The Confidential Enquiries into Maternal Death – an update
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Summary

- MDE Ireland
- MBRRACE-UK
- Case assessment
- New morbidity enquiries
- Key messages on sepsis
Maternal mortality surveillance in Ireland

- MDE Ireland began in 2009; data collected continuously since
- Remit to carry out confidential enquiries into maternal deaths occurring within Ireland
- Funded and endorsed by the HSE
- Stand alone office based in Cork
Maternal and perinatal mortality surveillance in the UK

- April 2010 the UK-wide Maternal, Newborn and Infant Clinical Outcome Review Programme (previously run by CMACE)
  - Put out for open competitive tender
  - MBRRACE-UK were the successful bidders
  - Procurement halted March 2011 - to enable a review
  - CMACE closed 31st March 2011
- Re-tendering process re-started in January 2012:
  - MBRRACE-UK collaboration successful for a second time
  - Contract started 1st June 2012
New activities in addition to previous CMACE work:

- Surveillance of infant deaths up to age one year
- Secure electronic web-based data entry system for the stillbirth and infant mortality data
- Confidential case reviews of selected stillborn and infant mortality or morbidity cases (topic-based)
  - Congenital Diaphragmatic Hernia (2013)
  - Term unexplained antepartum stillbirth (2014)
- Confidential case reviews of selected maternal morbidity cases as well as all deaths up to one year after delivery
  - Sepsis (2013)
  - Postpartum psychosis (2014)
  - Women with artificial heart valves (2015)
- **Annual reports** for both maternal and stillborn/infant programmes
Reporting of maternal deaths in the UK

• Data on most 2009 cases collected through CMACE
• Cases from 2010 and early 2011 reported to CMACE
• Cases from 2011 and 2012 reported through MPMN portal and national offices in Scotland and Northern Ireland
• Cases from 2013 reported to MBRRACE-UK
Maternal Morbidity and Mortality Annual Report Provisional Topics

- **Year 1 (2014):** Sepsis, haemorrhage, AFE, anaesthetic, neurological, respiratory, endocrine and other indirect
- **Year 2:** Psychiatric, thrombosis, malignancy, late and coincidental
- **Year 3:** Pre-eclampsia and eclampsia, cardiac, early pregnancy
What happens when I report a maternal death?

- Case notified to MBRRACE
  - Notes, surveillance data, post mortem, local clinicians details requested
  - Data returned, local clinicians forms sent out
    - Midwifery
    - Obstetric
    - Anaesthetic
    - Other specialties as required
  - Data returned and complete
    - Case released for expert review
    - Pathology assessment of cause of death
      - Midwifery review x 2
      - Obstetric review x 2
      - Anaesthetic review x 1/2
      - Psychiatric review x 1/2
  - Obstetric medicine, neurology, cardiology, infectious diseases, general practice, emergency medicine review as required
  - Collection and analysis of data / assessment reports
  - Final Maternal Death Enquiry chapters written
Confidential Enquiry Assessors

- 15 Obstetricians
- 16 Anaesthetists
- 3 Obstetric Physicians
- 4 Cardiologists
- 2 Neurologists
- 15 Midwives
- 8 GPs
- 7 Intensive care consultants
- 8 Pathologists
- 6 Psychiatrists
- 8 Infectious disease physicians
- 1 Emergency medicine consultant
Case ascertainment (UK 2009-12)

- ~250 cases from CMACE (complete data on less than 100)
- ~150 cases from MPMN portal
- ~50 cases notified direct to MBRRACE-UK
- ~50 additional cases identified through case checking directly with units
- ~30 additional cases identified through linkage with national death/birth reports
MDE Ireland (2009-11)

- 25 maternal deaths
  - 6 direct maternal deaths
  - 13 indirect maternal deaths
  - 6 coincidental deaths

- Maternal mortality rate 8.0 per 100,000 maternities
  (95%CI: 3.5–12.6)

Source: Confidential Maternal Death Enquiry in Ireland, Report for Triennium 2009-11
Data collection UK

• Case note collection almost complete (only two cases not returned)
• Case assessment complete
• Report writing underway
## Local clinicians reports

<table>
<thead>
<tr>
<th>Clinician</th>
<th>Returned (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetrician</td>
<td>37</td>
</tr>
<tr>
<td>Midwife</td>
<td>39</td>
</tr>
<tr>
<td>Anaesthetist</td>
<td>39</td>
</tr>
<tr>
<td>GP</td>
<td>45</td>
</tr>
<tr>
<td>Emergency care</td>
<td>23</td>
</tr>
<tr>
<td>Critical Care</td>
<td>31</td>
</tr>
<tr>
<td>Physician</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>
## Case assessment

<table>
<thead>
<tr>
<th>Assessor type</th>
<th>Number of reviews completed as first assessor</th>
<th>Number of reviews completed as second assessor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetrician</td>
<td>247</td>
<td>110</td>
</tr>
<tr>
<td>Midwife</td>
<td>239</td>
<td>92</td>
</tr>
<tr>
<td>Anaesthetist</td>
<td>254</td>
<td>150</td>
</tr>
<tr>
<td>Physician</td>
<td>180</td>
<td>10</td>
</tr>
<tr>
<td>GP</td>
<td>29</td>
<td>8</td>
</tr>
<tr>
<td>Intensive care</td>
<td>105</td>
<td>-</td>
</tr>
<tr>
<td>Pathologist</td>
<td>273</td>
<td>43</td>
</tr>
<tr>
<td>Psychiatrist</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>Infectious Disease</td>
<td>38</td>
<td>-</td>
</tr>
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</table>

1804 assessments completed
~1900 assessments required for next report
# 2014 Report timetable

<table>
<thead>
<tr>
<th>Maternal Deaths (MD) 2009 -2012</th>
<th>MD surveillance data collection</th>
<th>Analysis of surveillance data</th>
<th>Writing of surveillance chapter</th>
<th>MD case note collection</th>
<th>Assessor reviews</th>
<th>Analysis &amp; report writing</th>
<th>Maternal Morbidity (Sepsis)</th>
<th>Morbidity case note collection</th>
<th>Assessor reviews</th>
<th>Analysis of findings</th>
<th>Writing of morbidity chapter</th>
<th>Internal circulation of report</th>
<th>IAG &amp; funder circulation</th>
<th>Final corrections &amp; publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Aug</td>
<td>Sept</td>
<td>Oct</td>
<td>Nov</td>
<td>Dec</td>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
<td>Apr</td>
<td>May</td>
<td>Jun</td>
<td>Jul</td>
<td>Aug</td>
<td>Sept</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Maternal Deaths (MD) 2009 -2012</td>
<td>MD surveillance data collection</td>
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</tr>
</tbody>
</table>

Report publication 9th December 2014
Launch meetings: London 9th December
Edinburgh 12th December
Sepsis morbidity

Anna (aged 22) had a straightforward delivery of her second baby on 21st December and went home. The next day she was readmitted feeling extremely unwell with genital tract sepsis. She had a hysterectomy and spent Christmas and New Year in intensive care.

www.healthtalkonline.org
Sepsis morbidity
What can a confidential enquiry into morbidity cases add to a review of deaths alone?

- A comparison of care of women who die with those who survive
- A larger number of cases; potentially more generalisable messages to improve care
- Allows for a more rapid audit/review cycle
- Can allow for the inclusion of the woman’s perspectives on her care
What can confidential enquiries into morbidity add to epidemiological studies?

- **Epidemiological studies: Numbers**
  - Disease incidence/prevalence
  - Audit of guidelines/change in practice
  - Risk factors
  - Management techniques
  - Public health response
  - Outcomes

- **Confidential Enquiry: Reasons**
  - Not just the “what” but the “why”
  - Detailed investigation of care against accepted standards
Narrative versus Evidence-Based Medicine - And, Not Or

“Facts and figures are essential, but insufficient, to translate the data and promote the acceptance of evidence-based practices and policies…. narratives, when compared with reporting statistical evidence alone, can have uniquely persuasive effects in overcoming preconceived beliefs.

Stories help the public make sense of population-based evidence. Guideline developers and regulatory scientists must recognize, adapt, and deploy narrative to explain the science of guidelines to patients and families, health care professionals, and policy makers to promote their optimal understanding, uptake, and use.”

Sepsis Confidential Enquiry progress

- Topic Expert Group convened:
- Key standards identified
- All maternal deaths included
- 34 morbidity cases selected
  - Stratified sample of women with septic shock
- Case notes obtained and local clinician reports requested
Sepsis morbidity – some key messages

Two UK national epidemiological studies:

• UKOSS study of severe sepsis in pregnancy: June 2011-May 2012

• ICNARC data on all admissions to critical care of pregnant or recently pregnant women with a diagnosis of sepsis within the first 24 hours of admission
Deaths from genital tract sepsis
UK 1985-2008

Source: Saving Mothers’ Lives 2006-8
Defining sepsis

Pregnant or recently pregnant women admitted to critical care UK 2008-2010 (ICNARC)

<table>
<thead>
<tr>
<th>Source of infection</th>
<th>Number of women</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=646)</td>
<td></td>
</tr>
<tr>
<td>Pneumonia/ respiratory infection</td>
<td>257 (39.8)</td>
</tr>
<tr>
<td>Genital tract</td>
<td>157 (24.3)</td>
</tr>
<tr>
<td>UTI/ Pyelonephritis</td>
<td>59 (9.1)</td>
</tr>
<tr>
<td>Surgical trauma</td>
<td>24 (3.7)</td>
</tr>
<tr>
<td>Septicaemia</td>
<td>20 (3.1)</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>19 (2.9)</td>
</tr>
<tr>
<td>Other infection</td>
<td>62 (9.6)</td>
</tr>
<tr>
<td>Unknown</td>
<td>48 (7.4)</td>
</tr>
</tbody>
</table>

Acosta, Harrison, Rowan et al 2014 (in press)
Sources of severe sepsis (UKOSS)

- Genital tract: 31%
- Urinary tract: 20%
- Wound: 9%
- Respiratory: 5%
- Other: 9%
- Unknown: 26%

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Infection characteristics (UKOSS)

• 37% (N=134) antenatal
  – UTI infection (34%)

• 63% (N=231) postnatal
  – Genital-tract infection (37%)

• P<0.0001

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Key message 1

• Genital tract infection forms only a small proportion of maternal morbidity and mortality from infectious disease

• Consideration of the source is important when planning management
Causative organisms (UKOSS)

- No laboratory confirmed infection: 36%
- Escherichia coli: 21%
- Group A streptococcus: 9%
- Group B streptococcus: 8%
- Other streptococcus: 6%
- Staphylococcus: 6%
- Mixed organisms: 5%
- Other: 7%
- Unknown: 2%
- Other: 7%

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Causative organism by source of infection

Source of infection

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Causative organism by mode of delivery

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Key messages 2

• Antibiotics should cover the appropriate spectrum, dependent on suspected source and mode of delivery

• If there appears to be no response, rethink
  – Antibiotic spectrum
  – Collection
  – Other infection source
Rapid progression to severe sepsis

- <24 hours between the first signs of SIRS and sepsis:
  - 83% of cases and 85% of septic shock cases

- <48 hours between the first signs of SIRS and sepsis:
  - 89% of cases and 95% of septic shock cases

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Key messages 3

• Use of a sepsis bundle
  – International Surviving Sepsis Campaign
  – “Sepsis six” (within the first hour):
    • Administer high flow oxygen
    • Take blood cultures
    • Give broad spectrum antibiotics
    • Give intravenous fluid challenges
    • Measure serum lactate and haemoglobin
    • Measure accurate hourly urine output
Causative organism according to septic shock diagnosis

Acosta, Kurinczuk, Lucas et al. 2014 (in press)
Rapid progression to severe sepsis for Group A strep cases

- **50%**
  <2 hours between the first signs of SIRS and sepsis diagnosis

- **75%**
  <9 hours between the first signs of SIRS and sepsis diagnosis

Acosta, Kurinczuk, Lucas at al 2014 (in press)
Key messages 4

• Clinical suspicion of group A strep is a red flag for urgent action
  – Association with spontaneous vaginal delivery
• Positive culture for group A strep should be reported by telephone
## Severity (UKOSS)

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>Level 2 or ITU admission</td>
<td>286</td>
<td>78</td>
</tr>
<tr>
<td>Level 2 admission</td>
<td>171</td>
<td>47</td>
</tr>
<tr>
<td>ITU admission*</td>
<td>114</td>
<td>31</td>
</tr>
<tr>
<td>Septic shock</td>
<td>71</td>
<td>20</td>
</tr>
<tr>
<td>Death</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

* Irrespective of level 2 admission
Timing of infection (UKOSS)

- 37% cases antenatal
- 63% cases postnatal

- Median diagnosis to delivery interval (antenatal sepsis) = 0 days (IQR 0-36 days)
- Median time between delivery and sepsis (postpartum cases) = 3 days (IQR 1-7 days)

Acosta, Kurinczuk, Lucas et al 2014 (in press)
Key messages 5

- Some women may need intensive care on delivery suite
- Some women may need obstetric care in the critical care unit
- Facilities/processes need to be available for both
## Significant medical risk factors (UKOSS)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cases</th>
<th>Controls</th>
<th>aOR* 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n=365</td>
<td>n=757</td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>197 (54)</td>
<td>330 (44)</td>
<td><strong>1.6</strong> (1.2-2.2)</td>
</tr>
<tr>
<td>≥1</td>
<td>167 (46)</td>
<td>427 (56)</td>
<td>1</td>
</tr>
<tr>
<td>Pre-existing medical problems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>120 (33)</td>
<td>171 (23)</td>
<td><strong>1.4</strong> (1.0-1.9)</td>
</tr>
<tr>
<td>No</td>
<td>245 (67)</td>
<td>583 (77)</td>
<td>1</td>
</tr>
<tr>
<td>Febrile illness or antibiotics in 2 wks before delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>153 (42)</td>
<td>42 (6)</td>
<td><strong>12.1</strong> (8.1-18.0)</td>
</tr>
<tr>
<td>No</td>
<td>212 (58)</td>
<td>715 (94)</td>
<td>1</td>
</tr>
</tbody>
</table>

*Adjusted for all other factors examined
## Significant delivery risk factors (UKOSS)

<table>
<thead>
<tr>
<th></th>
<th>Postpartum cases n (%)</th>
<th>Controls n (%)</th>
<th>aOR* 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode of delivery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous vaginal</td>
<td>57 (21)</td>
<td>443 (59)</td>
<td>1</td>
</tr>
<tr>
<td>Operative vaginal</td>
<td>39 (14)</td>
<td>100 (13)</td>
<td>3.4 (1.7-7.0)</td>
</tr>
<tr>
<td>Pre-labour caesarean</td>
<td>67 (25)</td>
<td>119 (16)</td>
<td>3.5 (2.0-6.1)</td>
</tr>
<tr>
<td>Caesarean after labour onset</td>
<td>108 (40)</td>
<td>92 (12)</td>
<td>6.7 (3.8-12.0)</td>
</tr>
<tr>
<td><strong>Complications of delivery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>103 (34)</td>
<td>279 (37)</td>
<td>1.7 (1.1-2.5)</td>
</tr>
<tr>
<td>No</td>
<td>199 (66)</td>
<td>478 (63)</td>
<td>1</td>
</tr>
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*Adjusted for all other factors examined
### Significant factors associated with mortality (UKOSS)

<table>
<thead>
<tr>
<th></th>
<th>Survivors n (%)</th>
<th>Deaths n (%)</th>
<th>aOR* 95% CI</th>
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<tbody>
<tr>
<td>n=610</td>
<td>n=29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>234 (38)</td>
<td>5 (17)</td>
<td>1</td>
</tr>
<tr>
<td>25-34</td>
<td>254 (42)</td>
<td>15 (52)</td>
<td>2.2 (0.7-7.0)</td>
</tr>
<tr>
<td>≥ 35</td>
<td>121 (20)</td>
<td>9 (31)</td>
<td>3.3 (0.9-11.0)</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>317 (52)</td>
<td>13 (45)</td>
<td>1.2 (0.2-9.1)</td>
</tr>
<tr>
<td>&lt;25</td>
<td>126 (21)</td>
<td>3 (10)</td>
<td>1</td>
</tr>
<tr>
<td>25-29.9</td>
<td>90 (15)</td>
<td>7 (24)</td>
<td>5.2 (1.4-18.9)</td>
</tr>
<tr>
<td>≥ 30</td>
<td>76 (13)</td>
<td>6 (21)</td>
<td>6.3 (1.5-27.0)</td>
</tr>
<tr>
<td>IMD Quintiles 4&amp;5</td>
<td>354 (58)</td>
<td>17 (58)</td>
<td>2.6 (1.0-6.7)</td>
</tr>
</tbody>
</table>

*Adjusted for all other factors examined
Key points 6

• It cannot be assumed that antibiotics will prevent progression to severe sepsis and safety net checks should therefore be in place to make sure a pregnant woman has recovered
• Older and obese women are at particular risk of mortality
Lessons on Anaesthesia

• Chapter writing group (maternal deaths) led by Steve Yentis and Paul Clyburn
• Ongoing morbidity studies through UKOSS
  – Aspiration in pregnancy
  – Epidural haematoma/abscess
Conclusions

• The continuity of the CEMD in the UK has been maintained
• Joint assessment across MDE ireland and MBRRACE-UK allows for generalisable messages
• Wider range of expert reviewers involved
• Still need local clinician participation
• Morbidity reviews will add further
Acknowledgements

• Study co-authors
  • Colleen Acosta, Jenny Kurinczuk, Nuala Lucas, Derek Tuffnell, Sue Sellers, David Harrison, Kathy Rowan

• MBRRACE-UK (and MDE Ireland) Assessors
Funders

MBRRACE-UK

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- NHSSPS Northern Ireland
- Scottish Government Health Department
- NHS Wales
- Channel Islands and the Isle of Man Government Offices

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MDE Ireland

- HSE

ICNARC/UKOSS studies

- NIHR