Maternal Morbidity Studies and the NPEU

Marian Knight
Professor of Maternal and Child Population Health
Why study maternal morbidity?

Jane had a placental abruption and antepartum haemorrhage. She describes the drama of her situation and the importance of hearing her baby’s heartbeat.
Why study maternal morbidity?

- Severe complications are uncommon
- Robust evidence to guide management and service provision is difficult to obtain
- Randomised controlled trials challenging
  - Rare conditions, large collaboration needed
  - Often require recruitment during an emergency
  - Issues of consent and capacity
“Near-miss” events

“a severe life-threatening obstetric complication necessitating urgent medical intervention in order to prevent likely death of the mother”*

• In countries where deaths are rare
  – Events associated with death may be atypical
  – Study of “near-miss” events may give more insight into risk factors and possible means of prevention

Maternal Morbidity Programmes

UKOSS
UK Obstetric Surveillance System

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

UKNeS
The National Maternal Near-miss Surveillance Programme

npeu
National Perinatal Epidemiology Unit
UK Obstetric Surveillance System (UKOSS)

- Monthly prospective case collection from obstetrician, midwife, obstetric anaesthetist and risk midwife (individualised by hospital)
- Cohort or case control studies conducted as well as descriptive studies
- Rolling programme of studies
- Central data collection
Data Feedback
Advantages of UKOSS

• Can be used for a variety of studies
• Lessens the burden of multiple requests for information from individual clinicians
• Information used to make practical improvements in prevention, treatment and service planning
• Studies can be rapidly introduced in response to conditions of emerging public health importance
What conditions can be studied using UKOSS?

- Disorder is an important cause of perinatal or maternal morbidity or mortality
- Uncommon (<1 per 2000 births)
- UKOSS methodology is suitable
- Other data sources exist to assess or enhance ascertainment
Study Application Procedure

• Informal discussion with UKOSS team
• Outline applications discussed at management group (monthly)
• Full applications discussed by Steering Committee (four-monthly meeting)
• Investigators invited to attend Steering Committee meeting
Completed Studies

2006
• Eclampsia
• Peripartum Hysterectomy
• Acute Fatty Liver
• Antenatal PE
• TB

2007
• Gastrochisis

2008
• Extreme Obesity
• FMAIT

2009
• Therapies for peripartum haemorrhage
• Multiple repeat caesarean section
• Pregnancy in renal transplant recipients

2010
• H1N1 influenza in pregnancy
• Antenatal Stroke
• Failed Intubation
• Malaria
• Congenital Diaphragmatic Hernia
• Myocardial Infarction
• Uterine Rupture

2011
• Sickle cell disease in pregnancy
• Placenta accreta
• Aortic dissection
• Obstetric cholestasis

2012
• Pregnancy in non-renal transplant recipients
• Pulmonary vascular disease
• Severe maternal sepsis
• HELLP
• Pregnancy in women with a gastric band

2013
• Myeloproliferative disorders
• Pituitary tumours
• Massive transfusion in obstetric haemorrhage

2014
• CKD stage 5
• Cardiac Arrest in pregnancy
• Pregnancy in woman aged 48 or over
Current Studies

- Adrenal tumours in pregnancy
- Amniotic Fluid Embolism
- Anaphylaxis in pregnancy
- Epidural Abscess/Haematoma
- ITP in pregnancy
- Pregnancy in women with artificial heart valves
- Pregnancy in women after gastric bypass surgery
- Pulmonary aspiration in pregnancy
- Vasa praevia
Uses of UKOSS Data

- Disease incidence/prevalence
- Audit of guidelines/change in practice
- Risk factors
- Management techniques
- Public health response
- Outcomes
- Investigating disease progression
1. Incidence – Failed intubation

• 57 confirmed cases in the UK over 2 years
• 1 per 224 GAs (95% CI 179-281)‡
• Similar to estimates from smaller studies

‡Quinn A et al 2012 BJA Advance access publication
2. Guidelines – Antenatal PE

• 143 cases identified
• 9 women should have received LMWH according to RCOG guidelines
  – Only 3 (33%) did
• 6 women had a PE following LMWH prophylaxis
  – 3 (50%) received lower than recommended doses
  – 3 received enoxaparin 40mg once daily

Knight M on behalf of UKOSS 2008 BJOG 115: 453-461
3. Risk factors – Placenta accreta

- **Previous caesarean delivery**
  84% of affected women, 15% of control women, \( aOR \ 14.4, 95\%CI \ 5.6-36.9 \)

- **Other previous uterine surgery**
  29% of affected women, 12% of control women, \( aOR \ 3.4, 95\%CI \ 1.3-8.9 \)

- **Placenta praevia diagnosed antepartum**
  65% of affected women, 1% of control women, \( aOR \ 65.0, 95\%CI \ 16.6-255.0 \)

- **IVF pregnancy**
  4% of affected women, 0.4% of control women, \( aOR \ 32.1, 95\%CI \ 2.0-509.2 \)

- **Older maternal age in women without a previous CS delivery** \( aOR \ 1.3 \ for \ every \ one \ year \ increase \ in \ age, \ 95\%CI \ 1.1-1.5 \)
Absolute risk

- **NO previous C-section**: 1 in 33,000
- **Previous C-section NO placenta praevia**: 1 in 3300
- **Previous C-section AND Placenta praevia**: 1 in 20
4. Management – second-line therapies for PPH

Rate of success
- Uterine compression sutures, n=199: 70%
- Surgical ligation, n=20: 32%
- Interventional radiology, n=22: 29%
- RFVIIa, n=31: 60%

Need for additional therapy
- Uterine compression sutures, n=199: 13%
- Surgical ligation, n=20: 5%
- Interventional radiology, n=22: 26%
- RFVIIa, n=31: 23%

Hysterectomy
- Uterine compression sutures, n=199: 29%
- Surgical ligation, n=20: 45%
- Interventional radiology, n=22: 45%
- RFVIIa, n=31: 9%

5. Public Health Response – H1N1v influenza in pregnancy

- Pregnant women hospitalised with confirmed H1N1v
6. Outcomes – Mode of delivery in obese women

<table>
<thead>
<tr>
<th></th>
<th>Vaginal N=417 (%)</th>
<th>Caesarean N=174 (%)</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anaesthetic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failure or problems</td>
<td>35 (8.4)</td>
<td>18 (10.3)</td>
<td>0.72 (0.37-1.39)</td>
</tr>
<tr>
<td>with regional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anaesthesia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General anaesthetic</td>
<td>22 (5.3)</td>
<td>15 (8.6)</td>
<td>0.55 (0.26-1.16)</td>
</tr>
<tr>
<td>for delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maternal postnatal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post operative wound</td>
<td>33 (26.2)</td>
<td>38 (22.4)</td>
<td>1.20 (0.68-2.13)</td>
</tr>
<tr>
<td>infection or other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wound complication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU admission</td>
<td>9 (2.2)</td>
<td>6 (3.5)</td>
<td>0.62 (0.19-2.07)</td>
</tr>
<tr>
<td>Major maternal</td>
<td>18 (4.3)</td>
<td>11 (6.3)</td>
<td>0.53 (0.23-1.24)</td>
</tr>
<tr>
<td>morbidity</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

6. Outcomes – Mode of delivery in obese women

<table>
<thead>
<tr>
<th>Neonatal Event</th>
<th>Vaginal N=417 (%)</th>
<th>Caesarean N=174 (%)</th>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birthweight 4500g or greater</td>
<td>35 (8.4)</td>
<td>22 (12.7)</td>
<td>0.60 (0.32-1.12)</td>
</tr>
<tr>
<td>Shoulder dystocia</td>
<td>13 (3.1)</td>
<td>0 (0)</td>
<td>NC</td>
</tr>
<tr>
<td>Neonatal Intensive care unit admission</td>
<td>34 (8.3)</td>
<td>27 (15.5)</td>
<td>0.67 (0.34-1.30)</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>2 (0.5)</td>
<td>1 (0.6)</td>
<td>1.08 (0.09-13.2)</td>
</tr>
</tbody>
</table>

7. Investigating disease progression

Risk of severe morbidity progressing to death according to: age ≥30; unemployment, routine or manual occupation; black Caribbean or African ethnicity and a BMI ≥30kg/m²

<table>
<thead>
<tr>
<th>Number of risk factors</th>
<th>aOR [95%CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1.35 (0.67-2.75)</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2.77 (1.33-5.76)</td>
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<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4.40 (1.76-11.0)</td>
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</tbody>
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The Maternal, Newborn and Infant Clinical Outcomes Review Programme
Programme of work

• Surveillance of
  – Maternal deaths
  – Perinatal deaths
  – Infant deaths up to age one year

• Confidential reviews of
  – Maternal deaths
  – Specific maternal morbidities
  – Specific perinatal/infant morbidities
New work – maternal morbidity

- New morbidity topic selected annually
- Confidential enquiry of a sample of approximately 30 cases nationally
- Cases can be identified through a variety of sources depending on the topic
- Maternal morbidity confidential enquiries:
  - 2013: Sepsis
  - 2014: Postpartum psychosis
  - 2015: Women with an artificial heart valve
Sepsis morbidity – some key messages

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

• A sample of the women with septic shock chosen for the 2014 Confidential Enquiry into Maternal Morbidity
Sources of severe sepsis

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

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


- 37% (N=134) antenatal
  - UTI (34%)
- 63% (N=231) postnatal
  - Genital-tract (37%)
  (P<0.0001)
Causative organism varies by source of infection

Source of infection

Acosta, Kurinczuk, Lucas at al 2014 (PLoS Med)
..and mode of delivery

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

Acosta, Kurinczuk, Lucas at al 2014 (PLoS Med)
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
- <2 hours between the first signs of SIRS and sepsis:
  - 50% Group A Strep cases

Importance of a sepsis bundle and early antibiotics
Clinical suspicion of Group A Strep is a red flag for urgent action

Acosta, Kurinczuk, Lucas at al 2014 (PLoS Med)
## Severity

<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

- 78% of women had level 2 or 3 critical care
- 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)

Some women may need critical care on delivery suite
Some women may need obstetric care in the critical care unit
Facilities/processes need to be available for both

Acosta, Kurinczuk, Lucas at al 2014 (PLoS Med)
What can confidential enquiries into morbidity add to UKOSS studies?

• **UKOSS 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

Report published 9th December 2014
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.”

Women’s and partners’ experiences – a few key messages
"True stories are...nutritious and sustaining. They feed the mind with information and the heart with hope and strength."

Philip Pullman

People's stories: see, hear and read their experiences...

Healthtalkonline is the award-winning website of the DIPEx charity and replaces the website formerly at dipex.org. Healthtalkonline lets you share in other people's experiences of health and illness. You can watch or listen to videos of the interviews, read about people's experiences and find reliable information about conditions, treatment choices and support.

The information on Healthtalkonline is based on qualitative research into patient experiences, led by experts at the University of Oxford. These
Themes

• Near-miss events can have a major impact on fathers
• Women often felt very unsupported following their transition from critical/high dependency care to the postnatal ward
• Many women and their partners express a need for ongoing counselling and experience long-term problems
• Small things can make a big difference
Darren’s wife had a uterine rupture and their daughter was stillborn. He describes being in theatre (3.19) and that the worst moment for him was having to tell his wife a second time that their daughter had died (4.50).
Summary

• The study of severe morbidity gives additional value to complement information on maternal deaths
• UKOSS studies can be used to investigate incidence, risk factors, management and outcomes of individual conditions, and audit guidelines
• Women’s experiences add an additional perspective
• Many of these research questions cannot be answered using any other methodology
• These studies would not be possible without the collaboration of clinicians throughout the UK
Acknowledgements

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• Co-authors, researchers and admin team

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