CMACE 2006-2008

Saving Mothers’ Lives

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Stockholm
May 2011
History of CEMD

- Series of triennial reports 1952-present
- 1952-1984 England & Wales
- 1985-present UK
- 1 April 2003 CEMD →CEMACH/CEMACE
- (January 2009 Ireland (2009-11))?
Methodology

• NOT Clinical audit

• ‘observational and self-reflective study which identifies patterns of practice, service provision and public health issues that may be causally related to maternal deaths.’

• ‘sentinel event reporting’

• Small numbers....
‘Vignettes’

• Past reports included ‘case examples’
• Problems with patient confidentiality

• 2000-2002 and thereafter ‘composite vignettes’
• Less helpful?
Causes of death: definitions

‘Maternal death’ Pregnancy → 42 days post

‘Direct’ Obstetric diseases

‘Indirect’ Pre-existing diseases

‘Coincidental’ (fortuitous)

‘Late’ 42 → 1 year
UK Maternal mortality rates 1952-2008
per 100,000 maternities
UK Maternal death rate 2006-2008

UK: total reported 11.39/100,000 maternities

UK: Death certificates 6.76/100,000 maternities

UK: WHO definition 6.7/100,000 live births
<table>
<thead>
<tr>
<th>Years</th>
<th>No of deaths</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994-96</td>
<td>158</td>
<td>7.2</td>
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<tr>
<td>1997-99</td>
<td>128</td>
<td>6.0</td>
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<tr>
<td>2000-02</td>
<td>136</td>
<td>6.8</td>
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<td>2003-05</td>
<td>149</td>
<td>7.0</td>
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<tr>
<td>2006-08</td>
<td>155</td>
<td>6.7</td>
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</table>
International comparisons 2010

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimate</th>
<th>Lower &amp; Upper Estimates</th>
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<tbody>
<tr>
<td>Sweden</td>
<td>6</td>
<td>(3-8)</td>
</tr>
<tr>
<td>UK</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>7</td>
<td>(6-9)</td>
</tr>
<tr>
<td>France</td>
<td>8</td>
<td>(5-14)</td>
</tr>
<tr>
<td>Canada</td>
<td>12</td>
<td>(7-20)</td>
</tr>
<tr>
<td>USA</td>
<td>24</td>
<td>(20-27)</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>1400</td>
<td>(750-2600)</td>
</tr>
<tr>
<td>Region</td>
<td>Maternal mortality ratio (maternal deaths per 100,000 live births)</td>
<td>Number of maternal deaths</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>World total</td>
<td>400</td>
<td>529,000</td>
</tr>
<tr>
<td>Developed regions*</td>
<td>20</td>
<td>2,500</td>
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<tr>
<td>Europe</td>
<td>24</td>
<td>1,700</td>
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<tr>
<td>Developing regions</td>
<td>440</td>
<td>527,000</td>
</tr>
<tr>
<td>Africa</td>
<td>830</td>
<td>251,000</td>
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<tr>
<td>Northern Africa</td>
<td>130</td>
<td>4,600</td>
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<tr>
<td>Sub-Saharan Africa</td>
<td>920</td>
<td>247,000</td>
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<tr>
<td>Asia</td>
<td>330</td>
<td>253,000</td>
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<tr>
<td>Eastern Asia</td>
<td>55</td>
<td>11,000</td>
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<tr>
<td>South-Central Asia</td>
<td>520</td>
<td>207,000</td>
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<td>South-Eastern Asia</td>
<td>210</td>
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<tr>
<td>Western Asia</td>
<td>190</td>
<td>9,800</td>
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<tr>
<td>Latin America &amp; the Caribbean</td>
<td>190</td>
<td>22,000</td>
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<tr>
<td>Oceania</td>
<td>240</td>
<td>530</td>
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* Includes UK, Canada, USA, Japan, Australia and New Zealand, which are excluded from the regional totals
Top 10 Recommendations
Top 10 Recommendations 2003-5

1. Pre-conception care
2. Easy access
3. Seen within 2 weeks
4. Immigrant women
5. Treat systolic HT
6. Risks of CS & placenta praevia
7. Critical incident reporting & learning
8. Training for recognising serious illness
9. MOEWS
10. Guidelines – obesity, sepsis, early pregnancy
Top 10 Recommendations 2006-8

1. Pre-conception counselling
2. Interpretation services
3. Communication & referral
4. Multidisciplinary specialist care
5. BACK TO BASICS: Clinical skills and training
6. Recognising and managing sick women
7. Treat systolic HT
8. Sepsis
9. Incident reporting
10. Pathology
The good news: 2006-8

- Statistically significant decline in mortality in:
  - Direct deaths
  - Thromboembolism
  - Black African women
- Halving of deaths from ectopics
- More women attending antenatal clinic
- Reduction in inequalities gap
The bad news: 2006-8

• Indirect deaths unchanged
• Sepsis worse
• Substandard care remains
• Back to basics & teamwork
• Communication, referral & involvement
Causes of death: 2006-8

Rate per 100,000 maternities

- Cardiac disease
- Other indirect causes
- Indirect neurological conditions
- Sepsis
- Pre-eclampsia and eclampsia
- Thrombosis and thromboembolism
- Amniotic fluid embolism
- Psychiatric causes
- Early pregnancy deaths
- Haemorrhage
- Anaesthesia
- Other direct
- Indirect malignancies
Quality of care: 2006-8

<table>
<thead>
<tr>
<th>Cause</th>
<th>Numbers of cases</th>
<th></th>
<th></th>
<th>Percentage of cases</th>
<th></th>
<th>Percentage of cases with no SSC</th>
<th>Total number of cases</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Major</td>
<td>Minor</td>
<td>Total</td>
<td>Major</td>
<td>Minor</td>
<td>Total</td>
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<tr>
<td>Direct</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Thrombosis and thromboembolism</td>
<td>6</td>
<td>4</td>
<td>10</td>
<td>33</td>
<td>22</td>
<td>56</td>
<td>44</td>
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<td>Pre- eclampsia, eclampsia and acute</td>
<td>14</td>
<td>6</td>
<td>20</td>
<td>64</td>
<td>27</td>
<td>91</td>
<td>9</td>
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<tr>
<td>Haemorrhage</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>44</td>
<td>22</td>
<td>67</td>
<td>33</td>
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<td>Amniotic fluid embolism</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>15</td>
<td>46</td>
<td>62</td>
<td>38</td>
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<tr>
<td>Early pregnancy deaths</td>
<td>6</td>
<td></td>
<td>6</td>
<td>55</td>
<td></td>
<td>55</td>
<td>45</td>
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<tr>
<td>Sepsis</td>
<td>12</td>
<td>6</td>
<td>18</td>
<td>46</td>
<td>23</td>
<td>69</td>
<td>31</td>
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<td>Anaesthesia</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>43</td>
<td>43</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>Total Direct</td>
<td>47</td>
<td>28</td>
<td>75</td>
<td>44</td>
<td>26</td>
<td>70</td>
<td>30</td>
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<tr>
<td>Indirect</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>13</td>
<td>14</td>
<td>27</td>
<td>25</td>
<td>26</td>
<td>51</td>
<td>49</td>
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<tr>
<td>Other Indirect causes</td>
<td>17</td>
<td>11</td>
<td>28</td>
<td>33</td>
<td>21</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Indirect neurological causes</td>
<td>11</td>
<td>12</td>
<td>23</td>
<td>31</td>
<td>33</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>Psychiatric causes</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>46</td>
<td>8</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Total Indirect</td>
<td>47</td>
<td>38</td>
<td>85</td>
<td>31</td>
<td>25</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Total Direct and Indirect</td>
<td>94</td>
<td>66</td>
<td>160</td>
<td>36</td>
<td>25</td>
<td>61</td>
<td>39</td>
</tr>
</tbody>
</table>
Causes of death: 2006-8
CMACE EMERGENT THEME BRIEFING
#1: Genital Tract Sepsis
September 2010

SAVING MOTHERS’ LIVES 2006-08: Briefing on genital tract sepsis

During the 2006 – 2008 triennium, sepsis was the leading cause of direct maternal deaths, accounting for 26 direct deaths and a further 3 deaths classified as ‘Late Direct’¹. Whilst maternal mortality is declining overall, maternal deaths due to sepsis have risen in recent triennia, particularly those associated with Gp A streptococcal infection (GAS):

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Rate / 100,000 maternities</td>
<td>0.65</td>
<td>0.85</td>
<td>1.13</td>
</tr>
<tr>
<td>Numbers* (all organisms)</td>
<td>13</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>Numbers* (GAS)</td>
<td>3</td>
<td>8</td>
<td>13</td>
</tr>
</tbody>
</table>

*: Direct and indirect maternal deaths together
Sepsis: 26 + 3 Direct deaths

- Strep pyogenes (Gp A Strep) 13
- E coli 5
- Staph aureus 3
- Strep pneumoniae 1
- Morganella morganii 1
- Clostridium septicum 1
- PVL MRSA 1
- Unknown 4
Test for trend over period 1985–2008: $P = 0.01$
Sepsis: Key points

• Be aware of sepsis – sepsis beware!

• Educate: patients & healthcare providers
• Diagnose & monitor
• IMMEDIATE antibiotics

• Guidelines (Abx & Mx)
Sepsis: Back to Basics

- Hyper, hypo, swinging pyrexia
- Tachycardia > 100
- Tachypnoea > 20
- Leucopenia < 4 x 10⁹
- Diarrhoea
- Abdo pain
Sepsis: Key points

Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock.
Crit Care Med 2008;36:296-327

....but careful with fluids
Thrombosis and thromboembolism
Venous thromboembolism: reducing the risk

Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital

This guideline updates NICE clinical guideline 46 and replaces it

NICE clinical guideline 92
Developed by the National Collaborating Centre for Acute and Chronic Conditions
Pre-eclampsia/eclampsia
CEREBRAL deaths in pre-eclampsia/eclampsia


0  2  4  6  8  10  12  14

Cerebral
Bleed
Infarct
Oedema
Eclampsia
Pre-eclampsia: Hypertension

CEMACE 2006-8
Treat at systolic $\geq 150$

CEMACH 2003-5
Treat at systolic $\geq 160$

(Martin et al, Obstet Gynecol 2005)
Mississippi: 1980-2003
28 strokes
25 haemorrhagic – data on 24

23/24 systolic > 160
3/24 diastolic > 110
6/24 MAP > 130
Top 10 Recommendations

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Top 10 Recommendations 2006-8

ABANDON ROUTINE USE OF SYNTOMETRINE?
Pre-eclampsia: Hypertension

CEMACH 2003-5

Treat at systolic $\geq 160$

(Martin et al, Obstet Gynecol 2005)

Consider pressor response to intubation
Pre-eclampsia: Hypertension

CEMACH 2003-5

2 cases:

GA CS for fetal distress
BP: 209/120, 210/105
PULMONARY deaths in pre-eclampsia/eclampsia

1987-1989: 12
1990-1991: 10
1992-1993: 12
1994-1995: 8
1996-1997: 2
1998-2000: 2
2001-2002: 2
2003-2004: 2
2005-2006: 2
2007-2008: 2
Haemorrhage
Maternal deaths from haemorrhage

- Total
- PPH
- Abruption
- Placenta praevia
- Genital tract trauma

Yearly breakdown from 1985 to 2008:
- Total: 50
Confidential Enquiries

Recurrent themes:

- Failure to recognise problems
- Failure to take action
- Failure to refer
- Inappropriate delegation to junior staff
- Poor or non-existent teamwork

CEMACH, CESDI & NCEPOD
Obstetric emergency training

Simulated emergencies should be organised to improve management of rare obstetric emergencies

CEMD – Why Mothers Die 1998
NHSLA. CNST Maternity Standards 2000
CEMACE – Saving Mothers Lives 2007/11
Kings Fund: Safer Births everybody’s business. 2008
PROMPT: ‘Course in a Box’

- Course manual
- Trainer’s manual
- CD Rom
- Telephone/email support

www.prompt-course.org
PROMPT Course
PPH Drill with props
**EWS/MOEWS**

Early warning scores

- Identify serious illness
- Trigger referral
Welcome

"Teams that work together should also train together, with regular training taking place on the labour ward rather than on ‘away days’...” (The King's Fund – 2008)

The PROMPT (PRactical Obstetric Multi-Professional Training) course is a multi-professional training package which enables midwives, obstetricians and anaesthetists to implement a fully evaluated obstetric emergencies course within their own maternity units.

- A 'Course in a Box'
- Endorsed jointly by the Royal College of Midwives and the Royal College of Obstetricians and Gynaecologists
- Answers and satisfies national recommendations (e.g. CEMACH, CNST, The King's Fund)
- Has been acquired by many units around the world, including the UK, USA, Italy, Hong Kong, Australia, New Zealand, Singapore, Fiji, Cook Islands, and others.

Resources

- Downloadable resources: Including the CTG sticker, Shoulder Dystocia proforma, etc. Visit the downloads pages.

Contact Us

For more information, please contact the PROMPT Co-ordinator, prompt.course@obstetric.com.au
Anaesthesia
Anaesthetic Related Deaths

- 127 cases (49%) had anaesthetic involvement
- 7 deaths – directly related to the anaesthetic
- 18 deaths – anaesthetic management contributed to death
- 12 deaths – anaesthetic involvement too late
Case 1

- Failed intubation
- Oxygenation via iLMA
- Unrecognised oesophageal intubation – increasing hypoxia and no ETCO$_2$
- 2$^{nd}$ dose thiopentone and NDMR given despite coughing
- No cricothyroid access attempted
- Patient had working epidural – not topped up
Case 1 recommendations

- FAILED INTUBATION DRILLS!!!!!!!
Case 1 recommendations

- FAILED INTUBATION DRILLS!!!!!!!

- Epidural anaesthetic for operative delivery learning point
  - Top up as soon as decision made for theatre
Section 8 Cord prolapse drill

**Equipment Required:**
- Mother with pregnant abdomen (mockup)
- Dummy baby with cord
- Electronic fetal monitor
- Management
- Oxygen
- Phlebotomy at CTG
- Cervix
- Blood pressure machine

**Instructions:**
- Follow the scenario and script provided for cord prolapse.
- Use an extra to play the part of the mother.
- Add a baby and uterus.
- After the drill discuss alternatives and further management.

**Notes:**

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Cord prolapse

**Scenario:**
You have entered the room of a primigravid woman in labour at 36 weeks gestation. She had gone into spontaneous labour and was known to have a small baby on ultrasound examination. Her last vaginal examination had indicated that her cervix was 4 cm dilated with intact membranes and the head was high, at 3 cm above the maternal symphysis.

Just as you enter the room the mother tells you she thinks her membranes have ruptured. Continuous electronic monitoring is in progress.

**Initial observations on arrival**

<table>
<thead>
<tr>
<th>Pulse</th>
<th>100 bpm</th>
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<tbody>
<tr>
<td>BP</td>
<td>120/70</td>
</tr>
<tr>
<td>CTG</td>
<td></td>
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</tbody>
</table>

"I think my waters have gone"

**Drill procedure for cord prolapse**

1. Oxygen
2. Call lateral
3. Call for help
4. Vaginal examination
5. Dissox head
6. Dissox head: interventional elevation of presenting part
7. Call theatre team
8. Catheterise (consider filling bladder)
9. IV access x 1
10. Consider tocolytics
11. End point: Caesarean section

Document all actions including drug dosages and timings.
Cord Prolapse

*\(p<0.0001\) (Chi-squared test)
Neonatal Outcome

Apgar <7  |  IP Stillbirth  |  NICU Admission

Pre-Training  |  Post-Training

50  |  40  |  0
Anaesthesia

![Graph showing pre-training and post-training usage of different types of anaesthesia: Epidural, GA, Spinal.]
Case 2

- Occurred on the critical care unit
- Pt with tracheostomy
  - Difficult tracheostomy
  - Removed when pt rolled
- Clear strategy for management of this scenario was needed prior to its occurrence
- Early involvement of more senior staff
Case 3

• Opioid toxicity in a women with PCA
  – PCA not available for r/v

• Serious incident learning point
  – All equipment and drugs retained in situ for inspection and analysis until the cause of the incident is determined
Case 4

• Acute circulatory failure
  – Blood incompatibility after a blood transfusion
Case 5

• Cardiac arrest during recovery from GA for surgical abortion
• iv syntometrine
• Substance abuse - discovered
Case 6

• Aspirated on emergence from GA for section
  – Cat 1 section for APH – placenta praevia
  – Bleeding settled and CVS stable
  – Not starved
  – No documentation whether cat 1 required

• Full stomach learning point
  – Fully awake and protecting airway prior to extubation
  – Consider orogastric tube
Case 7

• Acute haemorrhagic disseminated leucoencephalitis
  – Uneventful spinal anaes for caesarean
  – Empyema in spinal canal
  – Likely trigger for this autoimmune disease

• Need strict asepsis with neuroaxial blocks
Substandard Care

• 6 out of 7 cases
  – Not necessarily the cause of death
Deaths in which Anaesthetic Contributed

• 18 deaths
  – 10 failure to recognise serious illness
  – 8 poor management of pre-eclampsia/eclampsia
  – 6 poor management of sepsis
  – 5 poor management of PPH
  – 5 poor management of haemorrhage in early pregnancy
  – 12 failure to consult with anaes or critical care early
  – 9 obesity
  – 1 anaphylaxis
  – 1 thromboprophylaxis
Learning Points

• Severe pre-eclampsia
  – Immediate treatment and monitoring of BP on HDU
  – Early involvement of critical care services

• Sepsis - circulatory collapse
  – Sudden
  – Multidisciplinary management
  – Early abx, fluid resus, +/- inotropes, critical care involvement
  – Ix – bloods, cultures, lactate
  – Surgery to remove source
Learning Points cont.

- Haemorrhage
  - High risk women – deliver in major obs units with critical care, interventional radiology, cell salvage
  - Circulatory collapse can be sudden, MDT management
  - Fluids & inotropes
  - Symptoms/signs harder to recognise
    - Language difficulties
    - Obesity
    - pre-eclampsia
    - Brown/black skin
    - B-blockade
Learning Points cont.

• Anaphylaxis
  – Management charts should be immediately available

• Co-morbidities
  – High risk women require MDT involvement
  – Deliver in unit available to provide specialist services

• Thromboprophylaxis
  – Don’t delay 1st dose LMWH
Anaesthetic deaths: Key points

1. Failed intubation drills

2. Management of severe, acute illness
   Early anaesthetic/critical care involvement

3. Access to critical care services
Causes of death: 2006-8

Rate per 100,000 maternities

- Cardiac disease
- Other indirect causes
- Indirect neurological conditions
- Sepsis
- Pre-eclampsia and eclampsia
- Thrombosis and thromboembolism
- Amniotic fluid embolism
- Psychiatric causes
- Early pregnancy deaths
- Haemorrhage
- Anaesthesia
- Other direct
- Indirect malignancies
Deaths from cardiac disease 1964-2008

Per million maternities

Acquired

Congenital

Yentis 52-54 55-57 58-60 61-63 64-66 67-69 70-72 73-75 76-78 79-81 82-84 85-87 88-90 91-93 94-96 97-99 00-02 03-05 06-08
Cardiac disease

• Pre-pregnancy counselling
Cardiac disease

- Pre-pregnancy counselling
- Investigation & diagnosis
- Refer/discuss with specialist centre
Top 10 Recommendations 2006-8

1. Pre-conception counselling
2. Interpretation services
3. Communication & referral
4. Multidisciplinary specialist care
5. BACK TO BASICS: Clinical skills and training
6. Recognising and managing sick women
7. Treat systolic HT
8. Sepsis
9. Incident reporting
10. Pathology
Nothing new?

Do the simple things well
The future?
12 maternal deaths from swine flu in UK 2009
Saving Mothers' Lives
2009-2011 Report

A report of the UK confidential enquiries into maternal deaths

?www.cemach.org.uk
The Pyramid of Disease

1. Deaths
2. Severe Morbidity
3. Illness requiring medical care
4. Asymptomatic/Self-care
# UKOSS: Completed Studies

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<tr>
<th>Year</th>
<th>Studies</th>
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<tr>
<td>2006</td>
<td>• Eclampsia • Peripartum Hysterectomy • Acute Fatty Liver • Antenatal PE • TB</td>
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<tr>
<td>2007</td>
<td>• Gastroschisis</td>
</tr>
<tr>
<td>2008</td>
<td>• Extreme Obesity • FMAIT</td>
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<tr>
<td>2009</td>
<td>• Therapies for Peripartum Haemorrhage</td>
</tr>
<tr>
<td></td>
<td>• Multiple repeat caesarean section</td>
</tr>
<tr>
<td></td>
<td>• Pregnancy in renal transplant recipients</td>
</tr>
<tr>
<td>2010</td>
<td>• H1N1v influenza in pregnancy</td>
</tr>
<tr>
<td></td>
<td>• Antenatal Stroke</td>
</tr>
<tr>
<td></td>
<td>• Failed Intubation</td>
</tr>
<tr>
<td></td>
<td>• Malaria</td>
</tr>
<tr>
<td></td>
<td>• Congenital Diaphragmatic Hernia</td>
</tr>
<tr>
<td></td>
<td>• Myocardial Infarction</td>
</tr>
<tr>
<td></td>
<td>• Uterine Rupture</td>
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UKOSS: Current Studies

• Amniotic Fluid Embolism
• Aortic dissection
• Myeloproliferative disorders
• Pituitary tumours in pregnancy
• Placenta Accreta
• Pulmonary Vascular Disease
• Obstetric Cholestasis
• Non-renal Transplant recipients
• Sickle cell disease
Scottish Confidential Audit of Severe Maternal Morbidity

6th Annual Report 2008

http://www.healthcareimprovementscotland.org/home.aspx