Royal College of Anaesthetists

Chapter 17

Guidelines for the Provision of Anaesthesia Services (GPAS)

Guidelines for the Provision of Anaesthesia Services for Burn and Plastics Surgery 2020

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Declarations of Interest

All chapter development group (CDG) members, stakeholders and external peer reviewers were asked to declare any pecuniary or non-pecuniary conflict of interest, in line with the Guidelines for the Provision of Anaesthetic Services (GPAS) Conflict of Interests policy as described in the GPAS Chapter Development Process Document.

Declarations were made as follows:

- four members of the CDG were involved in producing five of the items of evidence.

The nature of the involvement in all declarations made above was not determined as being a risk to the transparency or impartiality of the chapter development. Where a member was conflicted in relation to a particular piece of evidence, they were asked to declare this, and then, if necessary, remove themselves from the discussion of that particular piece of evidence and any recommendation pertaining to it.

Medico-legal implications of the GPAS Guidelines

The GPAS Guidelines are not intended to be construed or to serve as a standard of clinical care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. Adherence to Guideline recommendations will not ensure successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgement should only be arrived at following discussion of the options with the patient, covering the diagnostic and treatment choices available. It is advised, however, that significant departures from the national Guidelines or any local guidelines derived from them should be fully documented in the patient's case notes at the time the relevant decision is taken.

Promoting equality and addressing health inequalities

The Royal College of Anaesthetists (RCoA) is committed to promoting equality and addressing health inequalities. Throughout the development of these Guidelines we have:

- given due regard to the need to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant Protected Characteristic (as defined in the Equality Act 2010) and those who do not share it
- given regard to the need to reduce inequalities between patients in access to, and outcomes from healthcare services and to ensure services are provided in an integrated way where this might reduce health inequalities.

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GPAS Guidelines in context

The GPAS documents should be viewed as 'living documents'. The GPAS Guidelines development, implementation and review should be seen not as a linear process, but as a cycle of interdependent activities. These in turn are part of a range of activities to translate evidence into practice, set standards, and promote clinical excellence in patient care.

Each of the GPAS chapters should be seen as independent but interlinked documents. Guidelines on the general provision of anaesthetic services are detailed in the following chapters of GPAS:

- chapter 2: guidance on the provision of anaesthesia services for preoperative assessment and preparation
- chapter 3: guidance on the provision of anaesthesia services for intraoperative care
- chapter 4: guidance on the provision of anaesthesia services for postoperative care.

The guidance in these three chapters applies to all patients who require anaesthesia or sedation, and are under the care of an anaesthetist. For urgent or immediate emergency interventions, this guidance may need to be modified as described in chapter 5: guidance on the provision of emergency anaesthesia services.

The rest of the chapters of GPAS apply only to the population groups and settings outlined in the 'Scope' sections of these chapters. They outline guidance that is additional, different or particularly important to those population groups and settings included in the Scope. Unless otherwise stated within the chapter, the recommendations outlined in chapters 2–5 still apply.

Each chapter will undergo yearly review, and will be continuously updated in the light of new evidence.

Guidelines alone will not result in better treatment and care for patients. Local and national implementation is crucial for changes in practice necessary for improvements in treatment and patient care.

Aims and objectives

The objective of this chapter is to promote current best practice for service provision in anaesthesia for burn and plastic surgery. This 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 burn and plastic surgery anaesthesia, but is primarily concerned with the requirements for the provision of a safe, effective and well-led service, which may be delivered by many different acceptable models. The guidance on provision of anaesthesia for burn-injured patients applies to all burn care services (facility, unit and centre) unless otherwise stated. The guidance on provision of anaesthesia for plastic surgery applies to all settings where this is undertaken, regardless of funding. All age groups, from neonates to the elderly, are included within the guidance unless otherwise stated, reflecting the broad nature of this service.

A wide range of evidence has been rigorously reviewed during the production of this chapter, including recommendations from peer-reviewed publications and national guidelines where available. However, both the authors and the CDG agreed that there is a paucity of level 1 evidence relating to service provision in burn and plastic surgery anaesthesia. In some cases it has been necessary to include recommendations of good practice based on the clinical experience of the CDG. We hope that this document will act as a stimulus to future research.

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The recommendations in this chapter will support the RCoA Anaesthesia Clinical Services Accreditation (ACSA) process.

Scope

Objective

To provide and describe current best practice in the provision of anaesthetic services within burn and plastic surgery and/or burn and plastic surgery interventions supported by evidence and national recommendations where available, for anaesthetists with responsibilities for service delivery and healthcare managers.

Target population

Groups that are covered:

- all ages of patients undergoing elective or emergency anaesthesia for burns that meet the thresholds for referral to specialised burn care services.[1]
- all ages of patients undergoing elective or emergency anaesthesia for plastic surgery procedures.
- all ages of patients undergoing elective anaesthesia for cosmetic surgery.
- anaesthetic departments that treat patients in the above group.
- anaesthetists working with patients in the above group.

Groups that are not covered:

- provision of burn and plastic services provided by a specialty other than anaesthesia.

Healthcare setting

All settings in which anaesthetic services are provided to patients for burn or plastic surgery and/or interventions.

Clinical management

Key issues that will be covered:

Key components needed to ensure provision of high quality anaesthetic services for patients requiring burn and plastic surgery procedures which involve anaesthetists.

Areas of provision included:

- levels of provision of service, including (but not restricted to) staffing, equipment, support services and facilities
- areas of special requirement, such as critical care, resuscitation, paediatrics, interventional radiology, endoscopy, satellite sites and the Emergency Department (ED)
- training and education
- research and audit
- organisation and administration
- patient Information.

Issues that are not covered:

Clinical guidelines specifying how healthcare professionals should care for people.

National level issues.

A note on cosmetic/aesthetic surgery

The Royal College of Surgeons categorises cosmetic treatments as follows:

- level 1a: Invasive – medium to high risk; may require general anaesthetic; may require an overnight stay
- level 1b: Invasive – low to medium risk, usually only requires local anaesthetic, out patient
- level 2: Minimally invasive – lower risk, usually non-permanent/reversible, day case, local anaesthetic if any.

Anaesthetists only provide services for level 1a or level 1b procedures.

Anaesthetic services provided for any surgery/intervention should adhere to the guidance on the general provision of anaesthetic services, which is detailed in chapters 2–4 as described above.

This guidance applies to all patients who require anaesthesia or sedation and are under the care of an anaesthetist, regardless of the funding model of the setting.

Anaesthetic services provided for head and neck surgery, for any purpose, should adhere to chapter 12.

Introduction

The range of procedures requiring anaesthesia for burn and plastic surgery is wide and includes patients of all ages. These range from those with common minor injuries (dog bites, nail bed injuries), to planned congenital cleft and hand procedures, and less frequently major burns and free-flap cases requiring multidisciplinary perioperative critical care. The recommendations in this chapter should be read in conjunction with those for general surgery, outlined in chapters 2–5, which unless otherwise stated, still apply.

Burns

Approximately 140,000 patients sustain burn injuries each year, with approximately 10% requiring admission to hospital, of which 50% are children. Burn care is stratified with four operational delivery networks in England and Wales and one in Scotland. Services are tiered for children and adults, following nationally agreed referral criteria,[1] with referral to Burn Facilities, Burn Units or Burn Centres dependent on the severity and complexity of the injury and locality. The Burn Care Standards were revised in 2013 to allow services to be peer reviewed against agreed benchmarks for specialist infrastructure and staff. The recommendations in this chapter apply to all tiers of burn care services, unless otherwise stated within individual recommendations.

Anaesthetists undertaking burn surgery need to be part of a multidisciplinary team and actively partaking in decision-making, inputting into ward management (including dressing changes and analgesia), critical care, and multidisciplinary team meetings.

Understanding the complexity of surgery for major burns surgery is vital. This includes the need to be prepared for massive blood loss, difficulties with monitoring and venous access, management of heat loss, prevention of thromboembolic events, and sepsis; as well as complex analgesia requirements, and understanding the impact on the patient and their family and of ongoing care for many years ahead. Anaesthetic services are not confined to provision of care in a theatre or critical care environment. Provision of remote analgesia, sedation and anaesthesia comes with its own potential difficulties with regard to monitoring and access to anaesthetic equipment. Services need to be able to provide care to meet standards for the admission to theatre of a patient with a major burn with little notice. Repeat and prolonged surgery for major burns is likely to continue for many weeks to months, with an impact on facilities, staff and equipment. Age appropriate services for anaesthesia and critical care must meet national and RCoA standards.

Plastic Surgery

Plastic surgery describes a reconstructive procedure designed to restore form and function to the body. It covers all aspects of wound healing and reconstruction after congenital, acquired (including secondary to cancer) or traumatic tissue defects. Other common conditions that can require plastic surgery include reconstruction of large skin defects, pressure sores and other chronic wounds, venous and other leg ulcers, and the results of devastating infections. Clinicians anaesthetising for plastic surgery procedures need an understanding of the principles of free-flap surgery. Age appropriate staff and facilities are required for complex surgery for congenital conditions, including cleft palate, congenital hand deformities, and trauma procedures. Prolonged procedures are common and require attention to detail regarding positioning, fluid management, blood flow, and prevention of thromboembolic complications.

Aesthetic Surgery

Aesthetic surgery is surgery carried out solely to change a person's appearance. Where a patient is receiving anaesthesia or sedation and is under the care of an anaesthetist for this type of surgery, the recommendations in this chapter and those relating to all types of surgery in chapters 2–4, still apply, regardless of the funding model of the setting.

Recommendations

The grade of evidence and the overall strength of each recommendation are tabulated in Appendix I. These recommendations should be read in conjunction with chapters 7,[2] 10,[3] 12,[4] and 16,[5] along with the Guidelines for the provision of intensive care services[6] and the Paediatric Intensive Care Society's 'Quality Standards for the care of critically ill children'[7] as there is considerable overlap.

1 Staffing requirements

1.1 An appropriately trained and experienced anaesthetist with regular commitments to burn and plastic surgery should be present during the conduct of general and regional anaesthesia for operative procedures, including those procedures requiring intravenous sedation where it has been agreed that this will be provided by the anaesthetic department.

1.2 An anaesthetist should be physically present when a general anaesthetic is administered. In exceptional circumstances, anaesthetists working singlehandedly may be called on briefly to assist with or perform a lifesaving procedure nearby. This is a matter for individual judgement, and the dedicated anaesthetic assistant should be present to monitor the unattended patient.[8]

1.3 A clinical lead for burn and plastic surgery anaesthesia should be appointed in each hospital providing anaesthesia for this specialty.

1.4 Anaesthetists should always be supported by dedicated, appropriately skilled and trained assistants, and the recovery facilities should be staffed during all operating hours and have appropriate anaesthetic support until the patient meets agreed discharge criteria.[9]

1.5 There should be adequate numbers of competent medical and non-medical staff to provide 24/7 cover for emergency burn and plastics anaesthesia.[10]

1.6 Where a paediatric service is being provided, all of the medical and non-medical staff, including recovery room staff, should have relevant and recent training in paediatric anaesthesia and resuscitation.[11,12]

1.7 There should be specific consultant programmed activity for burn anaesthesia in hospitals where burn surgery is undertaken.[11]

1.8 Where burn services are providing a Burn Centre level of care, there should be a 24/7 rostered availability of ST3 or above specialty registrars or appropriately experienced staff grade, associate specialist and specialty (SAS) doctors and emergency consultants. In Burn Centres that provide paediatric services, there should be a 24-hour rostered availability of consultant paediatric anaesthetists.[11]

1.9 There should be sufficient programmed activity time available for anaesthetists to assess patients perioperatively and attend multidisciplinary ward rounds.

1.10 There should be sufficient programmed activity to provide support to sedation and analgesia services for burn patients.

1.11 The clinical lead (see glossary) anaesthetist in burn and plastic surgery units will be responsible for the provision of service, teaching, production of guidelines, management, research, and audit, and be able to support quality improvement initiatives. Sufficient time should be included in job plans to support these activities and the continuing professional development of those anaesthetists.

2 Equipment, services and facilities

General equipment, services and facilities for anaesthesia are described in chapters 2–5. Additional specialised recommendations for burn and plastic surgery anaesthesia are given below.

Equipment

2.1 Appropriate equipment should be available to enable prone positioning of patients.[13]

Airway and ventilation

Burn and plastic surgery patients have a higher incidence of difficult airway.

2.2 A difficult airway trolley, including the equipment necessary for failed intubation and surgical airway access, should be available.[14] Appropriate specialist intubation equipment, including fibre-optic intubation equipment should be available. A fibre-optic scope should be available to assess inhalational injury.[15,16,17,18,19]

2.3 Equipment necessary for the formation of a surgical airway, including cricothyroidotomy, should be available.[20]

2.4 Ventilators with advanced ventilatory mode functions should be available.[21]

Monitoring

Physiological monitoring can be difficult in patients with major burns, as there may be a lack of sites available for probes, cuffs, and electrodes.[15,22]

2.5 Equipment to comply with the Association of Anaesthetists standards for anaesthetic monitoring should be available.[23]

2.6 Pulse-oximetry ear probes should be available.[22]

2.7 It may be difficult to make the electrocardiogram (ECG) gel electrodes adhere to damaged skin. ECG electrodes could be sited away from the chest[22] or could be attached to crocodile clips, surgical staples or steel sutures placed in burned areas.[15,19,24]

2.8 Invasive arterial blood pressure monitoring should be available for extensive burn debridement and major plastic surgery, to allow the benefits of continuous pressure monitoring, pulse-contour analysis and ease of blood sampling.[15,18,19,24]

2.9 An arterial blood-gas machine should be immediately available.

2.10 Equipment for central venous pressure, core and peripheral temperature, and urinary output monitoring should be available.[25,26]

2.11 Equipment to measure carbon monoxide levels in blood should be available.[15]

Equipment for delivery of anaesthesia services outside the operating room

2.12 Many burn-injured patients will require frequent sedation or anaesthesia for procedures outside the operating theatre. These should take place in a specified location that is provided with all the equipment required for the safe delivery of anaesthesia and to meet minimum monitoring standards.[2,23,27]

2.13 Equipment, such as TV screens and tablet computers, for distraction during painful procedures, including dressing changes, should be considered.[28,29,30]

Equipment for temperature management

The combination of lengthy procedures in cold operating theatres, large exposed areas of body surface, and administration of large volumes of fluids, can lead to marked intraoperative hypothermia. The consequences of hypothermia can be serious and affect outcomes in burn and plastic surgery patients.[31] Potential complications include cardiac events, coagulation disorders and blood loss, increased incidence of surgical wound infection, postoperative shivering, and prolonged hospital stay, as well as the increased costs associated with surgery.[32] The requirement for intraoperative analgesia and recovery times have been shown to be significantly lower for warmed plastic surgery patients.[31]

2.14 Temperature monitoring equipment should be available and easily accessible.[15,19,24]

2.15 Active warming equipment should be available and easily accessible, including warmed blankets for body areas not being operated on, forced-air warming devices[15,19,24,33] and devices for heating mattresses.[26]

2.16 Consideration should also be given to the provision of radiant heaters and more sophisticated warming devices.[15]

2.17 Warmed intravenous fluids should be available.[15,26]

Thromboprophylaxis

Burn patients are at particular risk of thromboembolic complication.

2.18 For burn and plastic surgery patients, mechanical methods of VTE prophylaxis, including graduated compression stockings, intermittent pneumatic compression devices, and venous foot pumps, should be available for any procedure that lasts more than one hour, and for all patients receiving general anaesthesia.[26,34]

Blood transfusion

Debridement of major burns has the potential for significant blood loss.

2.19 Equipment for blood transfusion should be available, including rapid transfusion devices.

2.20 Point of care testing for coagulation and haemoglobin, including thromboelastometry, could be considered to allow targeted use of blood products in major surgery for burns.[35]

2.21 For burns procedures, blood and blood products should be immediately available.[11,15,18,19]

2.22 Advice from a haematologist should be available at all times.

Services

2.23 Psychology and physiotherapy should be available to help manage the consequences of complex repetitive anaesthesia, and of the sedation and analgesia requirements of burn-injured patients.[11,36]

2.24 There should be access to an acute pain service.[11,22,37,38]

2.25 There should be adequate, age-appropriate critical care facilities, including high-dependency and intensive care units fulfilling national standards, to allow the timely admission of patients who require these services following surgery, including those with resuscitation burns and undergoing free-flap surgery.[6,11,25,39]

Facilities

2.26 Burn care services should have access to an appropriately sized, temperature and humidity controlled theatre at all times, with a maximum temperature setting of at least 30°C.[11,19]

2.27 A burns theatre should be located in immediate proximity to any service providing critical care for burn patients.[11]

2.28 A dedicated burns theatre should be adequately stocked and resourced. Theatre anaesthetic equipment and transport monitoring should be compatible with that used in the critical care rooms. Single use patient items are preferred, and protocol-based cleaning is needed between cases.[15]

2.29 Anaesthetic led sedation for dressing changes should take place in rooms equipped with monitoring, piped medical gases, scavenging (where needed), suction, an anaesthetic machine, and drug-infusion pumps.

2.30 Access to a high dependency unit for patients undergoing reconstructive surgery should be available.[40]

3 Areas of special requirement

Children

General recommendations for the provision of anaesthetic services for children are described in chapter 10.[2]

3.1 Wherever children and young people undergo anaesthesia, their particular needs should be recognised, and they should be managed in age appropriate facilities and be looked after by staff with relevant experience and ongoing training.[2]

3.2 Children with burns should be cared for in burn services in accordance with the National Burns Care Referral Guidance and with staff and facilities according to the Burn Care Standards.[11]

3.3 Children requiring surgery for cleft lip and palate should be treated by a specialist cleft service.

3.4 Wherever sedation services for paediatric burn management exist, anaesthetists should be involved with setting up, monitoring and auditing the service.

3.5 Anaesthetists who prescribe sedation for paediatric burn patients should have received appropriate training.[41]

3.6 Anaesthetists who prescribe oral sedation for paediatric burn patients do not need to be physically present for the procedure for which sedation is being prescribed, but they, or other suitably trained and experienced staff, need to be available to return immediately if the need arises.[42]

3.7 General anaesthesia may be more appropriate than sedation for an individual. If general anaesthesia is performed in non-theatre environments, the recommendations in chapter 7 should be followed.[2]

3.8 A hospital education and play service should be available for children.[11]

Child protection

It is essential to exclude non-accidental injury in children with burn injuries.

3.9 Healthcare workers, including the anaesthetist, must be aware of the local policy for child protection, and they have an obligation to document and report any concerns to a responsible individual.[43]

3.10 Hospitals must have guidelines in place to ensure the safety of children admitted to hospital, monitor injured children known to be at risk, and identify concerns arising from any injury or pattern of injuries.[22,44] They must provide the appropriate training related to these guidelines.

Critical care

Major burn injuries and complex plastic surgery cases often require critical care services. Recommendations for the provision of such services are described in Guidelines for the provision of intensive care services.[6]

3.11 Staffing models should promote shared care between burn and critical care teams as this may improve safety.[45]

Procedural sedation

Dressing changes, with or without showering or bathing, are a frequent accompaniment to the early phase of burn treatment. Where possible, they are conducted without general anaesthesia.

3.12 Any sedation service should be age appropriate, with general anaesthesia an option available for some cases.[22,42,46,47]

4 Training and education

Different levels of training and ongoing education are required, depending on the level of service provision provided by hospitals.

4.1 Patients requiring burn or plastic surgery procedures should be managed by anaesthetists who have an appropriate level of training in this field, have regular commitment to the burn and plastic surgery specialty, and have acquired the relevant knowledge and skills needed to care for these patients.

4.2 In order to maintain the necessary repertoire of skills, anaesthetists providing a burn and plastic surgery anaesthetic service should have a regular commitment to the specialty, and adequate time must be made for them to participate in a range of relevant continuing medical education (CPD) activities.

4.3 A small number of centres perform burn surgery. These centres should offer external training opportunities for anaesthetists, nursing staff, physiotherapists and other members of the multidisciplinary team.[48]

4.4 Anaesthetists who provide emergency care outside burn services should be trained in the initial management of the patient with severe burns, including timely emergency assessment, resuscitation, and transfer to a burns service, through the EMSB (Emergency Management of the Severe Burn) or an equivalent course.[49]

5 Organisation and administration

Burns

Requirements for links to other departments

Teams rather than individuals deliver care of the burn-injured patient. Effective teamwork can increase safety, whilst poor teamwork can have the opposite effect. It is therefore important that burn services anaesthetists develop good working relationships and lines of communication with other healthcare professionals involved in burn patients' care.[50]

5.1 The anaesthetist should be part of a burns multidisciplinary team.[11]

Organisation of lists

5.2 Burn surgery operating lists should be scheduled in working hours.[51]

5.3 Additional burn surgery operating lists may be planned at weekends and bank holidays to prevent unnecessary delays in treatment.[51]

5.4 Any scheduled burn lists should be organised and staffed by appropriately trained anaesthetists and surgeons, working regularly in that area, who have no conflicting clinical commitments.[51]

5.5 Patients requiring planned or emergency burn surgery should be cared for by theatre staff with current experience in burn care.[11] Anaesthetists who provide emergency care outside burn services should be trained to manage the initial treatment of the patient with severe burns, including timely emergency assessment, resuscitation, and transfer to a burns service.

5.6 Theatre and recovery staffing arrangements should be compliant with national guidelines.[9,23,52]

5.7 Safe sedation and analgesia for burn injured patients undergoing painful procedures outside of the operating theatre environment should be available, for example staple removal, wound dressing and showering.[2,23,53]

5.8 A nurse led sedation service should be supported by an immediately available burn anaesthetist.[42]

Contingency plans for urgent procedures

5.9 Timely access to theatre staff with experience in burn care should be available outside of normal working hours.[11]

5.10 Theatre teams should be informed whenever a major burn case is expected or has arrived. A member of the theatre team should be responsible for ensuring the availability of appropriately trained staff and facilities.[11]

5.11 All specialist burn services should participate in major incident planning with national and regional networks.[11]

5.12 Providers of emergency care outside burn services should have the knowledge and equipment needed to treat burn-injured patients should there be an extended delay in transporting the patients to a burn centre, as might be the case in a mass casualty incident.[54]

5.13 Transfer of the critically ill, burn-injured patient between services should follow national guidelines.[55,56,57]

Policies

5.14 Agreed local clinical guidelines should be in use which have been produced by an appropriately constituted multiprofessional team, comprising anaesthetists, specialist nurses, surgeons, critical care clinicians, pharmacists, specialty consultants and managers. These guidelines should cover at least the following:

- assessment and management of pain and itch, including the recording of pain and itch scores[11,58]
- sedation for painful procedures [11]
- initial assessment and management of burn-injured patients [11]
- recognition and management of the acutely unwell and deteriorating patient, including the need to escalate care and transfer to a higher level of care [11]
- assessment and management of burns to the face and airway [11]
- transfer policy, including the resources required [11]
- all trusts with an emergency department should have a plan for the management of major incidents involving burn-injured patients[59] which makes reference to the national burn major incident plan[11]
- management of multi-drug resistant infections
- perioperative temperature control [15,60]
- thromboprophylaxis
- major haemorrhage and transfusion policy [35]
- provision of sedation and anaesthesia outside of the operating theatre environment [53]
- a lipid rescue protocol should be in place where local anaesthetic infiltration is used.[61]

Plastic surgery

Organisation of lists

5.15 Elective plastic surgery operating lists should be separated from those for plastic surgery trauma to allow efficient planning in advance for elective cases, prevent cancellation of elective cases and allow a flexible response to emergencies.[51]

5.16 Hospitals should provide scheduled local anaesthetic lists, using a dedicated area for initiating and assessing local nerve blocks. Organising cases in this way fosters the development and maintenance of expertise in the anaesthetists and support staff, and minimises delay between cases.

5.17 For planned burn and plastic surgery there should be a preoperative assessment clinic organised as described in chapter 2.

5.18 There should be specific guidelines for assessing a suspected difficult airway, for example in patients with head and neck malignancy and in reconstructive burn surgery.[62]

5.19 Where major elective reconstructive surgery requiring postoperative critical care provision is undertaken, the funding for, and provision of, these beds should be planned to meet the demands of the service, so that unnecessary cancellations can be minimised.

5.20 All major head and neck surgery should be overseen by a named consultant anaesthetist with a subspecialty interest in this area.[63]

5.21 There should be funding for, and provision of, staff trained in post-operative monitoring of free tissue transfers and replanted tissues to reduce the incidence of flap failure.[39,64]

5.22 When very long surgical procedures are scheduled on a regular basis, appropriate funding and resources should be in place to support long duration lists.

Contingency plans for urgent procedures

5.23 Plastic surgery trauma lists should take place daily in working hours to prevent unnecessary overnight operating.[51]

5.24 Patients should not unnecessarily undergo surgery at night. In order to prevent this, planned operating lists may be necessary in the evening and weekend, in addition to scheduled weekday trauma sessions.[51]

5.25 Any scheduled plastic surgery trauma lists should be organised and staffed by senior anaesthetists and surgeons, working regularly in that area and without conflicting clinical commitments.[51]

5.26 Departments should develop and regularly review burn and plastic surgery referral guidelines and major incident plans.[54]

Policies

5.27 Agreed local clinical guidelines should be in use, produced by an appropriately constituted multiprofessional team, comprising anaesthetists, specialist nurses, surgeons, critical care clinicians, pharmacists, specialty consultants and managers. These guidelines should cover at least the following:

- airway management, including follow up for difficult patients (both plastic surgery and burn reconstructive surgery) [62]
- monitoring of free flaps [39]
- monitoring of local anaesthetic blocks
- thromboprophylaxis [34]
- intraoperative warming.[32]

6 Financial Considerations

The costs of burn care are high due to the combination of specialised treatment and the often long lengths of stay.[65] Part of the methodology used in this chapter is a consideration of the financial impact for each of the recommendations made. Very few of the literature sources referenced have included financial analysis.

The majority of the recommendations are not new, but are a synthesis of pre-existing work. Current compliance rates with the recommendations are unknown, and so it is not possible to calculate the financial impact of their implementation in future practice. It is impossible to make an overall assessment of the financial impact of these recommendations with the currently available information.

7 Research, audit and quality improvement

7.1 Anaesthesia for burn and plastic surgery should be included in regular anaesthetic department mortality and morbidity meetings, audit meetings and quality improvement programmes.

7.2 Multidisciplinary audit meetings involving surgical teams should be encouraged, where mortality and morbidity should be discussed alongside all serious untoward incidents relative to the service.

7.3 Anaesthetic departments should be integrated into the overall clinical audit and governance structure of the hospital. Each anaesthetic department undertaking anaesthesia for burn and plastic surgery should have a system in place for the routine audit of important areas such as:

- perioperative temperature management [31]
- optimisation of perioperative blood transfusions [35]
- management of perioperative pain [66]
- management of perioperative blood-pressure control in plastic surgery [67]
- management of post-burn pruritus [68]
- quality of analgesia.

7.4 Burn services should undergo regular peer reviews within the national burn care network.[11]

7.5 Departments of anaesthesia should be encouraged to develop local key quality indicators relevant to their activity, which will assist in the process of supporting quality improvement.[11]

7.6 Research in anaesthesia for burn and plastic surgery should be encouraged. Staff members undertaking research should have received appropriate training.[69]

8 Implementation Support

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

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

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

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

9 Patient Information

Patients with difficult airways

9.1 When an awake fibre-optic intubation is required, patients should be informed. As part of a difficult airway follow up, patients should be informed verbally and in writing about any airway problem the anaesthetist encountered, and be advised to bring this to the attention of anaesthetists during any future preoperative assessment. The patient's GP should also be informed in writing.[70]

Regional anaesthesia

9.2 Where alternative techniques are available, the patient's preference must be fully taken into account.[71]

Consent

9.3 Anaesthetic risks must be communicated appropriately to the patient as part of the consent process.[71] The Royal College of Anaesthetists series of leaflets on 'The Risks of Anaesthesia'[72] could aid this discussion.

Areas for future development

Topics in anaesthesia for burn and plastic surgery in need of further research:

- adjuncts to pain control in burn injured patients [28]
- effective treatments for post burn pruritus [68]
- core burn outcomes for research
- fluid management
- use of technology, such as telemedicine, to help burns assessment
- financial implications of anaesthesia for burn and plastic 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.

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Appendix 1: Recommendations Grading

The grading system is outlined in the 'Methodology' section of this chapter. The grades for each of the recommendations in this chapter are detailed in the table below:

Recommendation Number	Level of Evidence	Strength of Recommendation
1.1	GPP	Strong
1.2	C	Strong
1.3	GPP	Strong
1.4	C	Strong
1.5	C	Strong
1.6	C	Strong
1.7	C	Strong
1.8	C	Strong
1.9	GPP	Strong
1.10	GPP	Strong
1.11	GPP	Strong
2.1	C	Strong
2.2	C	Strong
2.3	C	Strong
2.4	B	Strong
2.5	C	Strong
2.6	C	Strong
2.7	C	Strong
2.8	C	Strong
2.9	GPP	Strong
2.10	C	Strong
2.11	C	Strong
2.12	C	Strong
2.13	B	Weak
2.14	C	Strong
2.15	C	Strong
2.16	C	Weak
2.17	C	Strong
2.18	C	Strong
2.19	GPP	Strong
2.20	B	Aspirational
2.21	C	Strong
2.22	GPP	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
2.23	C	Strong
2.24	B	Strong
2.25	C	Strong
2.26	C	Strong
2.27	C	Strong
2.28	C	Strong
2.29	GPP	Strong
3.1	C	Strong
3.2	C	Strong
3.3	C	Strong
3.4	GPP	Strong
3.5	B	Strong
3.6	GPP	Strong
3.7	C	Strong
3.8	C	Strong
3.9	M	Mandatory
3.10	C	Mandatory
3.11	B	Strong
3.12	B	Strong
4.1	GPP	Strong
4.2	GPP	Strong
4.3	C	Strong
4.4	GPP	Strong
5.1	C	Strong
5.2	C	Strong
5.3	C	Aspirational
5.4	C	Strong
5.5	C	Strong
5.6	C	Strong
5.7	C	Strong
5.8	B	Strong
5.9	C	Strong
5.10	C	Strong
5.11	C	Strong
5.12	C	Strong
5.13	C	strong
5.14	B	Strong

Recommendation Number	Level of Evidence	Strength of Recommendation
5.15	C	Strong
5.16	GPP	Strong
5.17	GPP	Strong
5.18	B	Strong
5.19	GPP	Strong
5.20	C	Strong
5.21	C	Strong
5.22	GPP	Strong
5.23	C	Strong
5.24	C	Strong
5.25	C	Strong
5.26	C	Strong
5.27	B	Strong
7.1	GPP	Strong
7.2	GPP	Strong
7.3	B	Strong
7.4	C	Strong
7.5	C	Strong
7.6	C	Strong
9.1	GPP	Strong
9.2	M	Mandatory
9.3	M	Mandatory

Chapter 17
Guidelines for the Provision of Anaesthesia Services for Burn and Plastics Surgery 2020

About these Guidelines

Methodology

The process by which this chapter has been developed has been documented within the GPAS Chapter Development Process Document.

The evidence included in this chapter is based on a systematic search of the literature. Abstracts were independently screened by two investigators and reviewed against inclusion and exclusion criteria. Data were extracted by one investigator in accordance with predefined criteria. The review's objective was to determine the key components needed to ensure provision of high-quality anaesthetic services for patients who undergo burn or plastic surgery and/or related interventions which involve anaesthesia.

Search strategy

Searches were performed on Embase (1980 to present), Ovid MEDLINE (1996 to present), CINAHL and the Cochrane Library, for the literature search strategy, outcomes, databases, criteria for inclusion and exclusion of evidence (for the full Burns and Plastics chapter search protocol please contact the RCoA). A hand search of the literature was also conducted by the authors using the reference lists of relevant original articles and review articles.

The literature search was performed in September 2015 with a final update in August 2016.

The authors and researcher independently reviewed the abstracts and titles of the studies found in the initial search. After agreement on the primary selection of papers, full-text versions were accessed and reviewed against the following predefined inclusion and exclusion criteria. The full text papers were also reviewed by the CDG for suitability. The final list of publications used can be found in the References.

Inclusion criteria

The literature review considered studies that included the following patient population with all of the inclusion criteria listed below:

- all patients undergoing elective or emergency anaesthesia
- all staff groups working within burn and reconstructive plastic anaesthesia, including (but not restricted to) consultant anaesthetists, staff grade, specialty and associate specialist (SAS) doctors, trainee anaesthetists, nurses, operating department practitioners, surgeons, pharmacists, general practitioners, psychotherapists, occupational therapists, and psychiatrists.

Exclusion criteria

The literature review used the following exclusion criteria:

- studies that investigated the provision of a burn and plastic surgery anaesthesia service provided by a specialty other than anaesthesia were excluded
- publications that duplicated data that had been reported in an earlier publication were also excluded.

Data extraction and analysis

Data were extracted by the authors using a pro forma. The study characteristics data included:

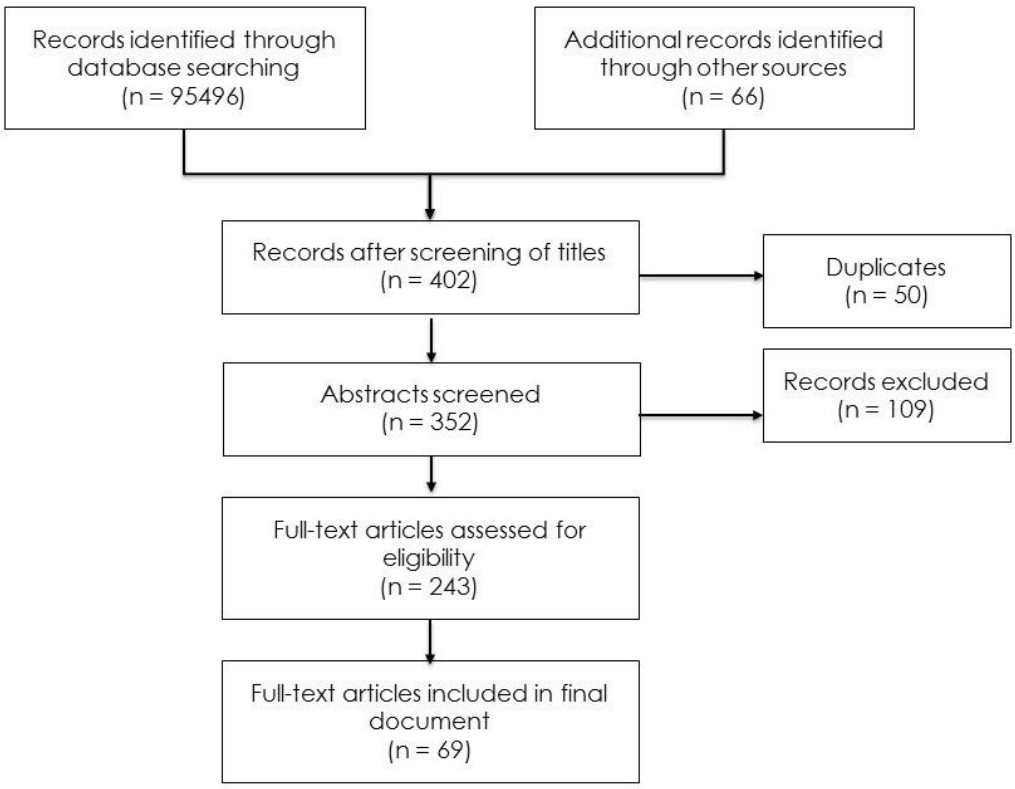
- the journal and country of publication
- the number of patients recruited into the study

- the study design
- patient characteristics
- outcome data
- the logic of the argument
- author's conclusions
- reviewer's comments.

The patient characteristics data extracted were age, gender and type of surgery. The analysis considered studies that included any clinical outcome, including (but not restricted to) survival, length of stay, critical care or hospital, morbidity, adverse effects and complications.

The results of the literature review can be seen below:

Preferred Reporting Systems for Systematic Review and Meta-analysis (PRISMA) flow chart



The evidence that is included in this chapter has been graded according to grading system, adapted from NICE and outlined below.

Level	Type of evidence	Grade	Evidence
Ia	Evidence obtained from a single large/multicentre randomised controlled trial, a meta-analysis of randomised controlled trials or a systematic review with a low risk of bias	**A**	At least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation (evidence level I) without extrapolation
Ib	Evidence obtained from meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias	**B**	Well-conducted clinical studies, but no high-quality randomised clinical trials on the topic of recommendation (evidence levels Ib, II or III), or extrapolated from level Ia evidence
IIa	Evidence obtained from at least one well-designed controlled study without randomisation		
IIb	Evidence obtained from at least one well-designed quasi-experimental study		
IIc	Evidence obtained from case control or cohort studies with a high risk of confounding bias		
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case-studies		
IV	Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities	**C**	Expert committee reports or opinions and/or clinical experiences of respected authorities (evidence level IV) or extrapolated from level I or II evidence. This grading indicates that directly applicable clinical studies of good quality are absent or not readily available
UG	Legislative or statutory requirements	**M**	This grading indicates that implementation of this recommendation is a statutory requirement, or is required by a regulatory body (e.g. CQC, GMC)
		GPP	Recommended good practice based on the clinical experience of the CDG
Adapted from Eccles M, Mason J (2001) How to develop cost-conscious guidelines. Health Technology Assessment 5:16 and Mann T (1996) Clinical Guidelines: Using Clinical Guidelines to Improve Patient Care Within the NHS. London: Department of Health.			

Strengths and limitations of body of evidence

Most of the published evidence on head and neck surgery is descriptive. There are publications describing aspects of this process based on expert opinion.

The limitations of the evidence are:

- the 'unmeasurables' (attitudes, behaviour, motivation, leadership, teamwork)
- few randomised controlled trials (RCTS); studies frequently use mixed populations of emergency and elective patients, or all emergency patients grouped together despite different underlying diagnoses
- papers often examine a single intervention within complex system or bundle
- papers are often examining small numbers and/or patients from a single centre
- poor use of outcome measures, frequently concentrating on easily measured short term outcomes which are not patient centred
- generally, a paucity of long-term follow up
- there is no standard definition used of 'high risk'
- use of different risk scoring systems
- decrease in outcome over time and geography when 'good papers' are used in quality Improvement programmes
- application of international studies in systems with either more or less resources than the UK into NHS practice
- older studies may no longer be applicable within the NHS
- very few studies included any analysis of financial implications
- evidence was mainly based on literature graded III and IV.

Methods used to arrive at recommendations

Recommendations were initially drafted based on the evidence by the authors for the chapter. These were discussed with the CDG, and comments were received both on the content and the practicality of the recommendations. The level of evidence that was the basis for each recommendation was graded according to a grading system, and the recommendation was then graded taking into account the strength of the evidence and the clinical importance using a recommendations criteria form (see GPAS Chapter Process Document).

Recommendations were worded using the following system of categorisation:

Strength	Type of evidence	Wording
Mandatory	The evidence supporting the recommendation includes at least one with an 'M' grading	Wording should reflect the mandatory nature of the recommendation, i.e. 'must'
Strong	Confidence that for the vast majority of people, the action will do more good than harm (or more harm than good)	Wording should be clearly directive 'should' or 'should not'
Weak	The action will do more good than harm for most patients, but may	Wording should include 'should be considered'

	include caveats on the quality or size of evidence base or patient preferences	
Aspirational	While there is some evidence that implementation of the recommendation could improve patient care, either the evidence or the improvement is not proven or substantial	Wording should include 'could'
Equipoise	There is no current evidence on this recommendation's effect on patient care	Wording should include 'there is no evidence of this recommendation's effect on patient care'

Consultation

The chapter has undergone several rounds of consultation. The multidisciplinary CDG formed the first part of the consultation process. The authors and GPAS Editorial Board identified key stakeholder groups. Where stakeholders are represented by an association or other medical college, they were asked to nominate delegates to join the CDG. The Chapter Process Document explains the recruitment process for those CDG members who were not directly nominated. The CDG members were involved in drafting the recommendations, and were provided with an opportunity to comment on all subsequent drafts of the chapter.

The chapter underwent peer review. Peer reviewers were identified by the GPAS Editorial Board or Professional Standards Committee. Nominees were either anaesthetists of consultant grade or were nominated by a key stakeholder group. Nominees had not had any involvement in the development of GPAS to date and were asked to comment upon a late draft of the chapter.

Following peer review, the chapter was reviewed by the College's Professional Standards Committee and the College's Lay Committee. Comments from all groups were considered and incorporated into a consultation draft.

The consultation draft of this chapter was circulated for public consultation from 22 December 2016 to 22 January 2017. As well as being made available on the College's website and promoted via Twitter, the draft was also circulated to all key stakeholder groups identified by the authors and the College. A list of organisations contacted by the College is available from the GPAS team at the College: GPAS@rcoa.ac.uk.

The editorial independence of GPAS

The development of GPAS is solely funded by the Royal College of Anaesthetists. However, only the GPAS technical team and the GPAS researcher are paid directly by the College for their work on GPAS, the GPAS Editors' employing organisation receives 2 programmed activities (PA) backfill funding. All funding decisions by the College are made by the CEO, in collaboration with the senior management team and College Council.

The authors of the chapters are all fellows of the Royal College of Anaesthetists. Members of College Council cannot act as chair of any CDG, as this individual has the deciding vote under the consensus method of decision making used in the chapters. Where College Council members have been involved in chapter development, this has been declared and recorded.

All persons involved in the development of GPAS are required to declare any pecuniary or non-pecuniary conflict of interest, in line with the GPAS conflict of interest policy as described in the

GPAS Chapter Development Process Document. Any conflicts of interest are managed on a case-by-case basis to maintain the transparency and impartiality of the GPAS document. The conflicts, and the way they were managed, are outlined at the beginning of the chapter.

The role of the GPAS Editorial Board and CQRB

The overall development of the entire GPAS document is overseen by the CQRB of the Royal College of Anaesthetists, which includes representatives from all grades of anaesthetist, clinical directors and lay representation.

Responsibility for managing the scope of the document and providing clinical oversight to the project technical team is delegated by the CQRB to the GPAS Editorial Board, which includes individuals responsible for the various internal stakeholders (see above for membership). On the inclusion/exclusion of specific recommendations within each chapter, the Editorial Board can only provide advice to the authors. In the event of disagreement between the authors, the majority rules consensus method is used, with the GPAS Editor holding the deciding vote.

Both of these groups, along with the College's Lay Committee review each chapter and provide comment prior to public consultation and are responsible for signoff before final publication. In the event of disagreement, consensus is reached using the majority rules consensus method, with the chair of CQRB holding the deciding vote.

Updating these guidelines

This chapter was updated in January 2020.

Guidelines will be updated on an annual basis. The researcher will conduct the literature search again using the same search strategy to uncover any new evidence, and members of the public will be able to submit new evidence to the GPAS project team. Where new evidence is uncovered, the lead author will decide whether the recommendations that were originally made are still valid in the light of this new evidence.

If new evidence contradicts or strengthens existing recommendations, the authors decide whether or not to involve the remainder of the CDG in revising the recommendations accordingly.

If new evidence agrees with existing recommendations, then a reference may be added but no further action is required.

If there is no new evidence then no action is required.

This chapter is due to be fully reviewed for publication in January 2022.

Every five years, guidance will be submitted to a full review, involving reconvening the CDG (or appointment of a new, appropriately qualified CDG), and the process described in the 'Methodology' section of this chapter begins again.

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