



OAA / AAGBI Guidelines for Obstetric Anaesthetic Services 2013

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This is a consensus document produced by expert members of a Working Party established by the Association of Anaesthetists of Great Britain and Ireland (AAGBI) and the Obstetric Anaesthetists' Association (OAA). It updates and replaces previous guidance published in May 2005. It has been seen and approved by the AAGBI Council and the OAA Committee.

- **What other guideline statements are available on this topic?**

The Royal College of Obstetricians & Gynaecologists have produced guidelines on the provision of maternity services:

1. High quality women's health care: A proposal for change. RCOG press, London, 2011.
2. Safer childbirth: Minimum standards for the organization and delivery of care in labour. RCOG press, London, 2007.

- **Why was this guideline developed?**

The original guideline published in 1998 was developed to ensure that obstetric patients received the same standards of anaesthetic care as those recommended for the general surgical population.

- **How and why does this statement differ from existing guidelines?**

This guideline concentrates on the roles and activities of the obstetric anaesthetist within the multidisciplinary team required to deliver safe maternity care. The major changes compared with the 2005 version include a section on maternity critical care and the recommendation for increased dedicated consultant anaesthetic sessions.

The need to define anaesthetic services in maternity in 2013 reflect the expanding role of the anaesthetist as peri-partum physician in caring for an increasingly challenging patient population in a rapidly changing health service.

Date of review: 2018

1. Key recommendations

1. A duty anaesthetist must be immediately available for emergency work on the delivery suite 24 hours a day.
2. There must be a nominated consultant in charge of obstetric anaesthesia with time allocated for this role.
3. There should be a clear line of communication from the duty anaesthetist to the supervising consultant at all times.
4. The workload of the obstetric anaesthetist continues to increase. As a basic minimum there must be 12 consultant sessions per week to cover emergency work on delivery suite.
5. Scheduled obstetric anaesthetic activities (e.g. elective caesarean section lists, clinic) require additional consultant sessions over and above the 12 for emergency cover.
6. Women should have antenatal access to evidence based information about the availability and provision of all types of analgesia and anaesthesia. This information should be provided or at least ratified by the department of obstetric anaesthesia.
7. There should be an agreed system whereby the anaesthetist is given sufficient advance notice of all potentially high-risk patients.
8. When a 24-hour epidural service is offered, the time from the anaesthetist's being informed that a woman is requesting an epidural and ready to receive one until attending the mother should not normally exceed 30 minutes. This period should only exceed one hour in exceptional circumstances. Responses times should be regularly audited and if the above standards are missed frequently, consideration should be given to alteration of staffing arrangements.
9. Provision should be made for those who cover the delivery suite on-call, but do not have regular sessions there, to spend time on the delivery suite in a supernumerary capacity with one of the regular obstetric anaesthetic consultants.
10. There must be separate provision of staffing and resources to enable elective work to run independently of emergency work, in particular to prevent delays to both emergency and elective procedures and provision of analgesia in labour.
11. The person assisting the anaesthetist must have no other conflicting duties, must be trained to a nationally recognised standard and must work regularly and frequently in the obstetric unit.
12. The training undergone by staff and the facilities provided in the maternity recovery unit must be of the same standard as for general recovery, as defined in current, published guidelines.
13. Appropriate facilities should be available for the antenatal and peripartum management of the sick obstetric patient as defined in the document *Providing Equity of Critical and Maternity Care for the Critically Ill Pregnant or Recently Pregnant Patient*.

2. Introduction

This is the third version of the joint Association of Great Britain and Ireland/Obstetric Anaesthetists' Association (AAGBI/OAA) guidelines [1, 2]. A major change from the last revision in 2005 is the inclusion of a section on critical care in maternity. This reflects the belated recognition of this increasingly important area of obstetrics [3]. The number of women requiring advanced levels of care is set to increase as the trend towards an older obstetric population with increasing morbidities and levels of obesity shows no sign of abating. As a result, obstetric anaesthetists will continue to be required to take on the role of peripartum physician (paralleling a growing enthusiasm for that of peri-operative physician in non-obstetric practice [4]). This will inevitably mean involvement in training of staff caring for high-risk parturients and adoption of management roles to develop and maintain critical care facilities.

These guidelines recommend a further increase in the minimum number of weekly anaesthetic consultant sessions to 12 in order to provide delivery suite cover plus further sessions for scheduled work (caesarean section lists/clinic, etc). This arises from three developments. Firstly, recent surveys have confirmed that the workload of obstetric anaesthetists is increasingly onerous and complex [5, 6]. Secondly, the presence of the obstetric consultant on the delivery suite is now mandatory, with the number of hours per week determined by the number of deliveries [7]; this must be reflected in anaesthetic input. Thirdly, the Clinical Negligence Scheme for Trusts has circulated a draft standard that elective work should be independently staffed in order that it can run uninterrupted by emergencies. This is expected to be adopted as a full standard in due course.

On-call rooms are disappearing from many maternity units despite the well-described benefits of enabling periods of proper rest during night-time working [8]. Even when working to a shift-based rota, the most common pattern for trainees, fatigue is more likely to affect performance and thus patient safety at night. Even short periods of sleep can help mitigate these effects and we have therefore recommended that appropriate facilities be made available.

Effective teamworking is crucial to maternity care as highlighted in a recent report on safety in maternity services [9]. Obstetric anaesthetists play a pivotal role in the team itself and in delivering training in teamworking. This is reflected in our recommendations for anaesthetic representation on all maternity committees.

As noted in the previous version of these guidelines, we realise that our recommendations potentially have major financial and organisational implications. However, they are based on consideration of the safety of the women who deliver in our units and their babies. We have therefore stressed yet again that consideration should be given to amalgamating units that are too small to support the costs of providing these services.

3. Staffing

Anaesthetists are involved in the care of over 60% of pregnant women. The Audit Commission found a wide variability of anaesthetic staffing on labour wards [10] and a recent survey confirms this [6].

Previous recommendations concerning anaesthetic staffing were based on delivery rates. Busy units were defined somewhat arbitrarily as those with > 5000 deliveries per year, an epidural rate > 35% and a caesarean section rate > 25%, tertiary referral centres and/or centres with a high proportion of high-risk cases. It was proposed that there should be one consultant session per 500 deliveries with at least 10 sessions for units with over 3000 deliveries [2]. However, there are several problems with the use of such definitions [11]. The use of crude delivery rates:

- Does not take into account the huge variation in casemix that exists between units
- Does not take into account the impact of changing obstetric demographics (increased maternal co-morbidities such as obesity, increased maternal age, increased assisted conception, increasing immigrant population)
- Does not take account of the impact of the changes to training in anaesthesia (in particular the effect of the European Working Time Regulations on training, associated paperwork and reduced trainee numbers)
- Does not reflect the increased demand for the delivery of additional anaesthetic services such as anaesthetic clinics, maternity high dependency units (HDUs) and support for interventional radiology, etc
- Does not take into account changes in obstetric practice, such as increasing rates of caesarean section, trial of instrumental delivery, cervical cerclage and repair of complex tears, all of which increase theatre workload

The calculation of consultant sessions will need to take into account the volume of clinical work, the contribution by consultants towards administration and other non-clinical activities, and the numbers and experience of trainees. It is essential that the contribution made by non-consultant career-grade anaesthetists is included.

It is the unanimous opinion of this Working Party that a move towards obstetric anaesthetic services' being fully **consultant delivered** is both desirable and inevitable. Obstetricians have already set this as an objective and are in the process of working towards it [12]. Ultimately, obstetric consultant sessions devoted to emergency and elective obstetric activities should be matched by anaesthetic consultant sessions.

Recommendations

Medical staff

The term 'duty anaesthetist' denotes an anaesthetist who has been assessed as competent to undertake duties on the delivery suite under a specified degree of supervision.

The duty anaesthetist should be immediately* available to attend the obstetric unit 24 hours per day, and must therefore have no other responsibilities outside obstetrics. In all units offering a 24-hour epidural service, the duty anaesthetist must be resident on site.

If the duty anaesthetist is not a consultant, consultant support and on-call availability is essential 24 hours per day and a clear line of communication from the duty anaesthetist to the on-call consultant is essential at all times. If the duty anaesthetist is a consultant, the workload of the unit may dictate a need for additional manpower in order to deliver a safe service, and contact details of a back-up anaesthetist should be immediately available at all times.

The name of the on-call consultant must be prominently displayed at all times. The names of all consultants who cover labour ward, and their contact numbers, should be readily available.

The duty anaesthetist should not be responsible for planned maternity work such as elective caesarean section lists, anaesthetic antenatal clinics, etc. Such activities should be able to continue uninterrupted in the face of non-elective activities (e.g. emergency caesarean section, requests for regional analgesia in labour).

In consultant-led obstetric units where anaesthetic care is not primarily consultant-delivered, there should be a minimum of 12 consultant anaesthetic sessions (direct clinical care) per week to cover non-elective activity (i.e. a minimum of two sessions per working day, taking account of leave). Where there is a high turnover of trainees (i.e. a three-month interval or more frequent), a third evening session may be necessary in order to train and supervise trainees adequately.

In addition, there must be further consultant sessions for direct clinical care, to cover elective caesarean section lists and anaesthetic clinics.

There must be a nominated lead obstetric anaesthetist who has an active role in leading and managing services, with this adequately recognised in their job plan.

**Immediately available – able to attend within 5 min or less of being summoned, except in exceptional circumstances.*

Induction

All trainee and non-trainee anaesthetists, regardless of prior experience in obstetric anaesthesia, should receive a formal induction to the obstetric anaesthetic unit before commencing duties. This ideally should include:

- Information regarding the obstetric anaesthetic clinical supervisor and, if relevant, the educational supervisor for their attachment
- A physical tour of the delivery suite, obstetric theatres, learning environment and any other relevant areas
- Equipment:
 - A demonstration of relevant equipment, e.g. anaesthetic machine, epidural infusion devices
 - Location of the difficult airway trolley and its contents, including subglottic airway equipment
 - Depending on the stage of training/prior experience, location of other equipment such as blood storage fridge, rapid infusor device, cell salvage
- Resuscitation:
 - Location of the cardiac arrest trolley with demonstration of the defibrillator and any other equipment if unfamiliar
 - Location of lipid emulsion
 - Use of the resuscitaire and location of equipment required for neonatal resuscitation
- A clear description of:
 - Local arrangements for handover and contacting senior staff
 - Local arrangements for contacting the obstetric anaesthetist in an emergency and for a category-1 emergency caesarean section
 - The trainee/non-trainees' responsibilities whilst covering the delivery suite
- The location of local guidelines for obstetric anaesthesia.

Handover

Time for formal handover between shifts must be built into the timetable. The shift pattern of different professional groups should be compatible, e.g. anaesthetic and obstetric shifts should start/finish at the same times to allow multidisciplinary handover.

Anaesthetists not in training

A survey has shown that associate specialist/staff grade/specialty doctors contribute to the provision of obstetric anaesthetic services in 61% of units in the UK [6].

All non-trainee anaesthetists who undertake anaesthetic duties on the delivery suite should have successfully completed the Initial Assessment of Competence in Obstetric Anaesthesia (IACOA) and have been deemed by the consultant in charge of obstetric services to be competent to perform their duties in accordance with OAA and Royal College of Anaesthetists (RCoA) guidelines. The doctors must work regularly on the delivery suite and must also regularly undertake non-obstetric anaesthetic work to ensure maintenance of a broad range of anaesthetic skills. Non-trainee anaesthetists who are

appointed directly from other countries may not be familiar with the protocols in the UK. The following recommendations are to ensure that they are safe and are supported in the new working environment:

1. There should be a defined period of directly supervised obstetric sessions. The duration of supervision will depend on individual circumstances and should be mutually agreed
2. The anaesthetist must have successfully completed the IACOA before being allowed to work unsupervised.

Theatre staffing

Many units still use midwifery staff to assist in the operating theatre and this has an impact on midwifery staff on the labour ward. Strategic Health Authorities and Health Boards have been urged to make significant progress in replacing midwifery staff in the scrub/instrument role [13].

Staffing for theatre recovery and anaesthetic assistance

Parturients requiring anaesthesia have the right to the same standards of peri-operative care as any other surgical patient, including anaesthetic assistance. Training must be to the standards defined for the care of the general surgical patient [14].

If the person assisting the anaesthetist is a nurse or midwife, they must have current and effective registration, and must have been appropriately trained and been assessed as having achieved the required core competencies [15]. They must be experienced and should assist the anaesthetist on labour ward on a regular basis in order to maintain competence. The team providing care for women undergoing obstetric operations *must* include a *dedicated* anaesthetic assistant for each patient in an operating theatre. The assistant should have no other duties in the operating suite concurrently. Newly recruited assistants should undergo a period of induction before working on the maternity unit.

The training undergone by staff in recovery, whether they are midwives, nurses or Operating Department Practitioners, must also be of the same standard as that required for general recovery facilities [16]. Midwives with no additional training are not equipped to recover patients following anaesthesia. Staff should work in a general theatre recovery unit on a regular basis to ensure competence is maintained.

All staff must be given regular access to continuing professional development and complete all mandatory training as frequently as required.

4. Services and standards

In consultant-led, as opposed to midwifery-led, units, anaesthetic services should be available to all women. The exact nature and availability of the services offered should be clear both to women choosing to book in a particular unit and to commissioning bodies.

Antenatal services

Information for mothers

Up-to-date, locally relevant information about the services offered should be available for mothers in a range of formats appropriate to their needs (e.g. written, electronic, audio with translations), including as a minimum:

- Analgesia for labour: benefits (including efficacy); risks; and availability of all options offered
- Anaesthesia for caesarean section: benefits; risks; relative merits of all options offered
- All women should be asked if they would be prepared to receive blood in the case of haemorrhage and this should be documented in the notes.

Information should be given to mothers in a timely way – usually antenatally – that is relevant to them. Anaesthetists must have central role in the development of all information about pain relief and anaesthesia. **All** mothers should be given and encouraged to read information about analgesia for labour and anaesthesia for caesarean section, as the need for these choices is unpredictable and may arise in an emergency.

Antenatal assessment and multidisciplinary planning

Timely antenatal anaesthetic assessment services should be provided for women who:

- Might present difficulties should anaesthesia or regional analgesia be required
- Are at high risk of obstetric complications
- Have a body mass index (BMI) greater than 40 kg.m⁻² at booking [17]
- Have had previous difficulties with, or complications of, regional or general anaesthesia
- Have significant medical conditions.

Locally agreed referral criteria should be in place. Sample guidelines regarding referral to anaesthetic services and supporting information are available from the OAA [18].

Reviewing women antenatally allows for communication between obstetric anaesthetists, obstetricians and other specialists as required, and enables planning for the safe provision of anaesthesia for high-risk women.

Peripartum care

Pre-operative assessment of women scheduled to deliver by caesarean section

Before admission, women should receive information about anaesthesia, relevant investigations should be undertaken and arrangements made for pre-operative preparation (fasting, antacid therapy and any other medication that should be given or withheld). This pre-operative assessment and preparation may be led by midwifery or other appropriate staff, but an anaesthetist must be available to provide advice and, if necessary, to review patients during this process. The process for such pre-assessment services must include anaesthetic input and review.

Women should be assessed by an anaesthetist before their operation, and the plan for the anaesthetic and informed consent to the anaesthetic confirmed (this may be done verbally – see below).

Fasting guidelines are discussed below.

Informed consent

Information for mothers about labour analgesia and obstetric anaesthesia is available in a variety of languages and formats to aid the process of informed consent [19]. The principles of consent for anaesthesia or analgesia are set out in national guidelines [20]; it is not usually considered necessary to obtain written consent. Brief details of the discussion that has taken place, and of risks that the patient has been informed about should be recorded.

Regional analgesia for labour

Regional analgesia is the most effective form of labour analgesia [21]. Regional analgesia should be available 24 hours per day, seven days per week, to all women delivering in consultant-led obstetric units. Local guidelines should be developed covering the initiation, maintenance and management of complications of regional analgesia for labour, based on current national guidelines and/or best evidence [22].

Time to attend a request for analgesia

Requests for analgesia should be met as soon as possible. The time taken for the anaesthetist to attend requests for analgesia, and from request for analgesia to achieving analgesia, should be audited regularly: at least once a year in smaller units and more frequently in larger units. The time from request for analgesia to the anaesthetist's attending should not exceed 30 minutes. The RCoA suggests unit audit standards for the proportion of women attended by anaesthetist within 30 minutes of requesting epidural analgesia in labour [23].

Aseptic technique

It is mandatory to prepare the skin before performing central neuraxial block, and to use full aseptic precautions to reduce the risk of infective complications. Antiseptic solutions are neurotoxic, hence it is necessary to develop a systematic process for avoiding accidental injection or contamination of neuraxial injectate with antiseptic solution. A local policy should be in place taking into account these factors. Antiseptic solution should not be poured into receptacles on the sterile field that is to be used for regional blockade [24, 25].

Initiation and maintenance of analgesia

The anaesthetist should be immediately available for review of women and management of initial complications such as hypotension for at least 20 minutes after administration of the initial dose of regional analgesic. Local guidelines should address the management of initial complications. Continuing availability of an anaesthetist for review of women receiving regional analgesia is required throughout its duration.

Monitoring and care of women receiving regional analgesia in labour

Midwives caring for women receiving regional analgesia for labour should have been trained and deemed competent to do so by a local mechanism. Competence to care for women with epidural analgesia should be re-certified annually as a minimum. The specific recommendations set out in current national guidance should be followed [22].

The workload of the midwife assigned to a woman with an epidural in labour should be such that care of that woman is not compromised as specified by local guidelines. The anaesthetist must be satisfied with the level of care available.

Ambulation of mothers following initiation of epidural analgesia

Many delivery units encourage mothers who choose regional analgesia to ambulate. If ambulation is facilitated, a specific guideline should exist outlining the process in place for assessing whether women are able to ambulate safely. Falls, slips and trips occurring in women mobilising during epidural analgesia should be reported via local incident reporting systems and audited.

Post-delivery care following regional analgesia in labour

Removal of the epidural catheter and its integrity should be documented. Return of motor power should be monitored by continuing observations of motor power until full recovery is present. Women should be advised not to get out of bed unaccompanied in the first instance. Postnatal falls in women who have had epidural or regional analgesia for labour should be reported via local incident monitoring systems, and monitored.

Intravenous patient-controlled opioid analgesia in labour

Intravenous patient-controlled analgesia (PCA) may be offered as an alternative to regional analgesia. Recently, the use of remifentanyl PCA has increased [26]. There have been serious safety incidents associated with the use of remifentanyl PCA in labour [27]. Strict adherence to locally developed guidelines [28], careful monitoring of the mother and baby, and the constant presence of a member of staff who is trained and competent to monitor maternal respiration are the minimum that is necessary to ensure that this technique is safe.

Caesarean section

Many aspects of preparation and anaesthesia for caesarean section have been comprehensively reviewed in the clinical guidelines on caesarean section produced by the National Institute for Health and Clinical Excellence (NICE) [29]. Some of the more important standards or aspects not covered are dealt with in this section.

Classification of urgency of caesarean section

Existing national guidelines should be followed regarding classification of urgency of caesarean section:

1. Immediate threat to the life of the woman or fetus
2. Maternal or fetal compromise which is not immediately life-threatening
3. No maternal or fetal compromise but needs early delivery
4. Delivery timed to suit woman or staff.

The following audit categories have been suggested:

- $\geq 90\%$ category-1 caesarean sections should have a decision-to-delivery interval ≤ 30 min
- $\geq 90\%$ category-2 caesarean sections should have a decision-to-delivery interval ≤ 75 min [23].

However, regardless of the classification, each case must be judged and managed on its own merits with delivery achieved as quickly as it is safely possible to do.

Pre-operative preparation

Before elective surgery, standard adult fasting guidelines should be adhered to [30]. Women waiting for planned surgery should not be subjected to long periods of starvation and/or fluid deprivation (they should be encouraged to drink clear fluids up until two hours pre-operatively). This should be audited and monitored.

Choice of anaesthesia

The choice of anaesthesia for caesarean section rests with the competent mother. Information for mothers is available in a variety of formats via the OAA website and should be used to help women choose. Units should audit the type of anaesthesia used continuously, and monitor the results annually against the RCoA's proposed audit standards (Table 1) [23].

Table 1 Suggested audit standards for use of regional anaesthesia for caesarean section (CS) [23].

| Category | 1 | 2-3 | 4 |
|--|-------|-------|-------|
| Proportion of CS* under regional anaesthesia | > 50% | > 85% | > 95% |

Presence of birth partners

Obstetrics stands alone in permitting members of the public (usually the birth partner) to accompany patients during an operation. Inviting members of the public into the operating theatre environment carries risks. These should be managed by ensuring that the purpose of the birth partner's presence is clear to all concerned, and that the birth partner agrees to follow certain codes of behaviour, which should be set out in a local guideline and ideally clarified in a written information leaflet. The local guideline should identify the member of staff responsible for looking after birth partners if they require care or assistance unexpectedly during the operation.

Any particular needs that the birth partner has should be considered, and organised (if necessary) antenatally. For example, partners with a raised BMI may require special seating.

Whilst most obstetric units encourage birth partners to support women during operations under regional anaesthesia, few encourage their presence during general anaesthesia. This may be distressing for both women and their partners, and policies should be clear. Safety of the woman and her baby must be paramount. Development of antenatal information for birth partners would help to address this issue and is encouraged.

Elective caesarean section lists

Women delivering by planned caesarean section should have their operations performed as part of a scheduled list, resourced separately from the general workload of the delivery unit. A separately run list requires a full theatre team and should include a consultant obstetrician and a consultant anaesthetist. The list should be managed in the same way and to the same standards as other elective surgery lists. This may not be cost effective in units with a low elective workload (e.g. one or fewer elective caesareans per weekday or approximately 250 planned operations per year) but for all other units, separate resources should be allocated.

Elective caesarean sections should neither interfere with delivery unit work nor be interrupted by emergencies. Such interruptions and delays (to both the scheduled and the emergency workload) should be audited and monitored, and any necessary action taken to correct recurrence.

Postoperative analgesia

Intrathecal or epidural diamorphine or morphine can provide adequate analgesia after caesarean section without the addition of intravenous PCA opioid. The administration of parenteral opioids to women who have received neuraxial opioids is discouraged as it increases the risk of respiratory

depression. In the absence of contra-indications, women should be prescribed regular oral analgesia postoperatively. Pain scores on movement and sedation scores should be kept for all women postoperatively, and additional analgesia should be offered without delay when required.

Recovery care

Local guidelines (based on relevant national standards) for standards of care in recovery should be regularly updated, audited and monitored.

The following are recommendations of the AAGBI [16]:

- No fewer than two members of staff (of whom at least one must be a registered practitioner) should be present when there is a patient in recovery who does not fulfil the criteria for discharge to the ward
- All registered practitioners should be appropriately trained in accordance with the standards and competencies detailed in the *UK National Core Competencies for Post-anaesthesia Care* [31].

All women leaving obstetric recovery areas should continue to receive appropriate post-operative care. Staff caring for post-operative patients on post-natal wards must be trained to do so, and should carry out post-surgical care as set out in local guidelines.

There should be a ratio of two recovery beds to one operating theatre [31]. It should be noted that more space is required per bed area for obstetric theatre recovery, compared with general post-operative recovery areas. This is because there is a need to accommodate birth partners, cots etc as well as the patient in the same area.

To ensure privacy and dignity are maintained and that infection risk is reduced there should be adequate space between beds, and the facility to have private conversations with mothers and to conduct physical examinations (for example to check vaginal blood loss) [29].

Postnatal care

Following operative delivery, women need continuing care [29]. Any woman who has received neuraxial opioids should have respiratory rate, pain and sedation scores monitored for a period appropriate to the clinical situation.

Women who have received anaesthetic care (whether analgesia for labour or anaesthesia) should be followed up routinely to obtain feedback and exclude complications. With early discharge following delivery, it may be logistically impossible to achieve this, and significant complications may not become manifest until after women have been discharged. Therefore, all women who have received regional analgesia or anaesthesia should receive written information about when and how to seek help if complications should arise; this is particularly important for women who are discharged within

24 hours of their procedure. Patients who have suffered significant complications (for example awareness under general anaesthesia, accidental dural puncture) should be offered follow-up outpatient review with a consultant anaesthetist in the postnatal period [23].

Resuscitation team

A team trained in advanced resuscitation of the pregnant woman should be available to all women in obstetric units, and their skills should include the ability to carry out a peri-mortem caesarean section. A system for calling and admitting the team urgently to the delivery unit should be in place. Regular team training drills should be held.

Risk management

Units are expected to participate in relevant national audits, e.g. the Confidential Enquiries into Maternal Deaths, the OAA's National Obstetric Anaesthetic Database (NOAD), the UK Obstetric Surveillance System (UKOSS), national incident reporting to the Medicines and Healthcare products Regulatory Agency (MHRA) and other relevant bodies, local incident reporting and risk management. Quality improvement, involving continuous monitoring of activity and outcomes to facilitate continuous quality improvement, using appropriate formats, should be practised. The RCoA publishes a list of relevant audits of obstetric anaesthesia services, which should be used to audit these standards [23].

Local safety procedures such as syringe labelling, double checking or both should be developed to reduce the risk of wrong-route and other drug and infusion errors – and there should be adherence to national standards in all locations, including in delivery rooms.

Local anaesthetic solutions intended for epidural infusion should be stored separately from intravenous infusion solutions, in a locked cupboard or other safe area, to minimise the risk of accidental intravenous administration of such drugs [32].

Maternal critical care

Maternity critical care is an important emerging area for obstetric anaesthetists that poses significant organisational and clinical challenges. Compared with other areas of acute medicine, there is a paucity of published evidence on which to base guidance.

Timely recognition of the sick parturient is key to ensuring a good outcome and reducing maternal morbidity and mortality. Maternity services should implement NICE guidance on the recognition and response to acute illness in adults in hospital [33]. Although these guidelines do not specifically include the sick parturient, they provide a clear strategy for the delivery of care in this area.

Physiological observations should be recorded on admission for *all* women admitted to maternity units, including midwifery-led units. A graded response strategy for patients identified as being at risk

of clinical deterioration, as recommended by the Maternity Critical Care Working Party [3], should be agreed and delivered locally.

It is widely recognised that the quality of evidence for track-and-trigger systems in any area of medicine is limited. Such systems allowing a graded medical response can be based on aggregate scoring of physiological parameters (where points are allocated according to the degree of derangement of physiological variables, and then combined into a composite score). Alternatively, multiple parameter systems can be used (in which constituent criteria are not assigned a score but instead trigger when combinations of criteria are met). Both systems have inherent advantages and disadvantages. The recently published National Early Warning Score is an aggregate system but specifically excludes the obstetric population [34].

Whether an aggregate or multiple parameter system is used, the response should consist of the following three levels:

- Low-score group: increased frequency of observations and the midwife in charge alerted
- Medium-score group: urgent call to team with primary medical responsibility for the patient, plus a simultaneous call to personnel with core competences for acute illness
- High-score group: emergency call to a team with critical care competences and a maternity team. There should be an immediate response.

The Department of Health has defined a chain of response for the hospital team involved in the care of the acutely ill patient in hospital (Fig. 1) [34]. This can be adapted for use in the maternity setting.

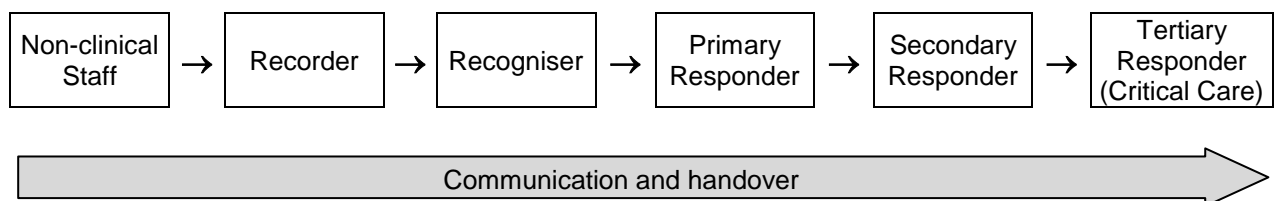


Figure 1 Chain of response for acutely ill patients in hospital. Redrawn from [34].

Staffing

Where level-2 care (see below) is provided in the maternity unit, staff appropriately trained to provide HDU care should be available 24 hours a day. The midwife/nurse-to-patient ratio must be at least one midwife/nurse to two patients or one-to-one if care is provided in individual rooms. Midwives working in this setting should have additional training that equips them with the necessary critical care competences that have been clearly set out [3].

There should be a named consultant anaesthetist and obstetrician responsible for all level-2 patients, 24 hours a day.

High dependency care (level-2 adult critical care)

Since 2007, the obstetric population has been included in the Intensive Care Society (ICS) definitions of levels of care in the adult population (Table 2) [35].

Table 2 Levels of care as defined by the ICS [35].

| | |
|---------|---|
| Level 0 | Patients whose needs can be met by normal ward care |
| Level 1 | Patients at risk of deterioration, needing a higher level of observation or those recently relocated from higher levels of care |
| Level 2 | Patients requiring invasive monitoring/intervention that includes support for a single failing organ (excluding advanced respiratory support i.e. mechanical ventilation) |
| Level 3 | Patients requiring advanced respiratory support alone or basic respiratory support in addition to support of one or more additional organs |

All units that care for high-risk patients must be able to access level-2 (HDU care) on site. Level-2 care may be provided within the maternity unit or within a hospital's general adult critical care unit. Level-2 care should be delivered to the same standard regardless of the setting.

Larger obstetric units should have a designated consultant (usually an anaesthetist) with relevant skills who is responsible for delivery of obstetric HDU care. This lead person should ensure that local standards are developed for identifying women who require critical care, based on existing national standards [35].

In smaller units, the lead obstetric anaesthetist should ensure that local standards exist.

Intensive care (level-3 adult critical care)

Some patients on the maternity HDU (level 2) may progress to requiring level-3 critical care (ICU). Delays in the transfer of critically ill obstetric patients to the ICU can significantly increase the mortality rate. Therefore it is essential that every unit has clear pathways in place to facilitate transfer. There should be close co-operation between the maternity HDU and the ICU teams at an early stage, with consultant-to-consultant referral and early involvement of the ICU consultant. Formal, documented local arrangements should exist for support and input from other disciplines (cardiology, respiratory medicine and allied professionals) when required.

Escalation protocols should be in place for women requiring level-3 critical care.

All patients must be able to access level-3 critical care if required; units without such provision on site must have an arrangement with a nominated level-3 ICU and an agreed policy for the stabilisation and safe transfer of patients to this unit when required.

5. Training and education

Each obstetric anaesthetic unit should have a consultant with overall responsibility for the training and education of trainee and non-trainee anaesthetists. They should be supported locally by trainers, educational supervisors, College Tutors and Regional Advisors, and programmed activity time should be allocated for work relating to this responsibility. Trainers must fulfil the RCoA [36] and General Medical Council (GMC) criteria [37] and can include consultants, SAS doctors and senior trainees.

It is expected that in the future, the service is likely to be consultant-delivered; however, in the interim, rotas should be designed to maximise training opportunities including, for example, an extended working day for consultants [38].

Although a 24-hour obstetric anaesthetic consultant presence is the ideal, trainees also need to learn to work without direct supervision and should develop their skills and confidence accordingly, without compromising patient safety.

Induction

All trainee and non-trainee anaesthetists, regardless of prior experience in obstetric anaesthesia, should receive a formal induction to the obstetric anaesthetic unit before commencing duties there (see Section 3).

Levels of training

- A training programme appropriate to the educational opportunities offered by the unit should be in place as documented in the RCoA 2010 Curriculum [36]
- Basic training for core trainees: this should consist of an absolute minimum of 20 directly supervised sessions within a four-month period, during which time the trainee should achieve the core clinical learning outcomes. It is recommended that at least half of these sessions are supervised by a consultant obstetric anaesthetist
- Intermediate training for ST3/4 trainees: obstetric anaesthesia is one of the essential units of intermediate level training. There should be a dedicated block of training over a 4-12 week period and this should include 20 sessions as a minimum in order that all core clinical learning outcomes can be completed. It would be anticipated that for most trainees, this would require several more sessions than the 20 recommended
- Higher training: the majority of ST5/6/7 trainees will be expected to complete this level which is required for any consultant covering delivery suite out of hours. It can be delivered in non-specialist units. Local arrangements should be in place to ensure that all the required learning outcomes can be completed
- Advanced training for ST6/7 trainees: this should be undertaken by those trainees wishing to develop a sub-specialty interest in obstetric anaesthesia and/or undertake daytime sessions in obstetric anaesthesia, and those who are likely to go on to work in an obstetric tertiary referral

centre. This level of training can only be delivered in centres that allow the trainee the opportunity to develop the skills required to manage the delivery suite and undertake complex obstetric cases whilst building and consolidating knowledge of obstetric anaesthesia, obstetrics and neonatology

- Less than full-time (LTFT) trainees: at each level of training, LTFT trainees should be given an appropriate period of training in obstetric anaesthesia, proportionate to the percentage of whole time equivalent worked.

Assessment

Completion of the IACOA is mandatory for all core trainees before being allowed to work in an obstetric unit without direct supervision. Achieving the IACOA, however, does not signal the completion of the basic level unit of training in obstetric anaesthesia.

Supervision

All trainees should be supervised directly by a trainer present on delivery suite until the IACOA is completed. In addition, a joint OAA/ RCoA survey in 2010 [5] recommended that:

- The IACOA should be used in conjunction with a local system of review that satisfies local clinical governance arrangements before a trainee works without immediate supervision
- No trainee who feels unprepared to start obstetric on-call (regardless of completion of IACOA) should be expected to join the on-call rota unless directly supervised. Departments should make provision for this eventuality where rotas are written a long time in advance
- All trainees who have completed their basic obstetric training should have some opportunity to cover the labour ward without immediate supervision, so that they are confident to take on this responsibility once they are appointed to an ST3 post.

The first two of the above recommendations should also apply to non-trainee anaesthetists. All trainee and non-trainee anaesthetists working without direct supervision on delivery suite must have a named supervising consultant and both parties must be happy with the level of supervision available. In addition, they must know how to contact the supervising consultant in the event of an emergency.

Simulation

Simulation-based educational techniques can be used to assist all anaesthetists to develop the skills and attributes required to work safely and efficiently within the multidisciplinary obstetric team, including:

- Technical skill development using part-task simulators e.g. epidural, cricothyroidotomy [39]
- Reinforcement of emergency drills e.g. failed intubation [40]
- Teaching and assessing clinical skills when clinical opportunities are limited e.g. general anaesthesia for caesarean section
- Maternal and neonatal resuscitation [40]
- Teamwork training emphasising non-technical skills [9]

- Skills and drills training: anaesthetists should help organise and participate in regular multidisciplinary drills covering delivery suite emergencies such as major obstetric haemorrhage, maternal collapse and failed intubation [41]. These drills should be followed by debriefing and feedback so that lessons can be learned at both an individual and a systems level.

Continuing professional development

All anaesthetists involved in the delivery of obstetric anaesthetic services should undertake appropriate continuing professional development activities in line with revalidation guidelines.

6. The labour ward team

Maternity care is delivered by teams rather than individuals. Effective teamwork can increase safety; poor teamwork can have the opposite effect [9]. A report on safety standards in the maternity services identified the following problems:

- Differing goals of midwives and doctors with regard to the care of women
- Poor leadership and management
- Difficulties with communication between healthcare professionals during emergencies and shift changes

It is essential that obstetric anaesthetists should establish clear lines of communication with other professionals such as intensivists, neurologists, cardiologists, haematologists, other physicians, surgeons, radiologists, outreach nurses, physiotherapists and pharmacists.

Team briefing and a safety checklist should be used routinely to facilitate good communication and teamworking and reduce adverse incidents [42].

Checklists and team briefing

Pre-operative checklists and team briefing procedures should be used, both for elective and emergency obstetric operations. Nationally-developed obstetric modifications of the standard format exist and should be used or adapted for local use. In extreme emergencies, the procedure may be truncated, but it must be borne in mind that these are the most error-prone situations. Use of the checklist should be audited.

Anaesthetists and midwives

'Midwifery-led care' refers to all cases in which the lead professional for the case is a midwife rather than an obstetrician. This type of care may be delivered in a variety of units. If regional analgesia is required, the anaesthetist may be the only medically-qualified person involved with the labour/delivery.

It is recommended that the following criteria should be met whenever a hospital or maternity unit is proposing that anaesthetists should work directly with midwives who are acting as lead providers of obstetric care:

- There should be a consultant-led obstetric service on site
- There must be guidelines in place for the management of regional analgesia that have been agreed by anaesthetists, midwives and obstetricians. Midwives practising independently but intending to make use of a regional analgesia service must agree to follow the guidelines of the unit where they deliver their clients

- The midwife caring for a woman with an epidural must be trained in its management to a standard acceptable to the anaesthetist responsible for the service, must undergo regular refresher training, and must be managing regional analgesia on a regular basis
- The midwife must allow the anaesthetist access to any woman considering regional analgesia who wishes to discuss pain relief options
- If the anaesthetist feels that an obstetric opinion is necessary, he/she should consult the midwife in the first instance. However, if necessary, the anaesthetist may consult directly with the obstetricians, but should inform the midwife that this is his/her intention
- All decisions regarding regional analgesia must rest with the anaesthetist.

Anaesthetists and obstetricians

- Anaesthetists should encourage and facilitate consultation in the antepartum period by making themselves available when antenatal clinics are in progress and by ensuring clear lines of referral. A system for the antenatal assessment of high-risk mothers should be in place with 24-hour access to the information on the delivery suite
- Good communication on the delivery suite is vital in order to minimise last-minute referral and the hasty decision-making that often ensues. Anaesthetists should make themselves known to obstetricians who should, in turn, keep them informed of developing problems. Anaesthetists' attendance at obstetric ward rounds is to be encouraged in order to be kept well informed of the labour ward caseloads and casemix
- There should be formal arrangements in place and protected time for multidisciplinary handover at the beginning and end of each shift
- Anaesthetists should be involved in planning decisions that affect the delivery of maternity services. Anaesthesia should be represented on any committee that has relevance to anaesthetic services on the labour ward such as the labour suite working party, obstetric directorate and risk management forum.

Communication and classification of urgency

Whilst this section applies primarily to delivery by caesarean section, many of the items also apply in principle to trial of operative vaginal delivery in the operating theatre. Standard classification of the urgency of caesarean section as described in Section 4.6 should be used for caesarean section and this classification should be considered for operative vaginal delivery. It is recognised that this grading artificially categorises cases when in reality there is a continuum of risk, and that within a grade, some cases may require delivery more urgently than others. Each case must be graded and managed individually.

The situation may change after the decision to deliver has been made, and the classification should be re-assessed following transfer to theatre by the responsible obstetrician, and kept under review whilst anaesthesia is established.

Communicating both the planned procedure and its grade of urgency with the entire theatre team, as soon as the decision to deliver is taken, is vital, and a process for doing this should be covered by local guidelines. In addition, the anaesthetist responsible for the anaesthetic should be informed of both the indication for the procedure and its urgency by the operating obstetrician in person whenever possible.

Transferring patients to theatre may lead to delays, and measures to reduce such delays should be covered by local guidelines.

Other professionals and roles

Neonatal resuscitation

Units differ as to their policies about the involvement of the anaesthetist in neonatal resuscitation. Where they are given a role, anaesthetists should work with the neonatal team to ensure that appropriate training is delivered and maintained.

Maternity care assistants

The role of maternity care assistants (MCAs) is to complement and not to substitute for midwives. In some units they may be involved in monitoring and recording routine observations, or in assisting with epidural placement or in theatre. Appropriate training must be provided if they are to adopt these roles.

Support personnel

Increasing activity on the labour ward that requires information input, admissions and clerical duties demonstrate the need for a ward clerk or receptionist to be available at all times. Housekeeping, portering and maintenance teams need to be accessible on site because of the high turnover bed occupancy, high technology environment and emergency service provision.

7. Support services, equipment, facilities and accommodation

For the efficient functioning of the obstetric anaesthetic service, the following support services, equipment, facilities and accommodation are essential. The standards of equipment and monitoring must be the same as that of non-obstetric anaesthetic service.

Support services

A supply of O rhesus-negative blood should be immediately (within five minutes) available to the delivery suite at all times for emergency use. Grouping can be performed in about 10 minutes [42] and group-specific blood should be delivered within 20 minutes of request. Standard issue of cross-matched blood may take approximately 45 minutes [43] although some patients without antibodies may be eligible for electronic issue which can be much quicker: if the laboratory is in receipt of two 'group & save' samples taken on separate occasions they may be able to issue cross-matched blood as rapidly as group-specific [44].

In order to ensure that blood can be made available within the time frames stipulated, the transfusion laboratory should ideally be situated on the same site as the maternity unit.

Due to changes in transfusion practice, apart from packed red cells, blood products such as fresh frozen plasma (FFP), cryoprecipitate and platelets are now required earlier in the management of haemorrhage. As part of the response to a major obstetric haemorrhage call, the laboratory should make FFP available as rapidly as possible, enabling an approximate 1:1 ratio of red cells:FFP if deemed appropriate [44]. Platelets are not stored by all laboratories. If a significant delay is anticipated, the delivery suite should be notified in advance. The use of fibrinogen and prothrombin complex concentrates should be considered early [45].

Haematology and biochemistry services must be able to provide rapid analysis of blood and other body fluids. However, near-patient testing (see below) will guide blood and product replacement far more quickly than standard laboratory tests and should be utilised whenever possible.

There must be rapid availability of diagnostic radiological services. In tertiary referral centres, 24-hour access to interventional radiology services is highly recommended.

Medical physics technicians are required to maintain, repair and calibrate anaesthetic machines, monitoring and infusion equipment.

Physiotherapy services should be available 24 hours a day, 365 days a year for patients requiring critical care.

Hotel services must provide suitable on-call facilities including housekeeping for resident and non-resident anaesthetic staff. Refreshments must be available throughout the 24-hour period.

There must be adequate secretarial support for the antenatal anaesthetic assessment clinic and other duties of the consultant obstetric anaesthetist: teaching; research; audit; study; appraisal activities; and other administrative work.

Equipment

Units should purchase appropriate equipment to enable safe delivery of neuraxial analgesia and anaesthesia with regard to any relevant national or international safety guidance. It is mandatory that local obstetric anaesthetists are involved in purchasing decisions involving equipment for neuraxial analgesia and anaesthesia. Epidural infusion sets should conform to standards for colour-coding and should be labelled.

A blood warmer allowing the transfusion of blood and fluids as well as warm air blankets must be available. A Level 1® or equivalent rapid infusion device should be available for the management of major haemorrhage.

A difficult intubation trolley with a variety of laryngoscopes, laryngeal mask airways and tracheal tubes should be available. Second generation supraglottic airway devices that give some protection from gastric contents [45] and other aids for airway management must be available in theatre. There should be 24-hour access to a fiberoptic 'scope [46].

The maximum weight that the operating table can support must be known and alternative provision made for women who exceed this. The operating table should be able to support a weight of at least 160 kg. Other equipment to facilitate the care of obese parturients such as weighing scales, wheelchairs, equipment to assist with the transfer of patients between beds, equipment to assist with ramping in order to optimise head and neck position for laryngoscopy, and appropriate ward beds should be readily available [47].

Cell salvage equipment (and personnel trained in its use) should be available at all times for emergency and elective caesarean sections in units that deliver women who decline to have blood transfusion [48].

There must be equipment such as HemoCue® or blood gas analyser to enable bedside estimation of haemoglobin concentration.

It is strongly recommended that there should be equipment to enable bedside estimation of coagulation such as thromboelastography (TEG) or thromboelastometry (ROTEM) [43].

Equipment for PCA must be available for postoperative pain relief. Ultrasound machines should be available for the use of ultrasound-guided central venous pressure lines insertion and transversus abdominis plane (TAP) blocks, and to assist with central neuraxial blocks in obese patients.

Accurate clocks should be available in all delivery rooms and theatres.

Resuscitation equipment including a defibrillator should be readily available on the delivery suite and should be checked regularly.

Facilities

The delivery suite rooms must be equipped with monitoring equipment for the measurement of non-invasive blood pressure. There should also be readily available equipment for monitoring ECG, oxygen saturation, temperature and invasive haemodynamic monitoring if required. All delivery rooms must have oxygen, suction equipment and access to resuscitation equipment. Delivery suite rooms must have active scavenging of inhalational anaesthetics to comply with Control of Substances Hazardous to Health (COSHH) guidelines on anaesthetic gas pollution [49].

There must be easy and safe access to the delivery suite from the main hospital at all times of the day.

There should be at least one fully-equipped obstetric theatre within the delivery suite. Where this is not possible, a lift that can be commandeered for the rapid transfer of women to theatre must be available. The number of operating theatres required should depend on the number of deliveries and operative risk profile of the women delivering in the unit.

Obstetric theatres should be equipped and staffed to the same standards as other operating theatres. [13, 49]. The standard of monitoring in the obstetric theatre must allow the conduct of safe anaesthesia for surgery. The same standards of monitoring apply whenever an anaesthetist is responsible for anaesthesia, whether general, regional or local [50].

Adequate post-anaesthesia care facilities, including the ability to monitor systemic blood pressure, ECG, oxygen saturation and capnography, must be available within the delivery suite theatre complex. The layout/lighting should conform to established standards; however, it must be appreciated that obstetric recovery spaces need to be much larger than required for standard adult recovery [16, 51].

There should be readily available 'eclampsia boxes' containing all necessary equipment and a protocol for eclampsia [52].

Lipid emulsion, dantrolene and sugammadex may all be useful in anaesthetic emergencies. These should be immediately available on the delivery suite and location of these drugs should be clearly identified. Local anaesthetic and opioid solutions intended for epidural use should be available and stored separately from intravenous fluids to minimise the risk of accidental intravenous administration of such fluids.

All units that care for high-risk patients should be able to access level-2 HDU care on site (see Section 4).

Accommodation

All consultant obstetric units should include dedicated office space for the sole use of the anaesthesia team on the delivery suite, or close enough for the resident anaesthetist to be able to work there between cases. This space should have adequate information technology facilities for both trainee and trained staff to be able to deal with emails, complete mandatory online training, access journals and search engines via the internet, complete portfolios and enter audit-related data. Local multidisciplinary evidence-based guidelines must be available in the office. The office space, facilities and furniture should comply with the standards recommended by AAGBI guidelines [53].

A library of specialist reference books/journals should be available. There should be a separate anaesthetic consultants' office available to allow teaching, assessment and appraisal, that complies with AAGBI guidelines [53].

A communal rest-room in the delivery suite should be provided to enable staff of all specialities to meet. A seminar room(s) must be available for training, teaching and multidisciplinary meetings.

We strongly support the provision of an on-call room containing a bed as there is good evidence that even short periods of sleep improve performance during nightshift work (regardless of the length of the shift) [8, 54].

Where a consultant is required to be resident, appropriate on-call accommodation should be provided [55].

8. The future

The delivery of healthcare constantly needs to evolve to meet the challenges of a changing population and deliver high-quality care; obstetric anaesthesia is no exception to this.

Changes in healthcare encompass both organisational and clinical aspects. Developments that the Working Party supports include:

- An aspiration to develop a 24-hour consultant-delivered anaesthesia service in the maternity unit, with the instigation of twilight and weekend sessions as an initial step
- An expanded role of the obstetric anaesthetist as a 'peripartum physician' – in particular, more antenatal involvement in the management of women with high-risk/complicated pregnancies
- Developing relationships between the maternity team and other specialities in the hospital setting, e.g. medical specialities such as cardiology, with maternity units receiving support from a named cardiologist
- More extensive use of near-patient testing in the maternity unit
- Development of safe and effective alternatives to regional analgesia in labour
- Outcome-based research on the impact of intrapartum analgesia and anaesthesia on mother and baby
- Further research into increased levels of anaesthetic safety
- Development of enhanced recovery programmes in obstetrics
- Confirmation at Department of Health level of the uninterrupted continuation of the Confidential Enquiries into maternal death and morbidity with more timely and frequent reports
- Promoting equitable provision of anaesthetic services by ensuring anaesthetic representation on commissioning bodies.

9. List of recommended guidelines

Departments should have written guidelines, setting out local standards of care (based on national standards where these exist), including as a minimum the following (listed alphabetically):

- Analgesia post-caesarean section (including TAP blocks)
- Antacid prophylaxis for labour and delivery
- Antibiotic and thromboprophylaxis for caesarean section
- Awareness under general anaesthesia
- Cell salvage
- Conditions requiring antenatal referral to the anaesthetist
- Fasting before elective and emergency obstetric procedures
- General anaesthesia for caesarean section
- Guideline development
- HDU admission and discharge criteria
- High BMI ($> 40 \text{ kg.m}^{-2}$)
- Intrauterine fetal resuscitation
- Intravenous opioid PCA (Including remifentanyl PCA if available locally)
- Management of major haemorrhage (including trigger phrase to activate major haemorrhage transfusion protocol)
- Management of pre-eclampsia and eclampsia
- Modified Obstetric Early Warning Score use
- Oral intake during labour
- Provision of information to patients including:
 - Anaesthesia for caesarean section (general and regional)
 - Pain management in labour
- Regional anaesthesia including:
 - Hypotension during regional block
 - Management of failed or inadequate regional block
 - Management of high regional block
 - Management of accidental dural puncture
 - Management of epidural haematoma
 - Management of post-dural puncture headache
 - Management of regional techniques in patients receiving thromboprophylaxis
 - Regional blocks for labour analgesia
 - Regional blocks for surgery
- Recovery following general and regional anaesthesia
- Resuscitation of the pregnant patient
- Staffing levels
- Skills and drills training.

The following national guidelines should be displayed or be immediately available in all locations where obstetric anaesthesia is delivered:

- Adult resuscitation guidelines [Resuscitation Council (UK)]
- Anaesthetic machine checklist [AAGBI]
- Management of:
 - Anaphylaxis [AAGBI and/or Resuscitation Council (UK)]
 - Failed intubation [to be produced by Dififcult Airway Society/OAA]
 - Malignant hyperthermia [AAGBI]
 - Neonatal life support [Resuscitation Council (UK)]
 - Peri-arrest arrhythmias [Resuscitation Council (UK)]
 - Severe local anaesthetic toxicity [AAGBI]

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