those who are post certificate of completion of training (CCT). Such posts should provide similar or enhanced levels of teaching, training and access to study leave as for regular training posts.

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

4.8 Departments should consider providing all newly appointed consultants or autonomously practicing anaesthetists, particularly those with limited experience, with a mentor to facilitate their development in thoracic anaesthesia.

5 Organisation and administration

5.1 Anaesthetic involvement in the leadership of thoracic units should be considered.

5.2 There should be a forum for discussion of matters relevant to both surgeons and anaesthetists, for example protocol development and critical incidents.

5.3 Clinical protocols should be developed from national guidelines and reviewed on a regular basis.

5.4 Anaesthetists should be part of the multidisciplinary team engaged in development and implementation of enhanced recovery programmes in thoracic surgery.^{32,33,40}

5.5 Hospitals should have systems in place to facilitate multidisciplinary meetings for thoracic services.

5.6 All handovers should contain representatives for the multidisciplinary teams from both theatre and the receiving area and should be documented and structured to ensure continuity of care.⁴¹

5.7 The theatre team should all engage in the use of the World Health Organization (WHO) surgical safety process,⁴² commencing with a team brief, and concluding the list with a team debrief. The debrief should highlight things done well and also identify areas requiring improvement. Teams should consider including the declaration of emergency call procedures specific to the location as part of the team brief.

5.8 Hospitals should review their local standards to ensure that they are harmonised with the relevant national safety standards, e.g. National Safety Standards for Invasive Procedures in England (NatSSIPs) or the Scottish Patient Safety Programme in Scotland.^{43,44} Organisational leaders are ultimately responsible for implementing local safety standards as necessary.

5.9 There should be sufficient numbers of clinical programmed activities in clinicians' job plans to provide cover for all elective thoracic operating lists and to provide adequate emergency cover.⁴⁵

6 Financial considerations

Part of the methodology used in this chapter in making recommendations is a consideration of the financial impact for each of the recommendations. Very few of the literature sources from which these recommendations have been drawn have included financial analysis.

The vast majority of the recommendations are not new recommendations, but they are a synthesis of already existing recommendations. The current compliance rates with many of the recommendations are unknown, and so it is not possible to calculate the financial impact of the recommendations in this chapter being widely accepted into future practice. It is impossible to make an overall assessment of the financial impact of these recommendations with the currently available information.

6.1 Service developments outside the operating theatre often place unintended demands on anaesthetists. The business plans for such services should include provision for anaesthetic services.

7 Research, audit and quality improvement

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- 322 7.1 Most research in thoracic anaesthesia will be undertaken in specialist cardiothoracic units
323 and should be given high priority.
- 324 7.2 Regular clinical audit of the work of thoracic anaesthesia services is essential. This might also
325 include submission of data to national audits, such as the ACTACC national audit project
326 which includes thoracic anaesthesia topics. Information technology (IT) support should be
327 available for such activities.⁴⁶⁴⁷
- 328 7.3 All thoracic units should have regular morbidity and mortality meetings. These should have a
329 list of patients to discuss in advance, an attendance register, and minutes with learning
330 points. Consultants or autonomously practicing anaesthetists should attend these meetings
331 and should be included in job plans. Trainees should be encouraged to attend during their
332 attachments.
- 333 7.4 Robust procedures should be in place to report and investigate adverse incidents involving
334 equipment, staff or patients. The published outcomes of these investigations should be
335 disseminated to all relevant anaesthetists and others.
- 336 7.5 Units with pre-assessment clinics should attempt to take part in research looking at pre-
337 optimisation and prehabilitation.

338 8 Implementation support

339 The Anaesthesia Clinical Services Accreditation (ACSA) scheme, run by the RCoA, aims to provide
340 support for departments of anaesthesia to implement the recommendations contained in the
341 GPAS chapters. The scheme provides a set of standards, and asks departments of anaesthesia to
342 benchmark themselves against these using a self-assessment form available on the RCoA website.
343 Every standard in ACSA is based on recommendation(s) contained in GPAS. The ACSA standards
344 are reviewed annually and republished approximately four months after GPAS review and
345 republication to ensure that they reflect current GPAS recommendations. ACSA standards include
346 links to the relevant GPAS recommendations so that departments can refer to them while working
347 through their gap analyses.

348 Departments of anaesthesia can subscribe to the ACSA process on payment of an appropriate
349 fee. Once subscribed, they are provided with a 'College guide' (a member of the RCoA working
350 group that oversees the process), or an experienced reviewer to assist them with identifying actions
351 required to meet the standards. Departments must demonstrate adherence to all 'priority one'
352 standards listed in the standards document to receive accreditation from the RCoA. This is
353 confirmed during a visit to the department by a group of four ACSA reviewers (two clinical
354 reviewers, a lay reviewer and an administrator), who submit a report back to the ACSA committee.

355 The ACSA committee has committed to building a 'good practice library', which will be used to
356 collect and share documentation such as policies and checklists, as well as case studies of how
357 departments have overcome barriers to implementation of the standards, or have implemented
358 the standards in innovative ways.

359 One of the outcomes of the ACSA process is to test the standards (and by doing so to test the
360 GPAS recommendations) to ensure that they can be implemented by departments of anaesthesia
361 and to consider any difficulties that may result from implementation. The ACSA committee has
362 committed to measuring and reporting feedback of this type from departments engaging in the
363 scheme back to the CDGs updating the guidance via the GPAS technical team.

364 9 Patient information

365 The Royal College of Anaesthetists have developed a range of [Trusted Information Creator](#)
366 [Kitemark](#) accredited patient information resources that can be accessed from our [website](#). Our
367 main leaflets are now translated into more than 20 languages, including Welsh.

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

In order to give valid informed consent, patients need to understand the nature and purpose of the procedure. Full guidance, including on providing information to vulnerable patients, can be found in chapter 2.³ Specific considerations for thoracic surgery are outlined below:

9.1 Booklets providing information for patients about their stay in hospital should be available for all patients. This will include the patient information booklets published by the British Thoracic Society on lung disease and the Roy Castle Lung Cancer Foundation for information about lung cancer and its surgical treatment. Sources of information about the anaesthetic should also be available.^{3,48,49,50,51,52}

9.2 Information on specific individual risks of invasive monitoring, e.g. risk of injury due to arterial and central venous lines, should be available to patients.

9.3 All thoracic units should provide patient information about preoperative smoking cessation, including how to access local services to support patients wishing to quit before their operation.

Areas for future development

Robot assisted thoroscopic surgery (RATS) is currently undertaken in a small number of UK centres and may provide better surgical outcomes due to improved surgical dexterity and stereoscopic high definition operating conditions. There is currently a paucity of literature supporting improved clinical outcomes or cost effectiveness of RATS and the technique presents unique challenges for anaesthesia.⁵³

Video assisted thoroscopic surgery (VATS) with regional anaesthesia or spontaneously breathing general anaesthesia is described in the literature and currently being performed by a small number of units in the UK. There are theoretical advantages of avoiding general anaesthesia, lung isolation and positive pressure ventilation⁵⁴ and many procedures can be performed without these interventions by a suitably trained team with good patient selection. Evidence of the putative benefits of using these strategies is emerging.^{55,56,57}

Abbreviations

ACSA	Anaesthesia Clinical Services Accreditation
ACTACC	Association for Cardiothoracic Anaesthesia and Critical Care
BiPAP	Bilevel positive airway pressure
CDG	Chapter Development Group
CPAP	Continuous positive airway pressure
CQC	Care Quality Commission
CTEPH	Chronic thromboembolic pulmonary hypertension
ECMO	Extracorporeal membrane oxygenation
GMC	General Medical Council
GPAS	Guidelines for the Provision of Anaesthetic Services
GPICS	Guidelines for the Provision of Intensive Care Services
HFNO	High-flow nasal oxygen therapy
HDU	High dependency unit
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
PSC	Professional Standards Committee
QMSG	Quality Management of Service Group
RATS	Robot-assisted thoracic surgery
RCoA	Royal College of Anaesthetists
RCTs	Randomised controlled trials
SAS	Specialty and associate specialist

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

VATS	Video-assisted thoracic surgery
------	---------------------------------

Glossary

Clinical lead – SAS doctors undertaking lead roles should be autonomously practicing doctors who have competence, experience and communication skills in the specialist area equivalent to consultant colleagues. They should usually have experience in teaching and education relevant to the role and they should participate in Quality Improvement and CPD activities. Individuals should be fully supported by their Clinical Director and be provided with adequate time and resources to allow them to effectively undertake the lead role

Immediately – Unless otherwise defined, 'immediately' means within five minutes.

References

- 1 The Anaesthesia Team 2018. Association of Anaesthetists. London 2018 (<http://bit.ly/1JgMJr9>)
- 2 Hyder JA, Bohman JK, Kor DJ, et al. Anesthesia care transitions and risk of postoperative complications. *Anesth Analg* 2016; 122: 134–44
- 3 Guidelines for the Provision of Anaesthesia Services for the Perioperative Care of Elective and Urgent Care Patients. RCoA 2021
- 4 Klein AA, Meek T, Allcock E, Cook TM, Mincher N, Morris C, et al Recommendations for standards of monitoring during anaesthesia and recovery 2021: Guideline from the Association of Anaesthetists. *Anaesthesia*. 2021;76:1212-1223
- 5 JB Brodsky. Lung separation and the difficult airway (review). *Br J Anaes* 2009;103(1):i66–i75
- 6 Narayanaswamy M et al. Choosing a lung isolation device for thoracic surgery: a randomized trial of three bronchial blockers versus double-lumen tubes. *Anesth Analg* 2009;108(4):1097–101
- 7 Merli G et al. Recommendations for airway control and difficult airway management in thoracic anesthesia and lung separation procedures. *Minerva Anestesiol* 2009;75(1–2):59–78, 79–96
- 8 V Pathak et al. Ventilation and anesthetic approaches for rigid bronchoscopy. *Ann Am Thorac Soc* 2014;11(4):628–634
- 9 Association of Anaesthetists of Great Britain and Ireland. AAGBI guidelines: the use of blood components and their alternatives 2016. *Anaesthesia* 2016; 71: 829–42
- 10 Guidance on the use of ultrasound locating devices for placing central venous catheters. NICE, 2002 (<http://bit.ly/2IOCAR8>)
- 11 Shelley B, McCall P, Glass A et al. Association between anaesthetic technique and unplanned admission to intensive care after thoracic lung resection surgery. *Anaesthesia* 2019; 74: 1121–9
- 12 Lee CC et al. High flow nasal cannula versus conventional oxygen therapy and non-invasive ventilation in adults with acute hypoxemic respiratory failure: a systematic review. *Respir Med* 2016;121:100–8
- 13 Jones NL et al. A review of enhanced recovery for thoracic anaesthesia and surgery. *Anaesth* 2013;68:179–89
- 14 Batchelor T, Rasburn N, Abdelnour-Berchtold et al. Guidelines for enhanced recovery after lung surgery: recommendations of the enhanced after surgery (ERAS) society and the European Society of Thoracic Surgeons (ESTS). *Eur J of Cardiothoracic Surg* 2019; 55: 91–115
- 15 Yeung JH et al. Paravertebral block versus thoracic epidural for patients undergoing thoracotomy. *Cochrane Database of Syst Rev* 2016;2:CD009121
- 16 Checking anaesthetic equipment. AAGBI, 2012 (<http://bit.ly/1sRK9Gb>)
- 17 Fahrendorff M et al. The use of viscoelastic haemostatic assays in goal-directing treatment with allogeneic blood products: a systematic review and meta-analysis. *Scand J Trauma Resusc Emerg Med* 2017;25(1):39
- 18 Guidelines for the provision of paediatric anaesthesia services. RCoA, 2020
- 19 Quality standards for the care of critically ill children (5th edition). PICS, 2015 (<http://bit.ly/2kVJOig>)

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- 20 Proposed congenital heart disease standards and service specifications. *NHSE*, 2016 (<http://bit.ly/2vf8zOn>)
- 21 0–18 years: guidance for all doctors. *GMC*, 2007 (<http://bit.ly/2oJdALi>)
- 22 The Family Proceedings Courts (Children Act 1989) (Amendment) Rules 2004 (SI 2004 No.3376, L25)
- 23 Age of Legal Capacity (Scotland) Act 1991. *HMSO* (<http://bit.ly/1h9V7uU>)
- 24 Children (Scotland) Act 1995. *HMSO* (<http://bit.ly/1h9Ve9Q>)
- 25 Northern Ireland Child Care law – ‘the rough guide’. *DHSSPSNI*, 2004
- 26 Curriculum for a CCT in anaesthetics. *RCoA*, 2010 (<http://bit.ly/2fH4Jlv>)
- 27 Safeguarding children and young people: roles and competencies for health care staff (intercollegiate document). *RCPCH*, 2014 (<https://bit.ly/2oc4Obl>)
- 28 Guidelines for the provision of anaesthesia services for an obstetric population. *RCoA*, 2020
- 29 Pineton de Chambrun M, Bréchet N, Combes A. The place of extracorporeal life support in cardiogenic shock. *Current Opinion in Critical Care*: 2020; 26: 424-431
- 30 R Farasatkish et al. Can preoperative anesthesia consultation clinic help to reduce operating room cancellation rate of cardiac surgery on the day of surgery? *Middle East J Anaesthesiol* 2009;20(1):93–6
- 31 Arora RC, Brown CH, Sanjanwala RM, McKelvie R. NEW prehabilitation: a 3-way approach to improve postoperative survival and health-related quality of life in cardiac surgery patients. *Canadian Journal of Cardiology* 2018; 34: 839-49
- 32 Engelman D, Ben A, William J et al. Guidelines for Perioperative Care in Cardiac Surgery: Enhanced Recovery After Surgery Society Recommendations. *JAMA Surgery* 2019; 154: 755-66
- 33 Gregory A, Grant M, Manning M et al. Enhanced Recovery After Cardiac Surgery (ERAS Cardiac) Recommendations: An Important First Step-But There Is Much Work to Be Done. *J Cardiothorac Vasc Anesth* 2020; 34: 39-47
- 34 The CCT in anaesthetics – intermediate level training (annex C). *RCoA*, 2010 (www.rcoa.ac.uk/CCT/AnnexC)
- 35 2021 Curriculum Learning Syllabus: Stage 2. *RCoA*, 2021 (<https://bit.ly/3yZITtF>)
- 36 2021 Curriculum Learning Syllabus: Stage 3. *RCoA*, 2021 (<https://bit.ly/3ojw17P>)
- 37 Working arrangements for consultant anaesthetists in the United Kingdom. *AAGBI*, 2011 (<https://bit.ly/2meMUE5>)
- 38 Joint statement from FICM and RCoA on specialist modules. *FICM*, 2017 (<http://bit.ly/3QHOIhT>)
- 39 Guidelines for the provision of intensive care services. *FICM and ICS*, 2022 (<https://bit.ly/3yEf0tU>)
- 40 Gao S, Barellio S, Chen L, Chen C, Che G, Cai K et al. Clinical guidelines on perioperative management strategies for enhanced recovery after lung surgery. *Translational Lung Cancer Research* 2019; 8 (6) 1174-1187
- 41 Denomme J, Isac M, Syed S, Yu J, Centofanti J. Transitions in critical care - evaluating the implementation of a handover tool for postoperative cardiac surgery patients. *Canadian Journal of Anesthesia* 2019; 66 S117-18
- 42 World Alliance for Patient Safety – implementation manual surgical safety checklist: safes surgery saves lives. *WHO*, 2008 (<http://bit.ly/1cQ6tkS>)
- 43 National safety standards for invasive procedures (NatSSIPs). *NHSE*, 2015 (<http://bit.ly/1K6fRY2>)
- 44 Scottish Patient Safety Programme (<http://bit.ly/2lkzPTb>)
- 45 Working arrangements for consultant anaesthetists in the United Kingdom. *AAGBI*, 2011 (<http://bit.ly/2vf6FgN>)
- 46 Papachristofi O, Sharples LD, Mackay JH et al. The contribution of the anaesthetist to risk-adjusted mortality after cardiac surgery. *Anaesth* 2016;71:138–76
- 47 Klein AA et al. The incidence and importance of anaemia in patients undergoing cardiac surgery in the UK – the first Association of Cardiothoracic Anaesthetists national audit. *Anaesth* 2016;71(6):627–35
- 48 Your anaesthetic for heart surgery. *RCoA*, 2018 (<http://bit.ly/1pgKGpR>)

Chapter 18

Guidelines for the Provision of Anaesthesia Services for Thoracic Procedures 2023

- 49 Anaesthesia for thoracic (lungs and chest wall) procedures. AAGBI, (<http://bit.ly/2vz7ORm>)
- 50 Surgery for lung cancer. Roy Castle Lung Cancer Foundation, Liverpool 2016 (<http://bit.ly/2vACh18>)
- 51 Joint briefing: smoking and surgery. *Action on Smoking and Health*, 2016 (<http://bit.ly/2vfl3p9>)
- 52 Your anaesthetic for heart surgery. Information for patients and carers. RCoA, 2020 (<https://bit.ly/3bOWvsv>)
- 53 Campos J, Ueda K. Update on anesthetic complications of robotic thoracic surgery. *Minerva Anestesiologica* 2014;80(1):83–8
- 54 Gonzalez-Rivas D et al. Non-intubated video-assisted thorascopic lung resections: the future of thoracic surgery? *Euro J Cardiothorac Surg* 2016;49(3):721–31
- 55 Iwata Y et al. Anesthetic management of nonintubated video-assisted thorascopic surgery using epidural anesthesia and dexmedetomidine in three patients with severe respiratory dysfunction. *J Anesth* 2016;30(2):324–7
- 56 Guo Z et al. Video-assisted thorascopic surgery segmentectomy by non-intubated or intubated anesthesia: a comparative analysis of short-term outcome. *J Thorac Dis* 2016;8(3):359–68
- 57 Irons JF et al. Intubated versus nonintubated general anesthesia for video-assisted thorascopic surgery- a case-control study. *J Cardiothorac Vasc Anesth* 2017;31(2):411–7