

Midwifery Summary

D Garrod¹, V Beale², A Miller³ (on behalf of the Centre for Maternal and Child Enquiries)

¹ Stepping Hill Hospital, Stockport, UK; ² NHS South West, Taunton, UK; ³ Centre for Maternal and Child Enquiries, London, UK
Correspondence: Ms Debbie Garrod, Stepping Hill Hospital, 6th Floor Women's Unit, Poplar Grove, Stockport SK2 7JE, UK. Email: debbie.garrod@stockport.nhs.uk

Keywords Confidential Enquiry, maternal, mortality, midwifery.

Recommendations for midwifery practice as set out in Chapter 13 of *Saving Mothers' Lives*

- Carry out, record and act on basic observations for both low-risk and high-risk women.
- Recognise and act on symptoms suggestive of serious illness, including sepsis, as outlined in the Back to Basics chapter of the full Report.
- Provide pregnant women and new mothers with information about the prevention and signs and symptoms of possible genital tract sepsis and the need to seek advice early if concerned, as well as the importance of good personal hygiene.
- Assess risk adequately throughout the continuum, re-assessing as needed if circumstances change.
- Refer and escalate concerns to a medical colleague of appropriate seniority.
- Make early referral to psychiatric services of women with serious mental health problems.
- Ensure the availability and use of interpreting services.
- Provide continuity of care for vulnerable women.

Carry out, record and act on basic observations for both low and high risk women.

Summary and key recommendations for midwives

The purpose of the maternal death enquiry is to reduce the number of maternal deaths in the future, through a process of systematic review of the care and circumstances of the women who died during pregnancy, childbirth and the postnatal period. The Midwifery Chapter of the 2006–08

triennial Report makes eight recommendations for midwifery practice; this Summary for Midwives takes each recommendation and illustrates some of the issues identified in the midwifery care of the women who died. This Summary is intended as an aide memoire to enable midwives to reflect on their practice and implement the lessons learned. The full *Saving Mothers' Lives* Report is relevant for midwives; this Summary should be read in conjunction specifically with the following Chapters of the Report: Midwifery, Back to Basics, Sepsis and Key Recommendations (see Appendix 1).

In this triennium 261 women died of causes Directly (107) or Indirectly (154) associated with pregnancy. The maternal mortality rate (MMR) for 2006–08 was 11.39 per 100 000 maternities (see Appendix 2). The main *Direct* cause of death was sepsis and the main *Indirect* cause was cardiac disease (see Appendix 3). It is important to note that 63% of the 261 women who died did so during the postnatal period. In order to set out the background of the type of care received by these women, please refer to Appendix 4.

In many of the cases where avoidable factors were identified midwives failed to carry out and act on basic observations. This issue has been raised in previous reports: it is strongly recommended that all midwives read the Back to Basics chapter of this current report.

The following vignettes are examples of situations where tragedy could so easily have been averted if basic physical observations had been performed, acted on and followed up.

A woman had a retained placenta following a normal birth. However, there seemed to be no appreciation of the change in her risk status, which led to failure to perform appropri-

ate observations and monitoring. It was several hours before she was transferred to theatre. She suffered a massive haemorrhage, underwent a hysterectomy but died.

A woman saw a midwife for a postnatal examination and reported having felt unwell for a week, with symptoms of breathlessness and pain on breathing; she also had swelling in one leg and calf and thigh pain. She was advised by the midwife to attend hospital or a walk-in centre. Some hours later she arrived at the Emergency Department where she collapsed, was intubated, ventilated and transferred to the Intensive-Care Unit. A diagnosis of pulmonary embolism/deep vein thrombosis was made. She went on to have several cardiac arrests later that day. She continued to deteriorate and died some days later.

The Back to Basics chapter recommends that if a woman complains of any symptoms that indicate a deviation from the norm, the midwife or GP must take basic observations, which include temperature, pulse, respirations and blood pressure. If observations are found to be abnormal, these must be followed up by appropriate referral to her GP or hospital and future care should take account of the fact that the woman's risk status may now have changed. Following this referral, the midwife has a duty to make sure appropriate action has been taken.

To 'beware sepsis' and recognise/act on symptoms suggestive of serious illness as outlined in the Back to Basics chapter of the full Report.

To provide pregnant women and new mothers with information about the prevention and signs and symptoms of possible genital tract sepsis and the need to seek advice early if concerned as well as the importance of good personal hygiene.

This Report identifies genital tract sepsis as the leading cause of *Direct* maternal death in the UK for the first time since the Confidential Enquiries into Maternal Deaths commenced in 1952. It is crucially important that midwives recognise and act on this finding. There were 26 *Direct* deaths as the result of sepsis in this triennium compared with 18 and 13 in the previous two triennia, respectively. Midwives must ensure that their practice meets the standards required to identify signs of sepsis at the earliest possible opportunity. They must provide pregnant women and new mothers with information about:

- the *prevention* of genital tract sepsis and the importance of good personal hygiene
- the *signs and symptoms* of possible infection
- the need to *seek advice* early if concerned.

The following vignette shows how the failure of a midwife to recognise the implications and potential seriousness of abnormal observations and act on them appropriately can allow the rapid and unmanageable escalation of sepsis.

A healthy young woman with a history of normal births had a straightforward labour and birth at term. She was discharged from hospital the following day and received postnatal visits from her midwife. Within the first week, on two occasions her midwife recorded that she was pyrexial and feeling unwell; she advised the woman to see her GP if she continued to feel ill. She visited again two days later but did not make any basic observations. The following day the woman saw her GP who referred her immediately to hospital where she was admitted with abdominal pain and septic shock. Her condition worsened rapidly and, despite excellent inpatient care, she suffered complete organ failure and died shortly afterwards.

Box 13.1. Signs and symptoms of sepsis

- Pyrexia is common, but a normal temperature does not exclude sepsis. Paracetamol and other analgesics may mask pyrexia and this should be taken into account when assessing women who are unwell.
- Hypothermia is a significant finding that may indicate severe infection and should not be ignored.
- Swinging pyrexia and failure to respond to broad-spectrum intravenous antibiotics is suggestive of a persistent focus of infection or abscess.
- Persistent tachycardia >100 beats/minute is an important sign that may indicate serious underlying disease and should be fully investigated.
- Tachypnoea is sepsis until proved otherwise—persistently increased respiratory rate >20 breaths/minute is a significant clinical finding that can also indicate other serious pathology, such as pulmonary oedema, pneumonia, thromboembolism or amniotic fluid embolism, and impending cardiac arrest.
- Diarrhoea is a common and important symptom of pelvic sepsis. Diarrhoea or vomiting in a woman with any evidence of sepsis is a very serious sign and an indication for commencing immediate broad-spectrum intravenous antibiotic therapy.
- Severe lower abdominal pain and severe 'after-pains' that require frequent analgesia or do not respond to the usual analgesia are also common important symptoms of pelvic sepsis. In some women very severe lower abdominal pain may be the result of the action of bacterial toxins on the bowel wall. On rare occasions overwhelming streptococcal infection can present with generalised abdominal pain in the absence of pyrexia and tachycardia.

- Abnormal or absent fetal heart with or without placental abruption may be the result of sepsis.
- Assess risk adequately throughout the continuum, re-assessing as needed if circumstances change
- Refer and escalate concerns to a medical colleague of appropriate seniority.
- Make early referral to psychiatric services of women with serious mental health problems
- Ensure the availability and use of interpreting services for women who need them.
- Provide continuity of care for vulnerable women to promote engagement with the service.

Many of the deaths were from community-acquired Group A streptococcal disease, mirroring an overall background increase in mortality from this disease in the general population. Midwives are recommended to provide all women with information about the signs and symptoms of sepsis and to report any they might experience as soon as possible to their GP or midwife.

Midwives should be aware of the potential for 'mouth to genital tract transmission' and inform women of this risk. They should, for example, advise all women that if they have a sore throat they should adopt simple hygiene measures such as washing the hands *before* as well as after using the lavatory and changing sanitary pads. Recognising that children are prone to frequent minor infections makes this advice particularly important for women who have other children or whose jobs bring them into contact with children.

Recent national guidelines^{1,2} as well as the preceding *Saving Mothers' Lives Report*³ have all recommended that pregnant women should be booked for care by 12 completed weeks of pregnancy. The rationale for early booking is to enable the midwife to:

- make a comprehensive assessment of the woman's health and wellbeing
- assess her risk status and identify and implement the appropriate pathway of care
- refer her for obstetric or other specialist consultation as needed.

The benefits of early booking are lost if the steps outlined above are not followed. In addition, ongoing risk assessment must be made throughout the woman's maternity care and changes to her pathway must be made when risk is identified to have changed at any stage.

The following vignette illustrates that a chain of inappropriate decisions can easily result in a possibly avoidable outcome. Had the risk for this woman been acknowledged at booking and acted on as further problems developed, during both pregnancy and labour, she may not have died.

A morbidly obese woman with additional risk factors (including hypertension) had neither obstetric nor anaesthetic review in either pregnancy or labour: so no plan was made for delivery of care. She was induced at term, having had prelabour rupture of membranes; the syntocinon rate was increased, on the instruction of the senior midwife, when the cardiotocograph was already pathological. An emergency caesarean section was carried out for suspected fetal compromise and this was followed by a fatal postpartum haemorrhage.

Trust policies must have clear guidance for midwives when escalation or referral to senior obstetricians or medical specialists is needed.

A woman with severe pre-eclampsia was admitted to the labour ward by a Senior House Officer but was not seen by a registrar for some hours. Treatment eventually commenced but was inadequate, and by the time a consultant was involved (several hours after admission) the woman had sustained an intracerebral haemorrhage and she died the following day.

In this instance the midwife caring for this woman should have escalated a referral to a senior obstetrician either directly or through the delivery suite co-ordinator, seeking support from a Supervisor of Midwives if needed. If Trust policies or organisational culture present barriers to direct referral for senior obstetric input, midwives should highlight and address this issue via midwifery Supervision.

There were 41 deaths with psychiatric causes counted within this Report, with a further 26 deaths occurring between 42 days and 6 months after termination of pregnancy, miscarriage or birth. Of these 67 deaths, 29 mothers died from suicide. To reiterate the recommendation made in previous reports: all women should be asked at their antenatal booking visit about a previous history of psychiatric disorder as well as their current mental health. A woman with a previous history of serious affective disorder or other psychoses should be referred in pregnancy for psychiatric assessment and management even if she is currently well. A minimum requirement for management should be to ensure she has regular monitoring and support for at least 3 months following birth. Good liaison with the GP and health visitor during pregnancy, the post-natal period and at discharge from midwifery care are of vital importance for this woman. Midwives are advised to read Chapter 11, which contains many valuable lessons for practice.

The following vignette illustrates the rationale for a number of the recommendations from the report. There were repeated missed opportunities for this vulnerable woman, including: making adequate and continuing risk

assessment; communication and referral; continuity of care; ensuring immediate and appropriate specialist care.

A woman had a history of serious depressive illness, including an earlier episode of severe postnatal depression, together with a family history of the same condition. Although she was being treated for depression by her GP, this information was not passed on to her midwife. In later pregnancy she became acutely depressed and required admission to a psychiatric unit. She was discharged but did not attend for follow up. It would appear that no attempts were made to reach her in the community. Her community midwife was unaware that she was not receiving psychiatric care after birth. She died by violent means.

Chapter 1 gives details of women for whom the provision of appropriate interpreting services might have made a difference to their outcome. This includes both the provision of an interpreter for appointments and also the availability of written information in a language understood by the woman. Issues arising from failure to use interpreting services are a recurring theme throughout all Chapters of the Report.

Reviewing the women who died, 26 of those who died from maternal causes, another four who died from *Coincidental* causes, and two who died some months after childbirth spoke little or no English. Only a minority had access to interpreting services; in other cases family members were used as translators. Several of these were the women's own children, who may have been the only family members who could speak English, having learnt it at school. Consequently, in these cases, the midwife was unable to obtain a comprehensive booking history. Inevitably, some women were unable to disclose domestic abuse and were therefore denied access to appropriate support.

A further issue in relation to language barriers was identified for those women who arrived in the UK from abroad later in pregnancy. Without interpreting services it was impossible to obtain a full booking history and make an assessment of risk status.

Chapter 1 of the Report highlights a range of situations and circumstances which render women more vulnerable. These include ethnicity, deprivation and substance misuse. Many women are disadvantaged by experiencing multiple factors. To ensure that these women receive the most appropriate care and at times when their vulnerability might increase, that is following removal of a child from care or case conference decision to remove the baby at birth, it is important to ensure continuity of care and carer.

Nine of the 29 women (31%) who committed suicide had been referred to social services during their pregnancy,

including eight of the 18 receiving psychiatric care. In five cases the referral was made because the woman was a psychiatric patient rather than because of specific concerns about the welfare of the infant. It was apparent from their notes that fear that the baby would be removed was a prominent feature of the women's condition and probably led them to have difficulties in engaging with psychiatric care.

Conclusion

This summary is drawn from various relevant chapters of the Report. It highlights the lessons learned through assessment of the care of the women who died, for whom there were avoidable factors identified during the review of their circumstances. These are lessons that are pertinent for all midwives, which is the purpose of the continuing maternal death enquiry.

It is essential that we remember that these women are not 'cases'. Each woman was an individual with hopes and aspirations for herself, her baby and her family. These women died too soon for their hopes to be realised. They leave behind babies who will grow up without knowing their mothers, as well as partners, other children, parents and their wider families, all of whose lives have changed for ever. If this Report helps to avert this tragedy for women and families in the future, it will have achieved its aim.

'What had we lost? Harry and Emily had lost their mother at the tender ages of three and six days old, I had lost my best friend. My confidante. My rock. My wife. My lover. My raison d'être. My world.' Ben Palmer⁴ ■

References

- 1 National Institute for Health and Clinical Excellence. *Antenatal Care Guideline*. London: National Institute for Health and Clinical Excellence, 2008. NICE [www.guidance.nice.org.uk/CG62/Guidance/pdf/English. Accessed 14 October 2010].
- 2 Royal College of Obstetricians and Gynaecologists. *Standards for Maternity Care: Report of a Working Party*. London: RCOG Press, 2008. [www.rcog.org.uk/files/rcog-corp/uploaded-files/WPRMaternity-Standards2008.pdf]. Accessed 14 October 2010.
- 3 Lewis G. editor. *The Confidential Enquiry into Maternal and Child Health (CEMACH)*. Saving Mothers Lives; Reviewing Maternal Deaths to Make Motherhood Safer 2003–05. The Seventh Report of the United Kingdom Confidential Enquiries into Maternal Deaths in the United Kingdom. London: CEMACH, 2007. [www.CMACE.org.uk]. Accessed 14 October 2010.
- 4 Palmer B. *Friday's Child: The Heartbreaking Story of a Mother's Love and a Family's Loss*. London: Virgin Books, 2008. 90 pp.

Appendix 1

Top Ten Recommendations

Service provision

1. Pre-pregnancy counselling

1.1. Women of childbearing age with pre-existing medical illness, including psychiatric conditions, whose conditions may require a change of medication, worsen or otherwise impact on a pregnancy, should be informed of this at every opportunity. This is particularly important because 50% of pregnancies are not planned. Women should be pro-actively offered advice about planning for pregnancy and the need to seek pre-pregnancy counselling whenever possible. Before pregnancy, these women should be offered specific counselling and have a prospective plan for the management of their pregnancy developed by clinicians with knowledge of how their condition and pregnancy interact.

1.2. Pre-pregnancy counselling services, starting for women with pre-existing medical illnesses, but ideally for all women planning a pregnancy, are a key part of maternity services and should be routinely commissioned as an integral part of the local maternity services network. They could be provided by the GP practice, specialist midwives or other specialist clinicians or obstetricians, all of whom should be suitably trained and informed. GPs should refer all relevant women to the local services if they do not provide such counselling themselves.

2. Professional interpretation services

Professional interpretation services should be provided for all pregnant women who do not speak English. These women require access to independent interpretation services because they continue to be ill-served by the use of close family members or members of their own local community as interpreters. The presence of relatives, or others with whom they interact socially, inhibits the free two-way passage of crucial but sensitive information, particularly about their past medical or reproductive health history, intimate concerns and domestic abuse.

3. Communications and referrals

3.1. Referrals to specialist services in pregnancy should be prioritised as urgent. In some specialties, routine referrals can take weeks or months, or even be rejected because of local commissioning rules. This is unacceptable for pregnant women. The referral must clearly state that the woman is pregnant, and its progress must be followed up. Trainee doctors and midwives should have a low threshold for referral 'upwards' and must receive an immediate response. Referral between specialties should be at a senior level. When rapid referral is required, the senior doctor should use the telephone.

3.2. Good communication among professionals is essential. This must be recognised by all members of the team

looking after a pregnant woman, whether she is 'low risk' or 'high risk'. Her GP must be told that she is pregnant. If information is required from another member of the team, it is not enough to send a routine request and hope for a reply. The recipient must respond promptly, and if not, the sender must follow it up. With a wide variety of communication methods now available, including e-mail, texting and fax, teams should be reminded that *the telephone is not an obsolete instrument*.

4. Women with potentially serious medical conditions require immediate and appropriate multidisciplinary specialist care

Women with pre-existing disease at the start of pregnancy

4.1. Women whose pregnancies are likely to be complicated by potentially serious underlying pre-existing medical or mental health conditions should be immediately referred to appropriate specialist centres of expertise where both care for their medical condition and their obstetric care can be optimised. Providers and commissioners should consider developing protocols to specify which medical conditions mandate at least a consultant review in early pregnancy. This agreement should take place via local maternity networks.

Pregnant women who develop potential complications

4.2. Women whose pregnancies become complicated by potentially serious medical or mental health conditions should have an immediate referral to the appropriate specialist centres of expertise as soon as their symptoms develop.

4.3. In such urgent cases, referral can take place by telephone contact with the consultant or their secretary (to make sure they are available or identify an alternative consultant if not), followed up by a fax if necessary.

4.4. Midwives and GPs should be able to refer women directly to both an obstetrician or a non-obstetric specialist—but must inform the obstetrician. The midwife should, wherever possible, discuss this with, or alert, the woman's GP.

Quality of care

5. Clinical skills and training

5.1. Back to Basics. All clinical staff must undertake regular, written, documented and audited training for the identification and initial management of serious obstetric conditions or emerging potential emergencies, such as sepsis, which need to be distinguished from commonplace symptoms in pregnancy.

5.2. All clinical staff must also undertake regular, written, documented and audited training for:

The understanding, identification, initial management and referral for serious more common medical and mental health conditions which, although unrelated to pregnancy, may affect pregnant women or recently delivered mothers.

These may include the conditions in recommendation 1, although the list is not exclusive.

The early recognition and management of severely ill pregnant women and impending maternal collapse.

The improvement of basic, immediate and advanced life support skills. A number of courses provide additional training for staff caring for pregnant women and newborn babies.

6. Specialist clinical care: identifying and managing very sick women

6.1. There remains an urgent need for the routine use of a national modified early obstetric warning score (MEOWS) chart in all pregnant or postpartum women who become unwell and require either obstetric or gynaecological services. This will help in the more timely recognition, treatment and referral of women who have, or are developing, a critical illness during or after pregnancy. It is equally important that these charts are also used for pregnant or postpartum women who are unwell and are being cared for outside obstetric and gynaecological services, for example Emergency Departments. Abnormal scores should not just be recorded but should also trigger an appropriate response.

6.2. The management of pregnant or postpartum women who present with an acute severe illness, for example sepsis with circulatory failure, pre-eclampsia/eclampsia with severe arterial hypertension, or major haemorrhage, requires a team approach. Trainees in obstetrics and/or gynaecology must request help early from senior medical staff, including advice and help from anaesthetic and critical-care services. In acute situations telephoning an experienced colleague can be very helpful. The recent Royal College of Obstetricians and Gynaecologists guideline of the duties and responsibilities of consultant on call should be followed.²

6.3. Pregnant or recently delivered women with unexplained pain severe enough to require opiate analgesia require urgent senior assessment/review.

7. Systolic hypertension requires treatment

7.1. All pregnant women with pre-eclampsia and a systolic blood pressure of 150–160 mm/Hg or more require urgent and effective antihypertensive treatment in line with the recent guidelines from the National Institute for Health and Clinical Excellence (NICE 2010). Consideration should also be given to initiating treatment at lower pressures if the overall clinical picture suggests rapid deterioration and/or where the development of severe hypertension can be anticipated. The target systolic blood pressure after treatment is 150 mm/Hg.

It is disappointing that in this triennium, as flagged up in the last, the single most serious failing in the clinical care provided for mothers with pre-eclampsia was the inadequate treatment of their systolic hypertension. In several

cases, this resulted in a fatal intracranial haemorrhage. Systolic hypertension was also a key factor in most of the deaths from aortic dissection. The last Report suggested that clinical guidelines should identify a systolic pressure above which urgent and effective antihypertensive treatment is required. Since then, a recent NICE guideline has identified that threshold as 150–160 mm/Hg.³ The guideline also recommends that pregnant women with pre-eclampsia and a systolic blood pressure of 150 mm/Hg or more should be admitted to hospital for urgent treatment. Clinically, it is also important to recognise increases in, as well as the absolute values of, systolic blood pressure. In severe and rapidly worsening pre-eclampsia, early treatment at less than 150–160 mm/Hg is advisable if the trend suggests that severe hypertension is likely.

8. Genital tract infection/sepsis

8.1. All pregnant and recently delivered women need to be informed of the risks and signs and symptoms of genital tract infection and how to prevent its transmission. Advice to all women should include verbal and written information about its prevention, signs and symptoms and the need to seek advice early if concerned, as well as the importance of good personal hygiene. This includes avoiding contamination of the perineum by washing hands before and after using the lavatory or changing sanitary towels. It is especially necessary when the woman or her family or close contacts have a sore throat or upper respiratory tract infection.

8.2. All healthcare professionals who care for pregnant and recently delivered women should adhere to local infection control protocols and be aware of the signs and symptoms of sepsis in the women they care for and the need for urgent assessment and treatment. This is particularly the case for community midwives, who may be the first to pick up any potentially abnormal signs during their routine postnatal observations for all women, not just those who have had a caesarean section. If puerperal infection is suspected, the woman must be referred back to the obstetric services as soon as possible.

8.3. High-dose intravenous broad-spectrum antibiotic therapy should be started as early as possible, as immediate antibiotic treatment may be life saving. It should be started within the first hour of recognition of septic shock and severe sepsis without septic shock. Each hour of delay in achieving administration of effective antibiotics is associated with a measurable increase in mortality.

8.4. There is an urgent need for a national clinical guideline to cover the identification and management of sepsis in pregnancy, labour and the postnatal period and beyond. This should be available to all health professionals, maternity units, Emergency Departments, GPs and community midwives. Until such time as a national guideline is developed, the principles for the management of acute sepsis as

detailed in Chapter 15 of this Report should be adopted. These are derived from those developed and updated by the Surviving Sepsis Campaign.

8.5. Consideration should be given to adopting a more rational system for classifying maternal deaths from sepsis, as suggested in Annex 7.2 in this Report.

Clinical governance

9. Serious Incident Reporting and Maternal Deaths

All maternal deaths must be subject to a high-quality local review. In England and Wales the framework for such serious incidents (previously known as Serious Untoward Incidents/SUIs) is set out in the NPSA's *National Frame-*

work for Reporting and Learning from Serious Incidents Requiring Investigation, issued in March 2010. The results of such high-quality reviews must be disseminated and discussed with all maternity staff and their recommendations must be implemented and audited at regular intervals.

10. Pathology

The standard of the maternal autopsy must be improved. The numbers of locations where they are performed should reduce, with specialist pathologists taking them on as part of agreed job plans. More clinical discretion over reporting maternal deaths to coroners is required, and there should be a complementary major input by clinicians into obtaining more consented hospital autopsies.

Appendix 2

Table 1.2. *Direct* and *Indirect* maternal deaths and mortality rates per 100 000 maternities as reported to the Enquiry; UK: 1985–2008

Triennium	<i>Direct</i> deaths known to the Enquiry			<i>Indirect</i> deaths known to the Enquiry			Total <i>Direct</i> and <i>Indirect</i> deaths known to the Enquiry		
	<i>n</i>	Rate	95% CI	<i>n</i>	Rate	95% CI	<i>n</i>	Rate	95% CI
1985–87	139	6.13	5.19–7.23	84	3.70	2.99–4.58	223	9.83	8.62–11.21
1988–90	145	6.14	5.22–7.23	93	3.94	3.22–4.83	238	10.08	8.88–11.45
1991–93	128	5.53	4.65–6.57	100	4.32	3.55–5.25	228	9.85	8.65–11.21
1994–96	134	6.10	5.15–7.22	134	6.10	5.15–7.22	268	12.19	10.82–13.74
1997–99	106	4.99	4.13–6.04	136	6.40	5.41–7.57	242	11.40	10.05–12.92
2000–02	106	5.31	4.39–6.42	155	7.76	6.63–9.08	261	13.07	11.57–14.75
2003–05	132	6.24	5.27–7.40	163	7.71	6.61–8.99	295	13.95	12.45–15.64
2006–08	107	4.67	3.86–5.64	154	6.72	5.74–7.87	261	11.39	10.09–12.86
Change in rate 2000–02 to 2003–05		0.94	–0.54–2.42		–0.05	–1.75–1.65		0.89	–1.37–3.14
Change in rate 2003–05 to 2006–08		–1.57	–2.96 to –0.19		–0.99	–2.58–0.60		–2.56	–4.67 to –0.46

Sources: CMACE, Office for National Statistics, General Register Office for Scotland, Northern Ireland Statistics and Research Agency.

Appendix 3

Table 1.5. Numbers and rates per 100 000 maternities of maternal deaths reported to the Enquiry by cause; UK: 2000–08

Cause of death	2000–02			2003–05			2006–08		
	<i>n</i>	Rate	95% CI	<i>n</i>	Rate	95% CI	<i>n</i>	Rate	95% CI
Direct deaths									
Sepsis*	13	0.65	0.38–1.12	18	0.85	0.54–1.35	26	1.13	0.77–1.67
Pre-eclampsia and eclampsia	14	0.70	0.42–1.18	18	0.85	0.54–1.35	19	0.83	0.53–1.30
Thrombosis and thromboembolism	30	1.50	1.05–2.15	41	1.94	1.43–2.63	18	0.79	0.49–1.25
Amniotic fluid embolism	5	0.25	0.10–0.6	17	0.80	0.50–1.29	13	0.57	0.33–0.98
Early pregnancy deaths	15	0.75	0.45–1.25	14	0.66	0.39–1.12	11	0.48	0.27–0.87
Ectopic	11	0.55	0.30–0.99	10	0.47	0.25–0.88	6	0.26	0.12–0.58
Spontaneous miscarriage	1	0.05	0.01–0.36	1	0.05	0.01–0.34	5	0.22	0.09–0.52
Legal termination	3	0.15	0.05–0.47	2	0.09	0.02–0.38	0	0.00	
Other	0	0.00		1	0.05	0.01–0.34	0	0.00	
Haemorrhage	17	0.85	0.53–1.37	14	0.66	0.39–1.12	9	0.39	0.20–0.75
Anaesthesia	6	0.30	0.13–0.67	6	0.28	0.13–0.63	7	0.31	0.15–0.64
Other <i>Direct</i>	8	0.40	0.20–0.80	4	0.19	0.07–0.50	4	0.17	0.07–0.47
Genital tract trauma	1	0.05	0.01–0.36	3	0.14	0.05–0.44	0	0.00	
Fatty liver	3	0.15	0.05–0.47	1	0.05	0.01–0.34	3	0.13	0.04–0.41
Other causes	4	0.20	0.08–0.53	0	0.00		1	0.04	0.01–0.31
All <i>Direct</i>	106	5.31	4.39–6.42	132	6.24	5.26–7.41	107	4.67	3.86–5.64
Indirect									
Cardiac disease	44	2.20	1.64–2.96	48	2.27	1.71–3.01	53	2.31	1.77–3.03
Other <i>Indirect</i> causes	50	2.50	1.90–3.30	50	2.37	1.79–3.12	49	2.14	1.62–2.83
Indirect neurological conditions	40	2.00	1.47–2.73	37	1.75	1.27–2.42	36	1.57	1.13–2.18
Psychiatric causes	16	0.80	0.49–1.31	18	0.85	0.54–1.35	13	0.57	0.33–0.98
Indirect malignancies	5	0.25	0.10–0.60	10	0.47	0.25–0.88	3	0.13	0.04–0.41
All <i>Indirect</i>	155	7.76	6.63–9.08	163	7.71	6.61–8.99	154	6.72	5.74–7.87
Coincidental	36	1.80	1.30–2.50	55	2.60	2.00–3.39	50	2.18	1.65–2.88
Late deaths (between 43 and 86 days after birth)									
<i>Direct</i>	4			11			9		
<i>Indirect</i>	45			71			24		

*Including early pregnancy deaths from sepsis.

Sources: CMACE, Office for National Statistics, General Register Office for Scotland, Northern Ireland Statistics and Research Agency.

Appendix 4

Table 1.6. Maternal deaths by type of antenatal care; UK: 2006–08

	Direct (n)	Indirect (n)	Direct and Indirect		Coincidental (n)	Late Direct (n)	All deaths	
			n	%			n	%
Type of antenatal care								
Team-based or 'shared' care	42	68	110	42	16	1	127	40
Midwife only	27	25	52	20	12	2	66	21
Consultant led unit only	11	32	43	17	7	3	53	17
Midwife and GP	6	4	10	4	2	1	13	4
Other	2	1	3	1	1	0	4	1
Private	0	1	1	0	0	0	1	0
No antenatal care	18	23	41	16	12	2	55	17
Not known	1	0	1		0	0	1	
Total	107	154	261	100	50	9	320	100
Reason for no antenatal care								
Death before booking or after miscarriages or termination of pregnancy	11	16	27	11	7	0	34	11
Concealed pregnancy	4	2	6	2	1	1	8	3
Not known	3	5	8		4	1	13	
Total	18	23	41		12	2	55	
Attendance								
Regular	73	109	182	71	28	6	216	68
Missed 1–3	9	11	20	8	4	0	24	8
Missed 4 or more	5	10	15	6	5	1	21	7
Not known	1	1	2		1	0	3	
Total	88	131	219		38	7	264	
Gestation at booking								
<12 weeks	42	76	118	47	16	5	139	46
12–19 weeks	35	40	75	30	14	2	91	30
20+ weeks	6	9	15	6	1	0	16	5
Not known	5	6	11		7	0	18	
Total	88	131	219		38	7	264	
All	107	154	261	100	50	9	320	100

Table 1.8. Maternal deaths by place of birth at 24 or more completed weeks of gestation; UK: 2006–08

Place of birth	<i>Direct (n)</i>	<i>Indirect (n)</i>	<i>Direct and Indirect</i>		<i>Coincidental (n)</i>	<i>Late Direct (n)</i>	<i>All deaths</i>	
			<i>n</i>	<i>%</i>			<i>n</i>	<i>%</i>
Consultant-led unit	68	75	143	87	17	7	167	88
Emergency Department	8	9	17	10	0	0	17	9
Home	2	1	3	2	0	0	3	2
Midwife-led unit	1	0	1	1	0	0	1	1
Private Hospital	0	1	1	1	0	0	1	1
Total delivered	79	86	165	100	17	7	189	100