

A view from the UK: the UK and Ireland Confidential Enquiry into Maternal Deaths and

Morbidity

Marian Knight¹ FFPH and Derek Tuffnell² FRCOG

¹ Professor of Maternal and Child Population Health, National Perinatal Epidemiology Unit, Nuffield Department of Population Health, University of Oxford, OX3 7LF, UK

² Consultant in Obstetrics and Gynaecology, Bradford Teaching Hospitals NHS Foundation Trust, Duckworth Lane, Bradford, BD9 6RJ, UK

Corresponding author:

Professor Marian Knight, National Perinatal Epidemiology Unit, Nuffield Department of Population Health, University of Oxford, OX3 7LF, UK

Email: marian.knight@npeu.ox.ac.uk

Tel: 0044-1865-289727 Fax: 0044-1865-289701

Funding: The Maternal, Newborn and Infant Clinical Outcome Review Programme, delivered by MBRRACE-UK, is commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England, NHS Wales, the Health and Social Care Division of the Scottish government, The Department of Health, Social Services and Public Safety (DHSSPS), Northern Ireland, the States of Jersey, Guernsey and the Isle of Man. The views expressed in this publication are those of the author(s) and not necessarily those of the NHS, the Department of Health or other funders.

Running head: The UK and Ireland Confidential Enquiries

Abstract

The UK Confidential Enquiry into Maternal Deaths has been in operation for more than 60 years, during which time maternal mortality rates have fallen tenfold. The program includes two aspects, surveillance and confidential case review, providing different information to aid quality improvement in maternity care. The enquiry now also reviews the care of women with specific severe morbidities. Recommendations have very clearly led to improved outcomes for women, most notably shown in the very low mortality rate due to hypertensive and related disorders of pregnancy. Maternal cardiac disease and mental health problems remain the major areas still to be addressed.

Keywords

Maternal mortality, maternal morbidity, confidential enquiry, surveillance, quality improvement

Introduction

The UK Confidential Enquiry into Maternal Deaths (CEMD) has been in operation for more than 60 years, during which time maternal mortality rates have fallen tenfold. An estimated 8.7 women per 100,000 die during or up to six weeks after pregnancy in the UK [1], in Ireland the figure is very similar at 9.8 per 100,000 [2]. The pattern of causes of maternal deaths has, however, almost reversed, from 1952-54 when two thirds of women died from direct, obstetric causes such as hypertensive disorders of pregnancy and one third from indirect causes [3], to now, when only one third die from direct obstetric causes and two thirds from medical and mental health-related causes [1]. Today, following a series of recommendations highlighting the importance of routine screening, blood pressure control and fluid management, fewer than one in every million women giving birth in the UK dies from a hypertensive disorder of pregnancy [4]; this compares to an estimated 1 per 100,000 in the US [5]. Whether these differences between the US and the UK can be attributed to the role of the Confidential Enquiry recommendations or to differences in healthcare systems and populations is unclear.

Methods

The UK CEMD includes two specific aspects, surveillance and confidential case review (confidential enquiry), both providing different, and complementary, information to aid quality improvement in maternity care. Maternal deaths are reported to a central office based at the University of Oxford through several sources, either directly from staff in the hospitals where women have died, or through direct reports from other individuals including coroners, pathologists, local supervisory midwives and, on occasion, members of the public. Programme staff may also identify maternal deaths through media reports. In addition, deaths are identified directly from routine registration where pregnancy or pregnancy-related causes are listed on the death certificate. The UK as a whole has not had, up to now, compulsory reporting of pregnancy or recent pregnancy on the death certificate (through a tick box or similar

requirement) and therefore cases are additionally identified through linkage of data on deaths in women of reproductive age to maternal data from births occurring in the previous year [4]. Only approximately 50% of maternal deaths would be identified if solely death registration data were used for identification [6].

Following the notification of a death occurring during or up to one year after the end of pregnancy, staff at the hospital where the death occurred are asked to provide basic surveillance data, including the woman's socio-demographic and pregnancy details and cause of death. They also send a full copy of the woman's medical records, including an autopsy report where a post-mortem examination has been undertaken (autopsies are undertaken for 85% of maternal deaths in the UK). Copies of the woman's records from relevant other hospitals, such as psychiatric units or other maternity units where she received care, as well as records from her family physician, are also obtained. Local clinicians caring for the woman are asked to complete a report on their perspectives of her care, identifying lessons to be learned as well as local factors which may have impacted adversely on their ability to provide quality care.

All copies of medical records and local clinicians reports are then fully anonymised, removing all details of names of women, their relatives and staff, addresses, hospital names and any other details which could identify the woman, staff or the hospital. The anonymised records are then uploaded onto a secure electronic viewing portal for confidential review. Multidisciplinary assessors are recruited through their relevant professional associations, and trained in the MBRRACE-UK confidential enquiry processes. A pathologist initially reviews each woman's records to determine the cause of death. As part of this process there is a strong emphasis on clinico-pathological correlation; autopsy findings are not considered in isolation without reference to the clinical course of events. Where the cause of death is unclear following pathologist review, advice is sought from relevant other clinical assessors.

Once the most likely cause of death has been determined, assessors from relevant specialties review the woman's care. An obstetrician, a midwife and an anaesthesiologist assess the care of all women. Care may additionally be reviewed by a psychiatrist, obstetric physician, family physician (general practitioner), cardiologist, critical care specialist, infectious diseases physician, emergency medicine specialist or neurologist depending on the woman's cause of death and/or care received. Each assessor may seek a second opinion by another reviewer within their specialty, thus 10-15 assessors review the care of each woman. They review care with specific reference to existing national guidance for management, for example national Institute for Health and Care Excellence (NICE) guidance or Royal College of Obstetricians and Gynaecologist green-top guidelines, and identify lessons which can be learned to improve care in the future.

A multi-disciplinary chapter-writing meeting is then held, at which all confidential reviews are considered and the main messages for future care identified to develop the recommendations which then form the basis of the confidential enquiry report.

Recent trends

The UK maternity population, in common with that in the US and elsewhere, is becoming more complex. On average, women giving birth are now older, more likely to be obese, more likely to have been born outside the UK and more likely to have co-existing medical and mental health problems. It is perhaps to be expected, therefore, that the maternal death rate from co-existing medical complications would be increasing. Recent trends, however (figure 1), show that maternal deaths from indirect causes in the UK are now decreasing.

Other trends in the US are also mirrored in the UK, including rising caesarean delivery rates [7]. Previous caesarean birth is a known risk factor for abnormally invasive placenta [8], and it is of concern that there is early evidence in the UK of an increase in maternal deaths from haemorrhage in association with abnormally invasive placenta [1]. This is reflected in an increase in the direct maternal death rate for the first time in a decade in the most recent report [1].

Confidential case review – not just the what but the why

Surveillance information tells us which women die, and what they die from. We know that in the UK, as in the US [9] black women are more at risk of dying from pregnancy-associated causes, as are women who live in more deprived areas, and women born in certain countries such as Pakistan and Jamaica [1]. We know that the leading cause of direct maternal mortality during or up to six weeks after pregnancy is thrombosis and thromboembolism, and the leading indirect cause is cardiovascular disease [1]. If we extend the time period to one year after childbirth, maternal suicide becomes the leading direct cause of death [1], recognising that maternal suicide is now classified by the World Health organisation as a direct cause of maternal death [10]. But these statistics do not tell us why these women died and, most importantly, how we can prevent maternal deaths in the future. For that, confidential case review is essential.

Confidential case reviews also add that essential element to ensuring impact - women's stories. Case vignettes have been a core element of the UK CEMD reports for many years, bringing the essential human element to the presentation of numbers and facts [11].

Making a difference - messages for care from confidential case reviews

Hypertensive disorders of pregnancy

As noted earlier, perhaps one of the clearest success stories in the UK concerns maternal deaths from hypertensive disorders of pregnancy. In the UK today, where annually about 800,000 women give birth, one woman dies from a hypertensive disorder of pregnancy every 18 months [4]. When the Confidential Enquiry started more than 60 years ago, more than 150 women died in the same time period [3]. Three distinct areas to improve care have been identified and reiterated over succeeding reports, with associated evidence-based changes to national guidance.

Routine screening

The importance of antenatal care to screen women for pre-eclampsia with a blood pressure and urine check at every visit continues to be evident. Five of the 14 women who died in the UK and Ireland from hypertensive disorders of pregnancy between 2009 and 2014 had not had their blood pressure checked at their initial antenatal care visit, and a number did not have their urine checked at each visit [4]. The women described in Box 1 illustrate this.

Box 1: Routine screening for hypertension and proteinuria

A low risk woman had a normal blood pressure at booking but did not have her urine tested. She had a high risk test for Down's Syndrome and was referred to fetal medicine. The fetus was small (3rd centile), and extensive fetal investigations were performed but no maternal checks. At 21 weeks she was found unresponsive with slurred speech, severe hypertension and 4+ proteinuria. She never regained consciousness and died from her intracranial bleed.

A woman in her fourth pregnancy, with a history of HELLP syndrome in her second pregnancy requiring ICU admission, had a borderline raised blood pressure at 35 and 37 weeks. She had not taken aspirin. She was admitted at 39 weeks with a headache and vomiting and a systolic

blood pressure of over 200mmHg. She was treated promptly with antihypertensives but she developed HELLP syndrome and an intracranial bleed 5 hours after delivery.

The first woman described here illustrates an increasing problem with sub-specialisation. Although she was seen repeatedly in the fetal medicine department, she had no routine checks herself as this aspect of her care was assumed to be within the remit of others. A lack of an individual taking overall responsibility for ensuring holistic care is frequently seen amongst women who die from many different causes in the UK, particularly where they have multiple medical, mental health or social problems. The need for coordinated multi-disciplinary care has been reiterated across all the most recent reports. The key message regarding screening for pre-eclampsia remains:

- Blood pressure measurement and urinalysis for protein should be carried out at each antenatal visit to screen for pre eclampsia. [12]

Control of severe hypertension

The number of women who died from intracranial haemorrhage in association with hypertensive disorders of pregnancy halved between 2003-8 and 2009-14 in the UK [4]. Nevertheless, in five of the women who died between 2009 and 2014 there was a delay in responding to severe hypertension, as illustrated in Box 2.

Box 2 Control of hypertension

A woman was admitted in labour with a blood pressure of 170/90. She did not have urinalysis done and her blood pressure was not rechecked until she had a neurological event three hours later. At this point her blood pressure was 180/100 with 4+ proteinuria. She was given magnesium sulphate and transferred to theatre for caesarean section under general anaesthesia. No antihypertensives were given prior to intubation nor was fentanyl given until

after delivery of the baby. She did not recover from her general anaesthetic and was found to have had a large intracranial bleed.

An important message from previous reports has been the urgent need to control severe hypertension [13]. It has been more evident in recent maternal deaths, such as the woman described above, that magnesium sulphate is relied upon as an antihypertensive. It is important to note that whilst magnesium sulphate does reduce blood pressure, and should be given promptly, it is not an adequate anti-hypertensive agent for women with severe hypertension. The key message concerning severe hypertension remains as follows:

- Keep blood pressure in all women to below 150/100, with urgent treatment to achieve this in women with severe hypertension [13].

Fluid management

No women died from inappropriate fluid management (pulmonary oedema or renal failure) in the UK and Ireland between 2009 and 2014. Indeed there have been no deaths in association with inappropriate fluid management since 1997. The following recommendation remains an integral part of national guidance:

- In women with severe pre-eclampsia, limit maintenance fluids to 80 ml/hour unless there are other ongoing fluid losses (for example, haemorrhage) [13].

Cardiac disease

One of the main focuses of the 2016 CEMD report was maternal cardiac disease; in a number of women, it was evident that classic symptoms of ischaemic heart disease were not recognised because the diagnosis was never considered in a young woman. In several women with chest pain, investigations were carried out to exclude pulmonary embolism, and once these

investigations were negative, women were discharged with no attempt to find a positive diagnosis. The vignettes in Box 3 illustrate both these points.

Box 3: Maternal deaths from cardiovascular disease

A woman had an uneventful pregnancy until 34 weeks when she developed chest pain. The pain had been off and on over three days and radiated into her back and left arm. The woman smoked, had a family history of ischaemic heart disease and a history of hypertension. She had been given entonox in the ambulance which is known to treat ischaemic pain. When she was assessed in the Emergency Department, no one asked about her risk factors for coronary disease. Despite an abnormal ECG, she had no further investigations. The obstetric team was not contacted. She was discharged home from the Emergency Department and found dead in bed the following day. Extensive coronary artery atherosclerosis and a thrombosed left anterior descending artery were found at post mortem examination.

A woman in her third trimester was admitted to an obstetric ward with severe chest pain that required opiate analgesia. She was an inpatient for three days, during which time myocardial ischaemia and pulmonary embolism were excluded. She continued to need opiates for her severe intermittent chest pain. It was interscapular and worse lying flat, so that she had to sleep in a chair. She had no senior obstetric review and no review by a cardiologist or other physician. A diagnosis of aortic dissection was not considered although she continued to have severe pain at the time of discharge. She collapsed at home a few days later with chest and abdominal pain and could not be resuscitated. Autopsy showed extensive ascending aortic dissection.

Key recommendations with regard to the care of women with cardiac disease therefore include:

- Pain in a pregnant woman (excluding labour pain or acute postoperative pain), that is severe enough to require parenteral opioids, may herald a serious underlying condition that may require senior input and/or escalation of care [14].
- Any woman presenting with chest pain severe enough to require opiate analgesia requires a positive diagnosis, not simply the exclusion of an acute coronary syndrome or pulmonary embolism [4].

Similarly, the significance of a raised respiratory rate, persistent tachycardia or orthopnoea was frequently not recognised, thus leading to the following recommendations [4]:

- A raised respiratory rate, persistent tachycardia and orthopnoea are important signs and symptoms, which should always be fully investigated.
- It is important to be mindful of the possibility of a cardiac diagnosis when repeated attempts are made to access medical care, particularly when extreme anxiety and breathlessness are prominent symptoms.

Haemorrhage

As noted above, there is a worrying signal that maternal deaths in the UK and Ireland due to haemorrhage in relation to abnormally invasive placentation may be increasing [1]. Four of the nine women who died from placenta praevia or accreta in 2013-15 died following collapse at home. Three of these women were known to have placenta praevia or accreta and two had had previous bleeding episodes. Box 4 describes one of these women.

Box 4 Abnormally invasive placentation

A woman with two previous caesarean sections was diagnosed with placenta accreta. She had had three previous admissions with bleeding. A week after discharge she developed pain and

bleeding. There was confusion over whether she was to be taken to the local hospital or the unit she had been referred to for her placenta accreta. A perimortem caesarean section was performed in the Emergency Department but despite best efforts she died.

The following new recommendation has been made:

- Recurrent bleeding, pain or agitation should be seen as 'red flags' in women with placenta accreta and women should be advised to remain in hospital [1].

The UK CEMD continues to evolve

The UK CEMD is not static, but has changed substantively over the past 60 years as technology has advanced and maternity care changed. The most recent changes include a move to the production of annual reports, to ensure messages to improve care are put into practice as soon as possible. The confidential enquiry chapters in each annual report are thus topic focussed according to causes of death, with the care of women who die from each specific cause reviewed in depth once every three years. This topic-based approach allows for a shorter, more focussed set of recommendations to be produced each year. It was a potential criticism of the previous triennial reports that there were so many recommendations it was difficult to even begin to plan to implement them all, which annual reports with fewer recommendations help alleviate.

Since 2009, women who died in pregnancy or in the year postpartum in the Republic of Ireland have had their care reviewed together with the UK cases. This helps to maintain anonymity and confidentiality when maternal deaths are increasingly uncommon, and, by allowing for review of a larger number of deaths, enhances the generalisability of messages for care. Only fully

anonymised records are transferred from Ireland to the UK in order to comply with confidentiality and data protection legislation. The Maternal Death Enquiry Ireland (MDE Ireland) produces separate surveillance reports [2, 15], but the joint confidential enquiry recommendations are taken forward in both countries. Assessors from the Republic of Ireland have joined the group of assessors from the UK undertaking confidential case reviews, and an Irish assessor is included in all the chapter-writing groups to ensure recommendations are generalisable across the two jurisdictions, which have different legal frameworks and health systems.

A further recent advance is the introduction of confidential reviews of the care of women with severe morbidity, which further enhances generalizability of the messages for care and allows for examples of contrasting care to be highlighted. Confidential Enquiries into Maternal Morbidity (CEMM) are topic specific, with topics identified through an open application process and subsequent selection by an independent advisory group comprised of representatives of relevant professional and government organisations as well as patient groups. The enquiry is conducted in exactly the same manner as for maternal deaths, with the exception that the care of only a stratified random sample of women with a specific morbidity is reviewed. Women with specific morbidities are identified through different sources depending on the topic; the majority to date have been identified by sampling from the women included in UK Obstetric Surveillance System (UKOSS) studies [16]. Morbidity confidential enquiries to date have covered maternal sepsis, women with prosthetic heart valves in pregnancy, severe postpartum mental illness and severe epilepsy. Future Enquiries will be reviewing the care of women with major obstetric haemorrhage and newly diagnosed breast cancer in pregnancy.

Maternal sepsis

The vignettes in Box 2 describe two women with maternal sepsis. The care of the woman who survived clearly illustrates the benefit of early recognition, senior involvement and rapid antibiotic treatment in women with suspected sepsis.

Box 2: Maternal sepsis

Two hours after delivery a woman became unwell on the postnatal ward feeling faint. Her oxygen saturation was 65% on air, therefore she was given oxygen and medical help was requested. She was reviewed by junior staff and found to be shocked, with moderate to heavy PV bleeding. Her temperature was never measured. After discussion with a consultant a diagnosis of haemorrhage was made and she was treated with fluids. She failed to improve and was taken to theatre where she had a cardiac arrest. A laparotomy and hysterectomy were carried out but resuscitation failed and the woman died. The postmortem found an extensive blistering skin rash, swollen labia and disseminated intravascular coagulation all as a result of overwhelming Group A Streptococcal sepsis.

A woman who was seven days post-spontaneous vaginal delivery became unwell at home with a fever. Her husband telephoned the triage unit of the maternity department and he was advised that his wife should attend the unit immediately. On admission she was noted to be tachycardic, tachypnoeic and febrile. She was prioritised for urgent medical review. A diagnosis of acute sepsis from retained products was made and fluid resuscitation started immediately.

Intravenous antibiotics were started within one hour of the diagnosis and she was transferred to the high dependency unit. The retained products of conception were removed promptly and she made a full recovery. Blood culture subsequently grew Klebsiella. Early recognition, clear advice and prompt treatment led to a good outcome without any further complications.

The report highlighted the following as major messages:

- “Think Sepsis” at an early stage when presented with an unwell pregnant or recently pregnant woman, take the appropriate observations and act on them [14].

- The key actions for diagnosis and management of sepsis are:
 - Timely recognition
 - Fast administration of intravenous antibiotics
 - Quick involvement of experts - senior review is essential [17]

Severe postpartum mental illness

In recognition of the major contribution of maternal suicide to maternal mortality in the UK and Ireland and to further highlight the importance of maternal mental health, the care of all women who died by suicide during or up to one year after pregnancy was reviewed for the 2015 report [6].

It was an overwhelming theme that women who died by suicide were ill for long periods before their deaths, with multiple opportunities to identify and treat their severe mental illness. Over half of the women who died by suicide had a diagnosis of a recurrent mental health disorder, yet for many this prior history, or its significance, was not identified at their initial antenatal appointment. Women presented on multiple occasions, often to different healthcare practitioners, and on each occasion their symptoms were assessed in isolation, with no-one taking an overall view to identify the escalating pattern of severity of their mental illness. In particular, women's symptoms were often downgraded, with expressions or acts of violent self-harm dismissed as 'impulsive'. This led to the following recommendations:

- Assessments should always include a review of previous history and always take into account the findings of recent presentations and escalating patterns of symptoms, their severity and any associated abnormal behaviour.
- New expressions or acts of violent self-harm are 'red-flag' symptoms and should always be regarded seriously.

The confidential enquiry into severe postpartum illness examined the care of women with a history of bipolar disorder or previous puerperal psychosis [1] in their subsequent pregnancy. Again this identified evidence that there was often a lack of recognition of the severity of women's mental illness, and, in particular, the associated need for risk minimisation strategies in future pregnancies was not considered. Importantly, however, as illustrated in Box 3, the Enquiry identified several examples of the impact of good care, where women who had been severely ill after a first pregnancy had their risk in a subsequent pregnancy identified and received early intervention, preventing any relapse of their major mental illness.

Box 3: Severe postpartum mental illness

A woman developed a postpartum depressive psychosis requiring admission to a mother and baby inpatient unit approximately six months after the birth of her first child. Her developing depressive and psychotic symptoms were under-recognised and she had strong ideas of suicide and infanticide by the time of referral to mental health services. Her inpatient care was good and, on discharge, a well-recorded discussion took place about risk in future pregnancies and the need to seek psychiatric referral. In a subsequent pregnancy two years later she was appropriately referred to specialist services. A plan was put in place for her late pregnancy and early postpartum management, and she did not relapse acutely.

Making an impact

The production of a report alone does not ensure that the UK CEMD/MM messages are rapidly taken forward to improve care. The actions and engagement of individuals and organisations at all levels of both healthcare and political systems is needed. As the longest running national audit, clearly the work of the Confidential Enquiry is fully embedded among the key professional

groups working in maternity – namely obstetricians, midwives and anaesthetists. All of these groups are introduced to the work of the Enquiry early in their training, and sessions are included in postgraduate courses run by both the Royal College of Obstetricians and Gynaecologists and the Obstetric Anaesthetists Association. Questions about the confidential enquiry recommendations are frequently incorporated into postgraduate examinations. Local training sessions and implementation plans are developed in many individual hospital units after each report is released. Vignettes from the report are used to develop regional and national training packages, for example NHS Education Scotland produced a 60 minute e-learning package, featuring scenarios based on the vignettes included in the MBRRACE-UK 2014 report, to help improve identification and early management of maternal sepsis (available at: <http://www.knowledge.scot.nhs.uk/scormplayer.aspx?pkgurl=%2fecomscormplayer%2fsepsis%2f.>)

The involvement of doctors and midwives across a range of specialties and organisations helps ensure widespread dissemination and adoption of recommendations into new guidance where appropriate. Additionally, report recommendations are recognised to be of importance by relevant policy leads and this enables high-level government actions. The UK Government's 'halve it' campaign, to reduce by 50% maternal deaths by 2030 [18] highlights the importance of taking forward the actions identified by the CEMD/MM [19].

As a further action, the MBRRACE-UK team work closely with voluntary organisations operating in the maternity area to produce a lay summary of the report with messages for women and families, ensuring that women are empowered to improve their own care. These patient support and other organisations disseminate the messages through their own networks, as well as lobbying government and policy leads for change, and are an invaluable additional route to ensuring messages for care are implemented to ensure ongoing quality improvement in UK and Ireland maternity services. Actions may also be taken forward independently by these groups to

further improve maternity care, for example, following the focus on maternal sepsis in the 2014 CEMD/MM report, the UK Sepsis Trust developed a series of clinical toolkits designed to enhance recognition and treatment of maternal sepsis at different levels of the healthcare system (available at <http://sepsistrust.org/clinical-toolkit/> as pdfs which are editable for local use).

Overcoming the challenges

The UK and Ireland Confidential Enquiry into Maternal Mortality and Morbidity has been used as a model for maternal death surveillance and review internationally, and is frequently consulted by groups developing maternal death and morbidity surveillance and review systems in other countries. Many face common challenges which have been addressed by the UK Enquiry over time and perhaps the solutions the UK Confidential Enquiry has identified may act as pointers to develop solutions elsewhere. Examples of challenges and solutions the UK Enquiry has faced include:

- Case identification: Initially case identification in the UK was imperfect, with clear evidence of under-ascertainment [3], however, it was recognised that a less than perfect start to reviewing maternal deaths was better than no start at all, and over time, through the development of networks of reporters and systems to check ascertainment through linkage of routine data, case ascertainment has improved and is now very high.
- Sampling: Initially, when maternal death rates were high, it was only possible to confidentially review the care of a sample of women who died. Using this approach, it was noted that recurring themes were encountered, and hence it was recognised that even reviewing only a sample of maternal deaths allowed identification of the required changes which would have the largest impact on improving care. This qualitative research-type approach is now used for reviews of the care of women with severe morbidity; the care of different women is reviewed until thematic saturation is reached

and no new messages for care are identified. This provides a time and resource efficient approach to identify messages to improve future care.

- Generalizability of recommendations when maternal deaths are rare: As maternal deaths have become less common, concerns over the generalizability of recommendations based solely on reviews of maternal deaths have been addressed through this inclusion of reviews of the care of women with severe morbidity.
- Anonymity and confidentiality: Clinical staff in maternity units across the UK are clear that the purpose of the confidential enquiry into maternal deaths and morbidity is not to apportion blame but to make changes to prevent maternal deaths in the future. Full anonymisation of records, including names of staff and hospitals as well as women and families, and the confidentiality of assessment enables high levels of engagement with the enquiry from clinical staff who do not fear litigation as a consequence of participation. Completion of local clinician assessments with their perspectives on local factors impacting on care is crucial to identify system level actions to address them and is an essential part of the confidential enquiry process.
- Differing legal frameworks: The transfer of confidential information across jurisdictions, allowing for a joint review process, has been enabled through fully anonymising records transferred from the Republic of Ireland to the UK. Reviewing anonymised records using an online viewing platform enables the participation of busy clinicians from throughout the UK to undertake the confidential case reviews and minimises travel time, and also enhances security as records no longer need to be transferred by post.

Conclusions

Recommendations from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity have very clearly led to improved outcomes for women, most notably shown in the

very low mortality rate due to hypertensive and related disorders of pregnancy. Challenges to implementing and continuing maternal death surveillance and confidential enquiry do occur, but these can be overcome with engagement of the relevant professional organisations and individuals. It is very clear that the success of the UK Confidential Enquiry is dependent on the commitment and hard work of individuals at all levels of the health system and government, most of whom are unpaid and give their time for free, recognising the importance of its work to improve the care of women and babies. This is helped by clear recognition at the highest levels of government of the benefits of confidential enquiry in improving patient safety, which has led to development of several allied UK confidential enquiries in different specialty areas. Perhaps most important, however, is the recognition that we owe it to the families left behind to learn from each and every maternal death to prevent them happening again in the future.

References

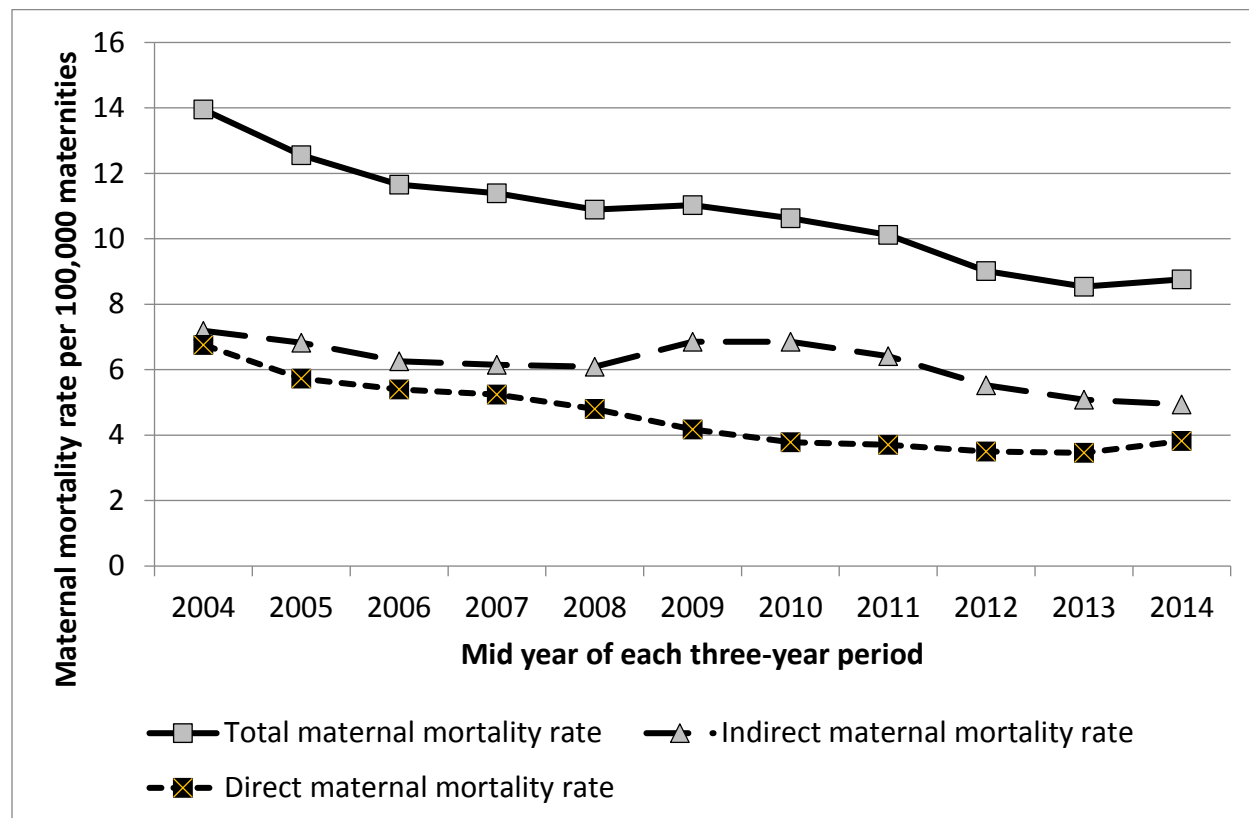
1. Knight, M., et al., eds. *Saving Lives, Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2013-15*. 2017, National Perinatal Epidemiology Unit, University of Oxford: Oxford.
2. O'Hare, M., et al., *Confidential Maternal Death Enquiry in Ireland, Data Brief no. 2*. 2016, MDE Ireland: Cork.
3. Ministry of Health, *Report on Confidential Enquiries into Maternal Deaths in England and Wales 1952-1954*. 1957, Her Majesty's Stationery Office: London.

4. Knight, M., et al., eds. *Saving Lives, Improving Mothers' Care - Surveillance of maternal deaths in the UK 2012-14 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-14*. 2016, National Perinatal Epidemiology Unit, University of Oxford: Oxford.
5. Control, C.f.D. *Pregnancy Mortality Surveillance System*. 2017 [cited 2017 20/07/2017]; Available from: <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html>.
6. Knight, M., et al., eds. *Saving Lives, Improving Mothers' Care - Surveillance of maternal deaths in the UK 2011-13 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-13*. 2015, National Perinatal Epidemiology Unit, University of Oxford: Oxford.
7. Betran, A.P., et al., *The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014*. PLoS One, 2016. **11**(2): p. e0148343.
8. Fitzpatrick, K.E., et al., *Incidence and Risk Factors for Placenta Accreta/Increta/Percreta in the UK: A National Case-Control Study*. Plos One, 2012. **7**(12).
9. Creanga, A.A., et al., *Pregnancy-Related Mortality in the United States, 2011-2013*. Obstet Gynecol, 2017. **130**(2): p. 366-373.
10. World Health Organisation. *The WHO Application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-MM*. 2012 [cited 2015 07/10/2015]; Available from: http://apps.who.int/iris/bitstream/10665/70929/1/9789241548458_eng.pdf?ua=1.
11. Meisel, Z.F. and J. Karlawish, *Narrative vs evidence-based medicine--and, not or*. JAMA, 2011. **306**(18): p. 2022-3.
12. National Institute for Health and Care Excellence. *CG62: Antenatal care*. 2008 [cited 2014 15/04/2014]; Available from: <http://www.nice.org.uk/guidance/cg62>.
13. National Institute for Health and Care Excellence. *CG107: Hypertension in pregnancy*. 2010; Available from: <http://www.nice.org.uk/guidance/CG107>.

14. Knight, M., et al., *Saving Lives, Improving Mothers' Care - Lessons learned to inform future maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-12*. 2014, Oxford: National Perinatal Epidemiology Unit, University of Oxford.
15. O'Hare, M., et al., *Confidential Maternal Death Enquiry in Ireland, Report for 2009 - 2012*. 2015, MDE Ireland: Cork.
16. Knight, M., et al., *The UK Obstetric Surveillance System for rare disorders of pregnancy*. BJOG, 2005. **112**(3): p. 263-5.
17. NHS England. *Patient Safety Alert: Resources to support the prompt recognition of sepsis and the rapid initiation of treatment*. 2014 [cited 2014 11/09/14]; Available from: <http://www.england.nhs.uk/wp-content/uploads/2014/09/psa-sepsis.pdf>.
18. Department of Health. *New ambition to halve rate of stillbirths and infant deaths*. 2015 27/09/2016]; Available from: <https://www.gov.uk/government/news/new-ambition-to-halve-rate-of-stillbirths-and-infant-deaths>.
19. Maternity Safety Programme Team Department of Health, *Safer Maternity Care. Next steps towards the national maternity ambition*. 2016, Department of Health: London.

Figure legends

Figure 1: *Direct* and *Indirect* maternal mortality rates per 100,000 maternities in the UK; rolling three-year average rates 2003-2015



Sources: CMACE, MBRRACE-UK

Reproduced with permission