MBRRACE-UK – the new home for the Confidential Enquiries into Maternal Deaths – reports for the first time

The Confidential Enquiries into Maternal Deaths (CEMD) in the UK has been revitalised with the publication of a new report [1]. The first CEMD Report, covering maternal deaths in England and Wales during 1952-54, was published in 1957 [2], and the process operated continuously until the publication of the last report, 2006-08, in 2011 [3]. However, soon after the laudatory retrospective of a half-century of continuous data collection and resultant systems changes [2], the chain was broken. A competitive tendering process for the right to run the CEMD was held in 2010, resulting in the award of the contract to a new consortium: Mothers and Babies – Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK). Before it could start, but after the programmed demise of the Centre for Maternal and Child Enquiries (CMACE, which had been running the Enquiries previously) in 2011, a review panel was instructed to examine the requirements for the programme [4]. The review panel concluded that the maternal and infant enquiries should continue, and MBRRACE-UK was reconfirmed in its status with a start date of May 2012 [1]. This confused period led to a breakdown in the established reporting and note review systems, with a danger that cases would be lost. Incomplete ascertainment of maternal deaths might look good for comparisons – UK mortality rates might become better than Albania’s [5]! – but does not square with the CEMD ethos of complete thoroughness and honesty. Reassuringly, MBRRACE-UK has obtained all case records from 2009 onwards and is confident that there are no ‘missing’ maternal notes. For the first time, the Report also includes cases from Ireland as part of a joint Confidential Enquiry process. The good news is that there has been a statistically significant decline in the maternal mortality rate, principally due to a decline in mortality from direct (obstetric) causes.

The format of this and future CEMD reports will be different to


doi:10.1111/anae.12926
those preceding it. The 2011 review panel recommended annual publication of the numbers of deaths. Over the past two decades, there has been a lag time of 2-4 years between the end of the particular triennium and the publication of the report. This potential gap of seven years between a death and its report could not be responsive to new patterns of disease, as shown by the publication in 2010 of an alert on the increasing number of deaths from sepsis, especially Group A streptococcus [6]. On the other hand, deaths from some causes have decreased significantly, to the point where case anonymity and confidentiality are not easy to maintain with three years’ cases pooled, let alone annual numbers.

The new style of report combines both of these aspects. Besides annual case numbers, there will be the familiar detailed reviews in topic-specific chapters but these will be divided between the annual reports in a triennial cycle. This year’s report includes surveillance data of maternal deaths between 2009-12, and topic reports on deaths from infectious causes, haemorrhage, amniotic fluid embolism (AFE), anaesthesia, and neurological, respiratory, endocrine and other indirect causes. The other topic-specific chapters will be published in either 2015 or 2016, after which the chapter cycle will be repeated.

It is recognised that for every maternal death, there are more ‘near-miss’ cases where many features of the events, apart from the outcome, are similar. The inclusion of an Enquiry into severe morbidity cases, identified through the UK Obstetric Surveillance System (UKOSS), allows analysis of a larger number of cases, as well as factors that might differentiate management of survivors and non-survivors. The recognition of the sometimes fine line between these two outcomes lies behind the abandonment in this report of the term ‘substandard care’. However, management is usually considered in the context of compliance with current national guidelines and recommendations, as well as aiming to highlight deficiencies in hospital systems and processes.

The four chapter reviews in this year’s Report that are of most relevance to anaesthetists include the chapters on deaths attributed to anaesthesia, haemorrhage, AFE and infectious diseases (sepsis). The anaesthetic chapter has been titled Lessons for Anaesthesia to emphasise the need to identify and disseminate improvable factors in care. There were four ‘anaesthetic’ deaths using the criteria from previous reports (‘direct deaths’), although lessons from several deaths are included in the chapter. Two of these four were related to the ‘mechanism’ of general anaesthesia and one to regional anaesthesia; one followed a regional anaesthetic, but the relevant factor was peri-operative medication that was not specific to the regional. The clear causal chain of direct death is less easy to establish and apply now compared with the past – some cases also included obstetric pathology that contributed significantly to the outcome.

Two women with elevated BMI died after ventilation problems during or following general anaesthesia. In one, an inability to ventilate the lungs followed intubation. The anaesthetists rightly questioned the tracheal tube’s position, but the cause was attributed to insurmountable bronchospasm. The second woman underwent a prolonged period of hypoventilation after general anaesthesia induced for surgical examination to stem post-partum haemorrhage, which was followed by cardiac arrest. In both cases, the lessons to be learned are applicable to all anaesthetic practice – awareness of fixation errors, the need to re-praise ABC continually and have a well-rehearsed drill for inability to ventilate after intubation, and a decisive approach for those who are not stable enough to be transferred to recovery care after anaesthesia.

Two deaths occurred following accidental dural puncture during attempted labour epidural analgesia. One had an epidural blood patch, but in both women headaches continued for several weeks post-partum. One woman developed subdural haematoma and the other cerebral venous sinus thrombosis many weeks after delivery. In both, there was no apparent evidence that the general practitioner had been informed of the complication or understood the possible consequences of persisting cerebral spinal fluid leak. Anaesthetic departments must develop systems of communication with primary care; persistent post-partum headache or other significant neurological symptoms require follow-up for differential diagnoses to be considered, investigated and excluded e.g. by specialist referral and imaging.
Another woman died from untreated post-partum hyperkalaemia due to renal failure. The woman had been given a diclofenac suppository for postoperative analgesia. Because of the potential for significant shut-down of renal function following non-steroidal anti-inflammatory drugs, careful consideration should be given to withholding them in women at risk for renal injury, especially pre-eclampsia and hypotensive haemorrhage, but also in those with raised or rising creatinine levels. Medical emergencies, including hyperkalaemia, require senior staff involvement and prompt corrective action.

A further two deaths followed unexpected cardiac arrest, one during labour with epidural analgesia and the other at the end of caesarean section with general anaesthesia, but anaesthesia was not considered to be the cause. In both cases the reviewers thought that the clinical management of maternal collapse was excellent, with several examples of good practice.

Anaesthetic reviews were provided for 203 cases. In some, the reviewers commented that general anaesthetic induction agent doses were not reduced in the presence of shock from haemorrhage or sepsis, especially with thiopental. The chapter authors conclude that unfamiliarity with thiopental may have reached a point where it should not be the first-line induction agent in obstetrics, as a significant proportion of general anaesthetics are for emergencies. The need for lateral uterine displacement in the supine position as an essential part of management of the sick pregnant women is stressed, including during pre-hospital ambulance care, transfer and resuscitation. Simulator-based studies allow the assessment of aspects such as lateral uterine displacement and the effect of transfer [7–9]. Some other general themes include: the need for multidisciplinary team/human factor training; recording of early warning scores with appropriate responses to abnormal findings; attention to intra-operative patient temperature and warming, particularly in haemorrhage; assessment of women with severe abdominal pain by senior clinicians; and the need to involve obstetric anaesthetists in serious untoward incident (SUI) investigations.

There were 17 maternal deaths directly attributed to obstetric haemorrhage in the four-year period reviewed by the Report. The overall mortality rate was 0.49 per 100,000 (95% CI 0.29–0.78), with an estimated case fatality rate of 1 per 1200 cases of massive obstetric haemorrhage, not significantly different from that in the previous Report. The deaths included two Jehovah’s Witnesses and one woman who had an elective caesarean section for placenta percreta. Nine of the women who died delivered by caesarean section and six women had a hysterectomy to control bleeding. The causes of bleeding were uterine atony, uterine rupture and genital tract trauma. In all the cases, there could have been improvements in care that might have made a difference to the outcome. Key areas noted for improvement were recognition of severity of haemorrhage, especially in smaller women (a table of blood volume loss by body weight is provided), and adequacy of resuscitation. The use of excessive doses of uterotonics to induce or augment labour was identified as a key contributory factor in cases of uterine rupture.

With regards to recognising significant haemorrhage, there were several examples of false reassurance from haemoglobin estimations using point-of-care devices (at the patient’s bedside or in the theatre/maternity suite) that may have led to delayed or inadequate resuscitation. A haemoglobin measurement in the absence of adequate fluid resuscitation will not reflect the magnitude of haemorrhage or the need for transfusion. Communication failures such as poor recording of blood loss and poor handover within the team contributed to a lack of awareness of the severity of the situation.

Improvements that could have been made in resuscitation include having blood (O negative) immediately available. It should be anticipated that coagulopathy will develop in women who have a major obstetric haemorrhage unless plasma components are replaced alongside red cells. In some of the deaths, there was a delay in providing plasma coagulation factors, or these factors were supplied in suboptimal doses. Although there continues to be debate about transfusing fixed ratios of red cells and plasma components in major haemorrhage, in the context of rapid obstetric haemorrhage the use of ‘major haemorrhage packs’ may ensure that the correct doses of coagulation factors are provided in a timely manner. The importance of using rapid infusion warming
Eighty-three women died from sepsis in 2009-12, of whom 20 (24%) had genital tract sepsis; these were classed as direct deaths. There has been a significant decrease in mortality from genital tract sepsis compared with the last report (0.50 vs 1.13 deaths per 100 000). Group A streptococcus was the infective cause in almost all the postnatal deaths from genital tract sepsis, whilst coliform infection was implicated in second trimester sepsis associated with ruptured membranes or cervical suture.

The indirect deaths from sepsis included 36 women who died from influenza, of whom 75% had H1N1 infection. This report is the first opportunity to review the deaths and clinical management of the 27 women who had confirmed H1N1 influenza infection. None of those who died from influenza had vaccination for seasonal flu or H1N1. There was also an underuse of antiviral therapy in these women. These findings are lessons for public health and vaccination programmes [12]. Whilst several women with H1N1 had extracorporeal membrane oxygenation (ECMO) therapy, it was not evident that this had been considered for the others. NHS England has commissioned five providers to support a national ECMO service, but not all these providers have an on-site obstetric service [13]. In the future, with technological improvements, ECMO may become more widely available to local ICUs [14].

Using data from UKOSS [15], the reviewers compared the care of the women who died with that of women who survived sepsis, and concluded that standards of care were better in the latter group. Our commitment and adherence to national and international guidance should help more of our patients survive sepsis [16–18]. The challenge in sepsis is to diagnose early and treat quickly. Early diagnosis requires a detailed medical history and thorough clinical examination to search for signs of infection and its source. In those women who died, there were often failures to assess and record vital signs, particularly respiratory rate. Abnormal observations need to trigger early action, including treatment with antibiotics within an hour if sepsis is suspected. Several deaths featured delayed antibiotic administration, inconsistent measurement of serum lactate and late or inadequate fluid resuscitation; in the absence of clear management plans, re-evaluation of progress did not occur.

Underpinning these failures of clinical management was the usual triad seen in many of the maternal deaths reviewed in this Report: poor senior clinical input/leadership; poor communication; and poor teamworking. The successful management of these ill women requires the involvement of senior anaesthetists who are well placed to interpret physiological derangement in critical illness, supervise resuscitation and monitoring, and escalate care. Handovers or shift changes on the delivery unit are the ideal time for the senior anaesthetist and senior obstetrician to review all ill women on the unit [19].

The location of care for the sick mother is another question that needs to be addressed. Level-2 HDU care for the obstetric patient...
needs to be located where pregnancy and delivery care can be provided. If such care is to be provided on the delivery unit, then adequate facilities and staff training are required [20].

The number of maternal deaths in the UK remains very low. The opportunity for detailed review of these deaths provided by the CEMD process shows that there are still improvements to be made in the quality and safety of maternal care. The lessons highlighted in the Report are not new, and many, if not all, are already published in guidance from national bodies. Implementation and commitment to these guidelines may reduce the number of deaths even further. Close attention to these same aspects of care might also help the much larger number of ‘near misses’, who may otherwise require significant ICU resources and develop long-term morbidity. What is very clear from the Report is that the anaesthetist on the delivery unit continues to have a key role in this 60-year project to improve the maternity care of our fellow citizens.

Competing interests
No external funding declared. Both authors are Anaesthetic Assessors for the CEMD.

J. H. Bamber
Consultant Anaesthetist
Cambridge University Hospitals
Cambridge, UK
Email: james.bamber@addenbrookes.nhs.uk

S. M. Kinsella
Consultant Anaesthetist
St Michael’s Hospital
Bristol, UK

References

doi:10.1111/anae.12938