

CONFIDENTIAL ENQUIRY INTO MATERNAL AND CHILD HEALTH
Improving the health of mothers, babies and children

Why Mothers Die

Confidential Enquiry into Maternal and Child Health



Save
Review

Volume 118, Supplement 1, March 2011

BJOG
An International Journal of
Obstetrics and Gynaecology

Saving Mothers' Lives

Reviewing maternal deaths to make
motherhood safer: 2006-2008

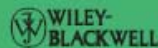


March 2011

The Eighth Report of the Confidential Enquiries into Maternal
Deaths in the United Kingdom



Centre for Maternal and Child Enquiries
Improving the health of mothers, babies and children



CMACE 2006-2008 Saving Mothers' Lives

Mark Scrutton
Consultant Anaesthetist
St Michael's Hospital
Bristol UK

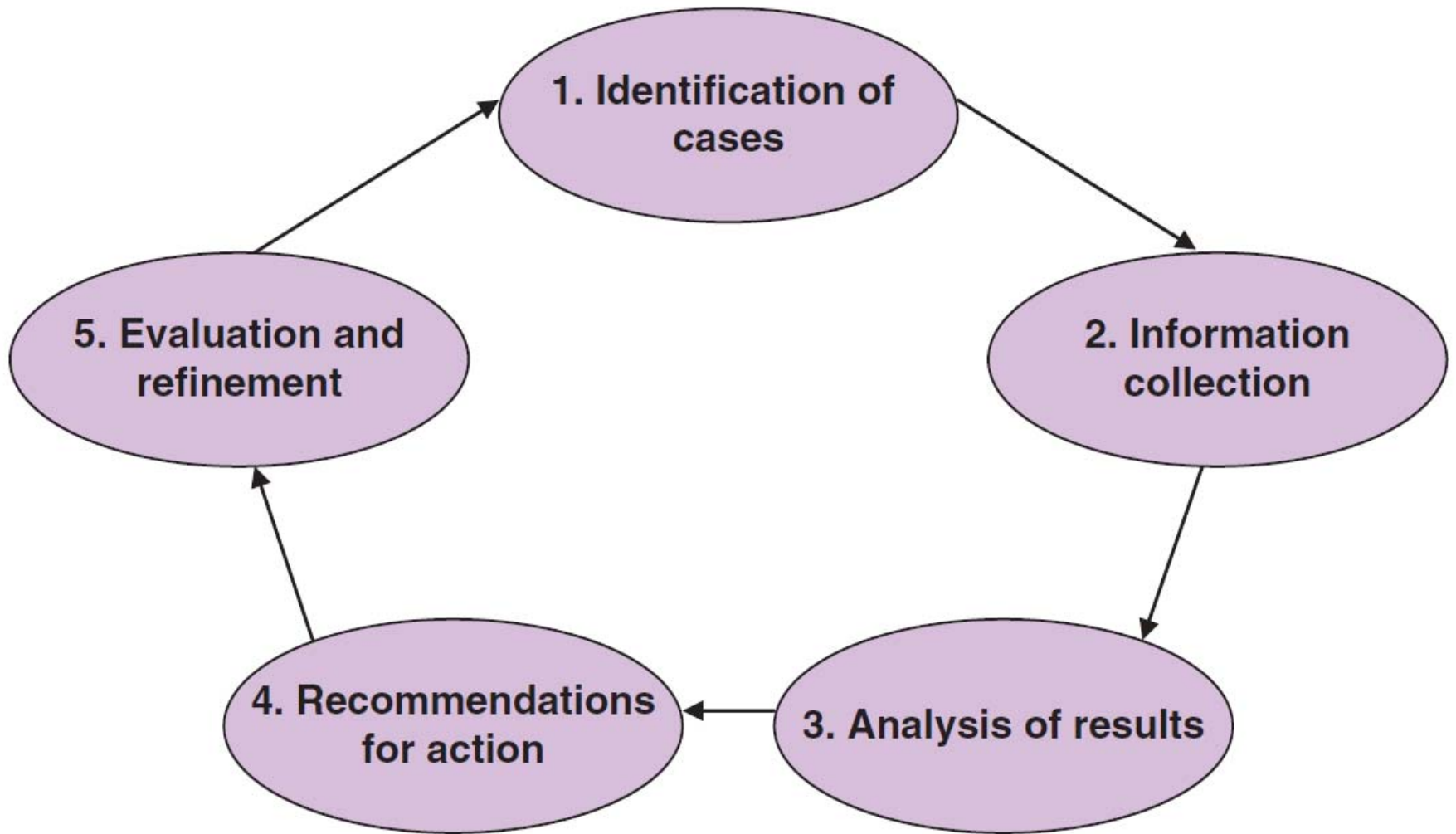
Stockholm
May 2011

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'

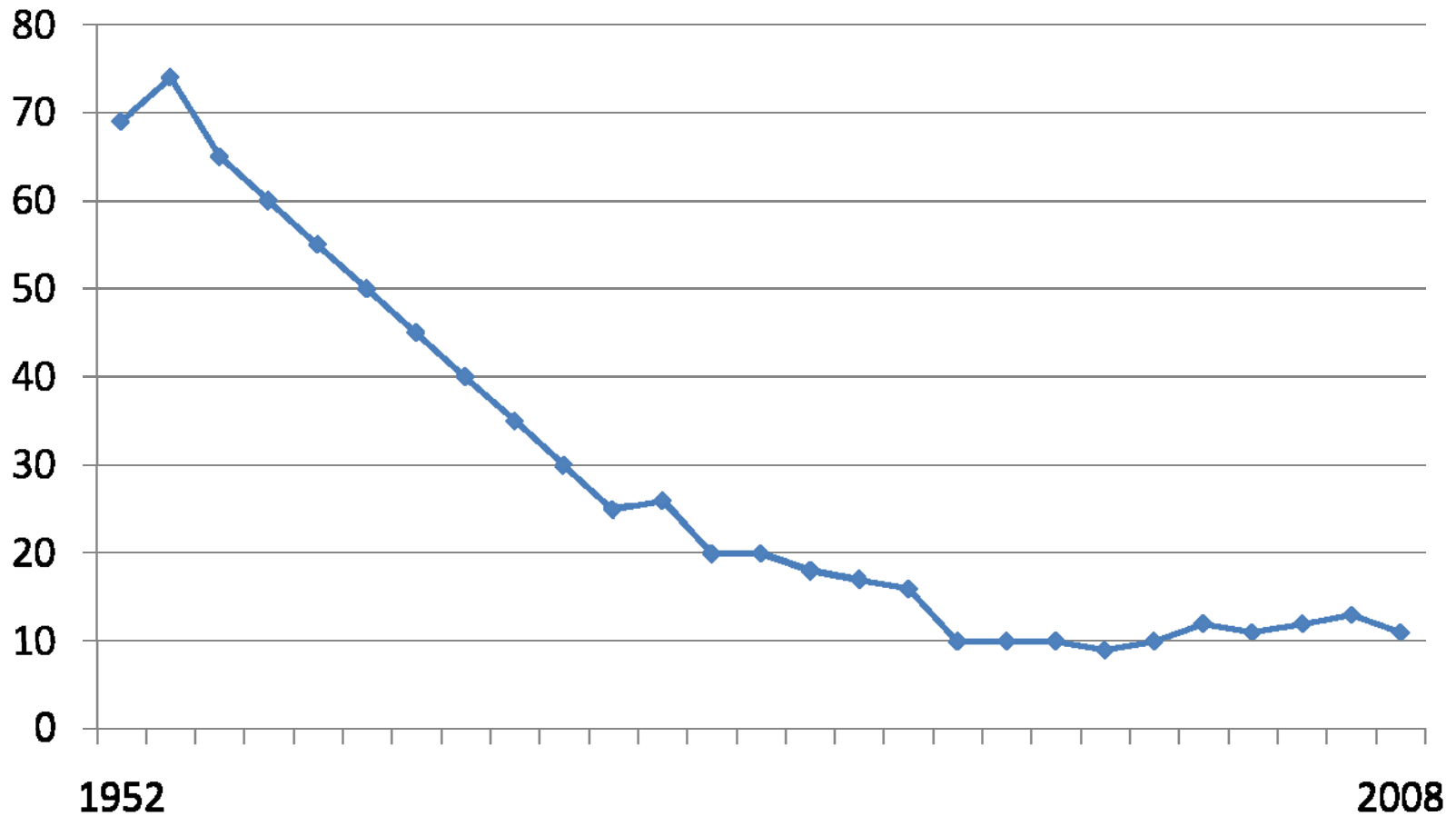
- Past reports included 'case examples'
- Problems with patient confidentiality
- 2000-2002 and thereafter 'composite vignettes'
- Less helpful?

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

UK Maternal death rate 1994-2008

<u>Years</u>	<u>No of deaths</u>	<u>Rate</u>
1994-96	158	7.2
1997-99	128	6.0
2000-02	136	6.8
2003-05	149	7.0
2006-08	155	6.7

International comparisons 2010

lower & upper estimates

Sweden	6	(3-8)
UK	7	
Germany	7	(6-9)
France	8	(5-14)
Canada	12	(7-20)
USA	24	(20-27)
Afghanistan	1400	(750-2600)

Table 3 Maternal mortality estimates by WHO/UN Regions: 2000

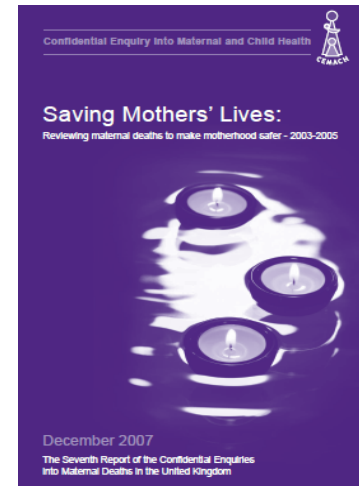
Region	Maternal mortality ratio (maternal deaths per 100,000 live births)	Number of maternal deaths	Lifetime risk of maternal death
World total	400	529,000	74
Developed regions*	20	2,500	2,800
Europe	24	1,700	2,400
Developing regions	440	527,000	61
Africa	830	251,000	20
Northern Africa	130	4,600	210
Sub-Saharan Africa	920	247,000	16
Asia	330	253,000	94
Eastern Asia	55	11,000	840
South-Central Asia	520	207,000	46
South-Eastern Asia	210	25,000	140
Western Asia	190	9,800	120
Latin America & the Caribbean	190	22,000	160
Oceania	240	530	83

* 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



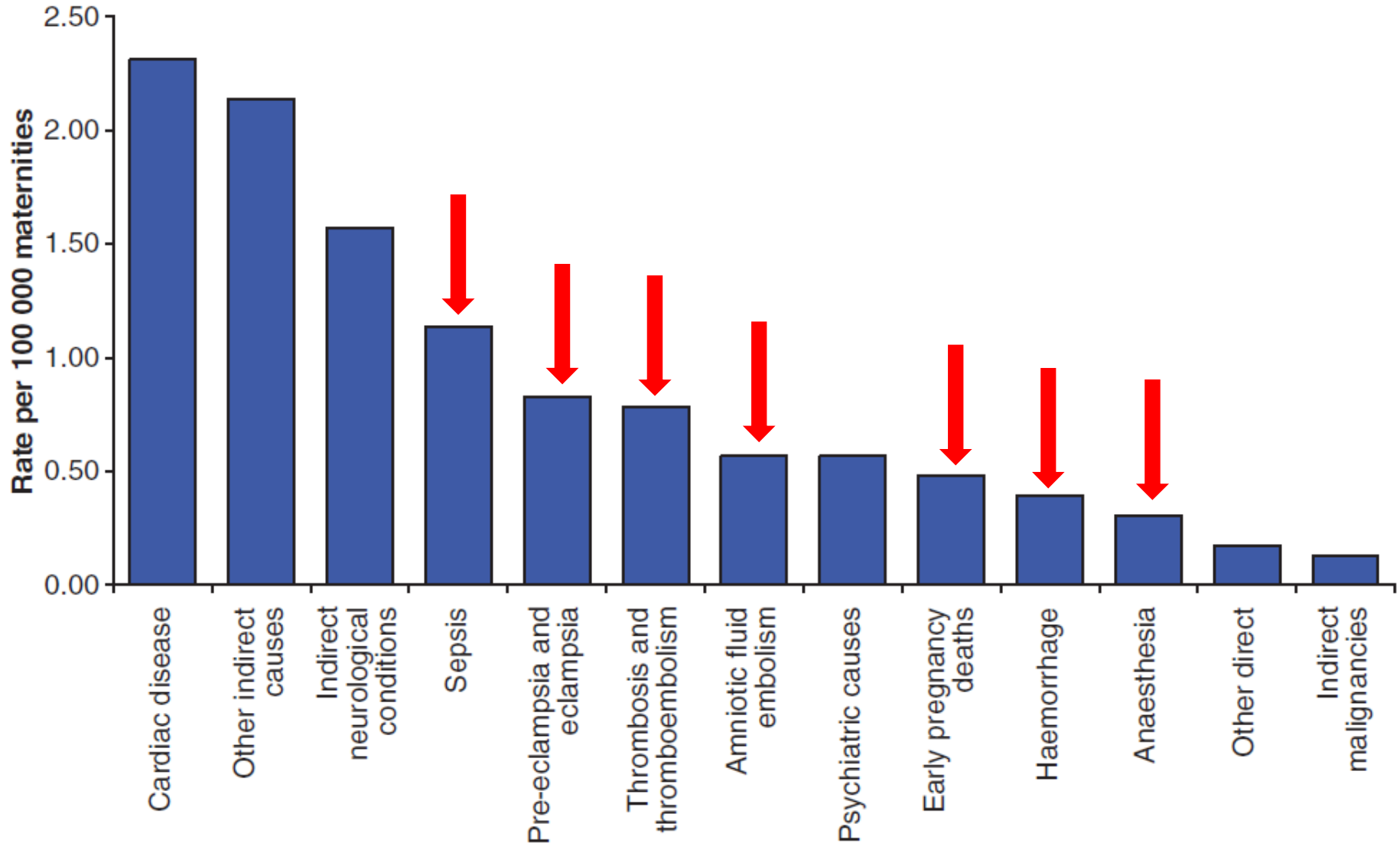
The good news: 2006-8

- 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 & teamworking
- Communication, referral & involvement

Causes of death: 2006-8



Quality of care: 2006-8

Cause	Numbers of cases			Percentages of cases			Percentage of cases with no SSC	Total number of cases
	Major	Minor	Total	Major	Minor	Total		
Direct								
Thrombosis and thromboembolism	6	4	10	33	22	56	44	18
Pre-eclampsia, eclampsia and acute fatty liver of pregnancy	14	6	20	64	27	91	9	22
Haemorrhage	4	2	6	44	22	67	33	9
Amniotic fluid embolism	2	6	8	15	46	62	38	13
Early pregnancy deaths	6	–	6	55	–	55	45	11
Sepsis	12	6	18	46	23	69	31	26
Anaesthesia	3	3	6	43	43	86	14	7
Total Direct	47	28*	75*	44	26	70	30	107*
Indirect								
Cardiac disease	13	14	27	25	26	51	49	53
Other <i>Indirect</i> causes	17	11	28	33	21	54	46	52
<i>Indirect</i> neurological causes	11	12	23	31	33	64	36	36
Psychiatric causes	6	1	7	46	8	54	46	13
Total Indirect	47	38	85	31	25	55	45	154
Total Direct and Indirect	94	66	160	36	25	61	39	261

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

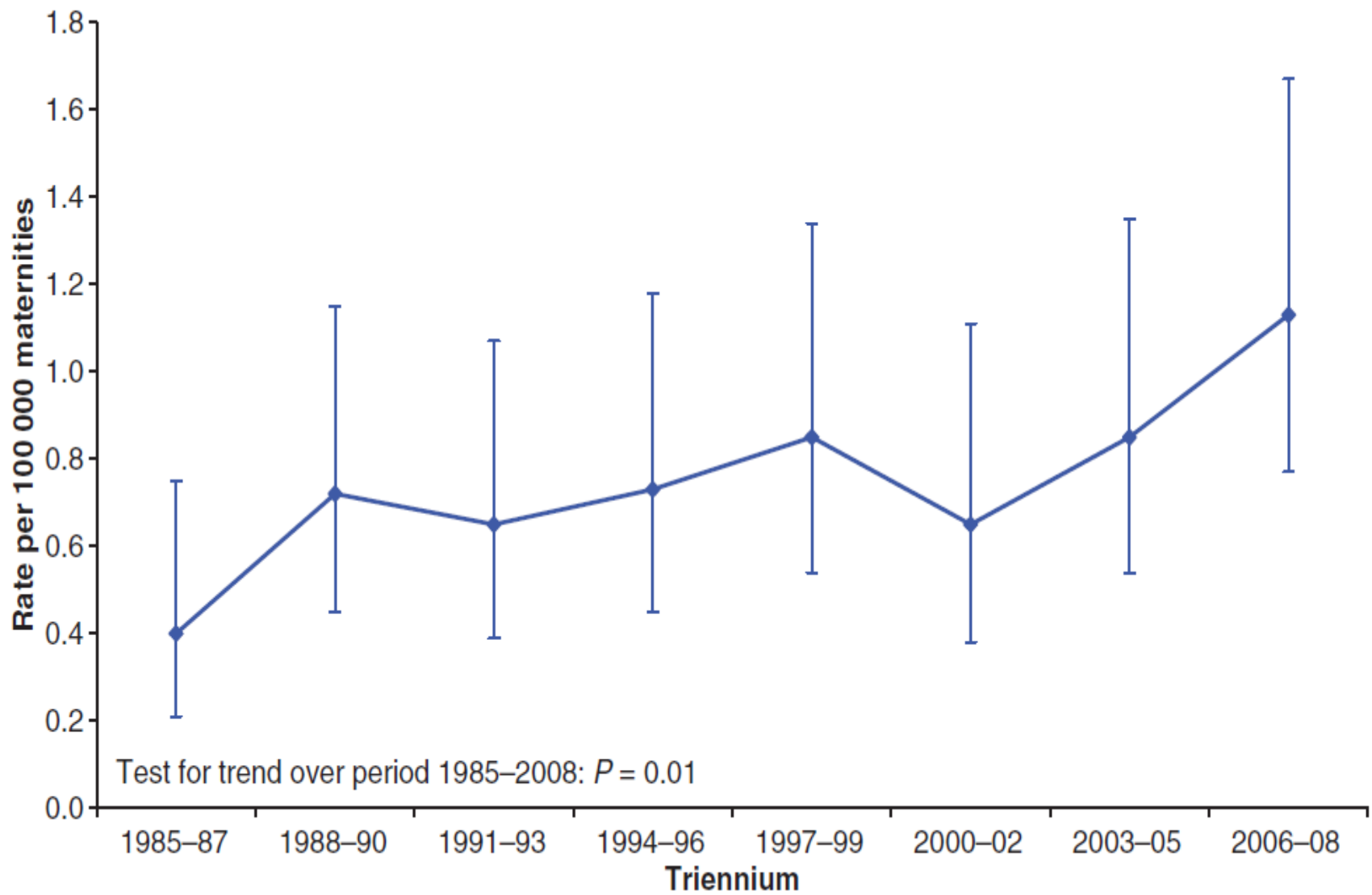
During the 2006 – 2008 triennium, sepsis was the leading cause of direct maternal deaths, accounting for 26 direct deaths and a further 3 deaths classified as 'Late Direct'¹. Whilst maternal mortality is declining overall, maternal deaths due to sepsis have risen in recent triennia, particularly those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

	2000-2002	2003-2005	2006-2008
Rate / 100,000 maternities	0.65	0.85	1.13
Numbers* (all organisms)	13	21	29
Numbers* (GAS)	3	8	13

*: 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



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 $< 4 \times 10^9$
- Diarrhoea
- Abdo pain



Sepsis: Key points

Surviving Sepsis Campaign:

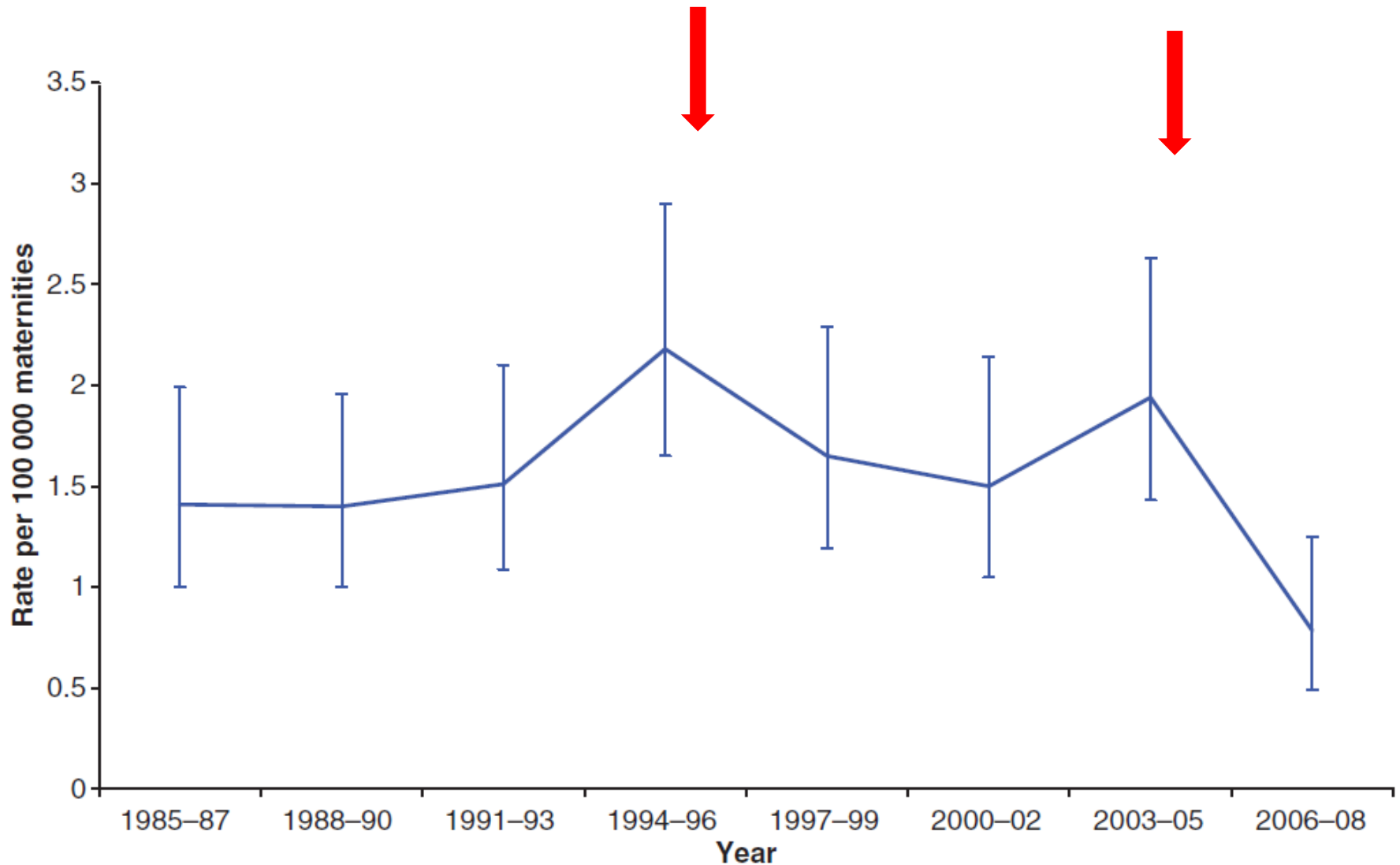
International guidelines for management of severe sepsis and septic shock.

Crit Care Med 2008;36:296-327

....but careful with fluids

Thrombosis and thromboembolism

Thrombosis and thromboembolism





Issue date: January 2010

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

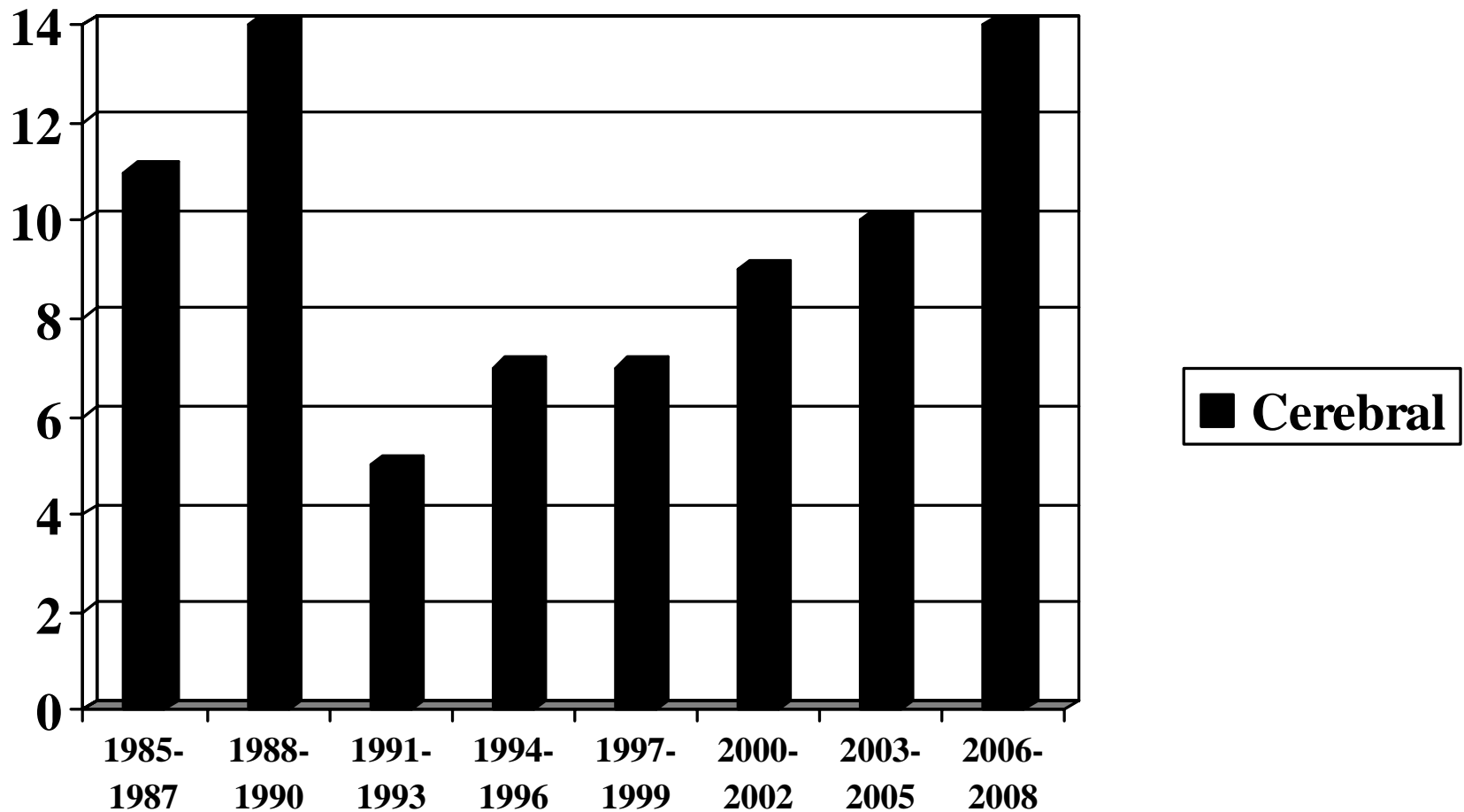
NICE clinical guideline 92
Developed by the National Collaborating Centre for Acute and Chronic Conditions

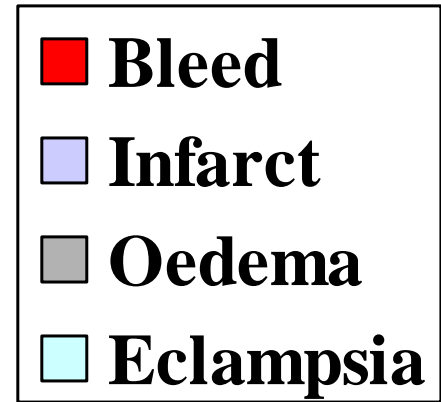
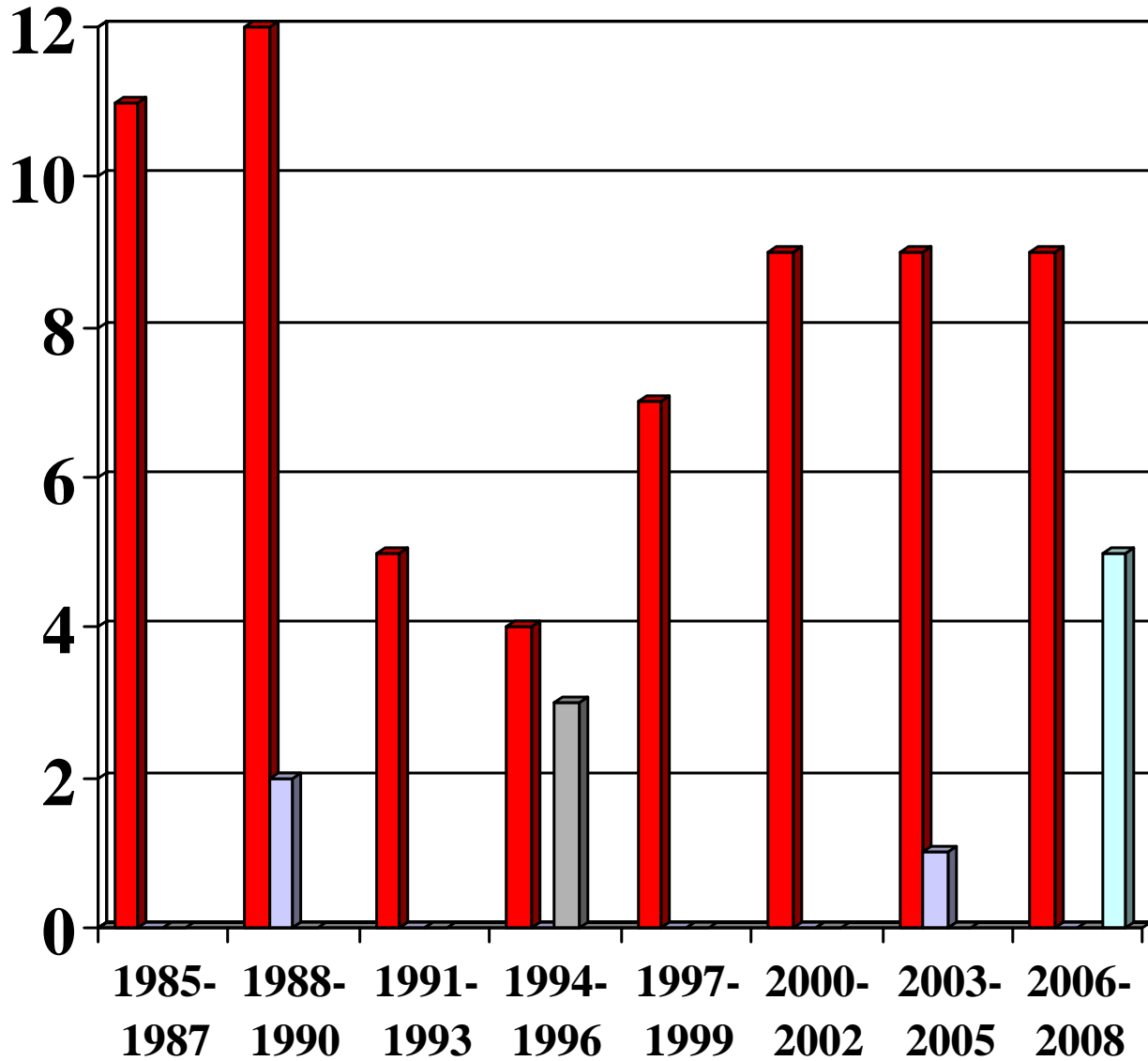
REDUCING THE RISK OF THROMBOSIS AND EMBOLISM DURING PREGNANCY AND THE PUERPERIUM

This is the second edition of this guideline, which was published in 2004 under the title *Thromboprophylaxis During Pregnancy, Labour and after Vaginal Delivery*.

Pre-eclampsia/eclampsia

CEREBRAL deaths in pre-eclampsia/eclampsia





Pre-eclampsia: Hypertension

CEMACE 2006-8

Treat at systolic ≥ 150

CEMACH 2003-5

Treat at systolic ≥ 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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2. Easy access
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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

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

Top 10 Recommendations 2006-8

**ABANDON ROUTINE
USE OF
SYNTOMETRINE?**

Pre-eclampsia: Hypertension

CEMACH 2003-5

Treat at systolic ≥ 160

(Martin et al, Obstet Gynecol 2005)

Consider pressor response to intubation

Pre-eclampsia: Hypertension

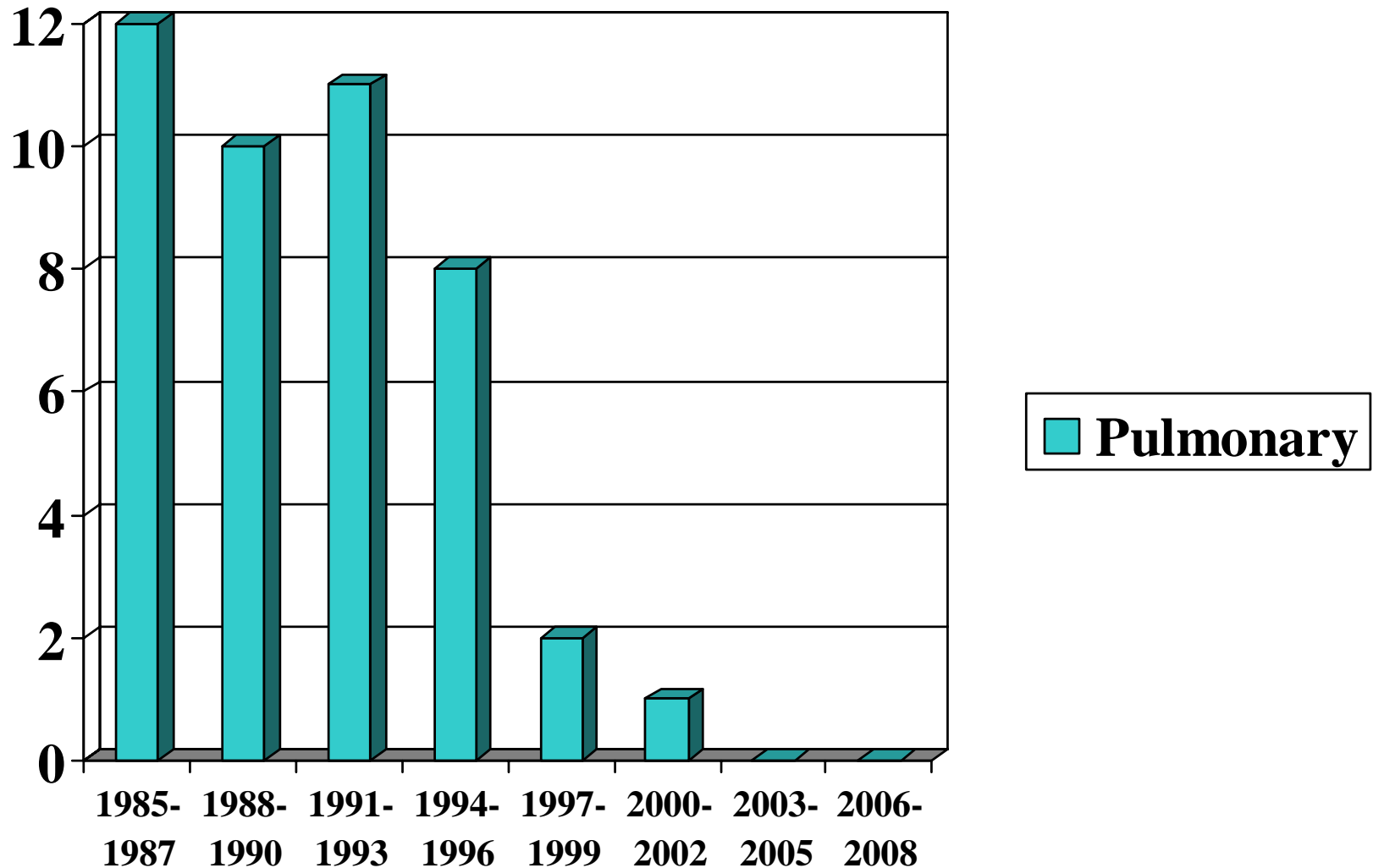
CEMACH 2003-5

2 cases:

GA CS for fetal distress

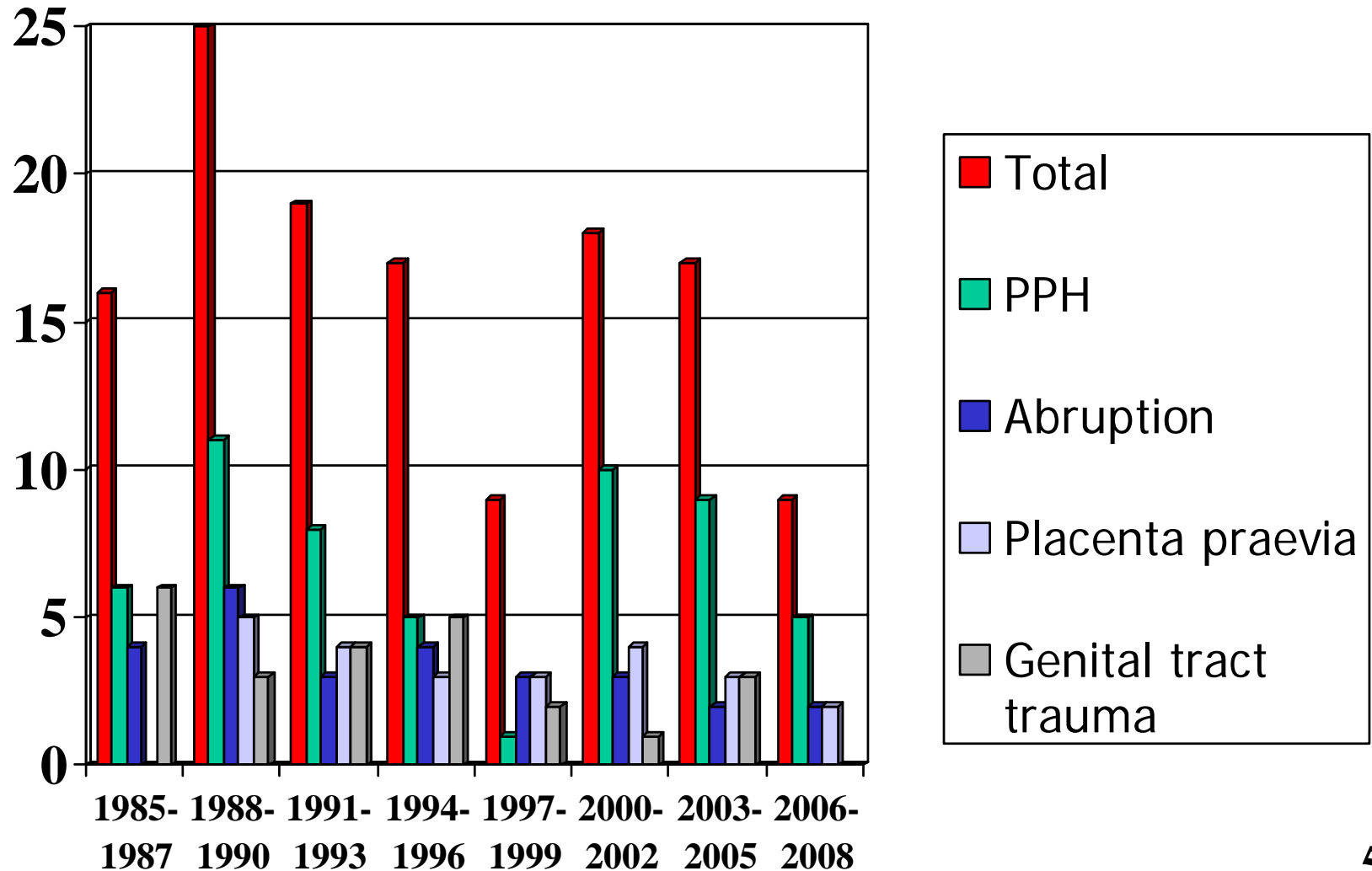
BP: 209/120, 210/105

PULMONARY deaths in pre-eclampsia/eclampsia



Haemorrhage

Maternal deaths from haemorrhage



Confidential Enquiries

Recurrent themes:

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

CEMACH, CESDI & NCEPOD

Obstetric emergency training

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

CESDI – 4th Annual Report 1997

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



Ward: _____

Use identification label on:
Name:
DOB:
Hospital No:

CONTACT DOCTOR FOR EARLY INTERVENTION IF PATIENT TRIGGERS ONE RED OR TWO AMBER SCORES AT ANY ONE TIME				
Date:				
Time:				
RESP (write rate in correct place)	>30		>30	
	21-30		21-30	
	11-20		11-20	
Saturation	0-10		0-10	
	95-100%		95-100%	
Administered O ₂ (L/min)	<25%		<25%	
	0 (min)		0 (min)	
Temp	38		38	
	38		38	
	37		37	
	36		36	
	35		35	
HEART RATE	170		170	
	160		160	
	150		150	
	140		140	
	130		130	
	120		120	
	110		110	
	100		100	
	90		90	
	80		80	
	70		70	
Systolic blood pressure	200		200	
	190		190	
	180		180	
	170		170	
	160		160	
	150		150	
	140		140	
	130		130	
	120		120	
	110		110	
	100		100	
Diastolic blood pressure	130		130	
	120		120	
	110		110	
	100		100	
	90		90	
	80		80	
	70		70	
	60		60	
	50		50	
	URINE	protein (++)		protein (++)
		protein (++)		protein (++)
protein (++)			protein (++)	
Clear (0) Pink (0)			Clear (0) Pink (0)	
Green (2)			Green (2)	
Blue			Blue	
Yellow			Yellow	
Unresponsive			Unresponsive	
0-1			0-1	
2-3			2-3	
Lochia		Normal (0)		Normal (0)
	Heavy (3) Fresh (0) Offensive (0)		Heavy (3) Fresh (0) Offensive (0)	
Loopy (urine)	NB (2)		NB (2)	
	YB (2)		YB (2)	
Total Amber Scores				
Total Red Scores				

EWS/MOEWS

Early warning scores

- Identify serious illness
- Trigger referral

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 ETCO₂
- 2nd 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

PROMPT: Cord Prolapse Drill

Section 8 Cord prolapse drill

Equipment Required

<ul style="list-style-type: none"> ■ Mother with pregnant abdomen (volunteer) ■ Dummy fetus with cord ■ Electronic fetal monitor ■ IV equipment 	<ul style="list-style-type: none"> ■ Catheter ■ Philosophy of CTG ■ Casarettale ■ Blood pressure machine
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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 primigravida 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 ischial spines.

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

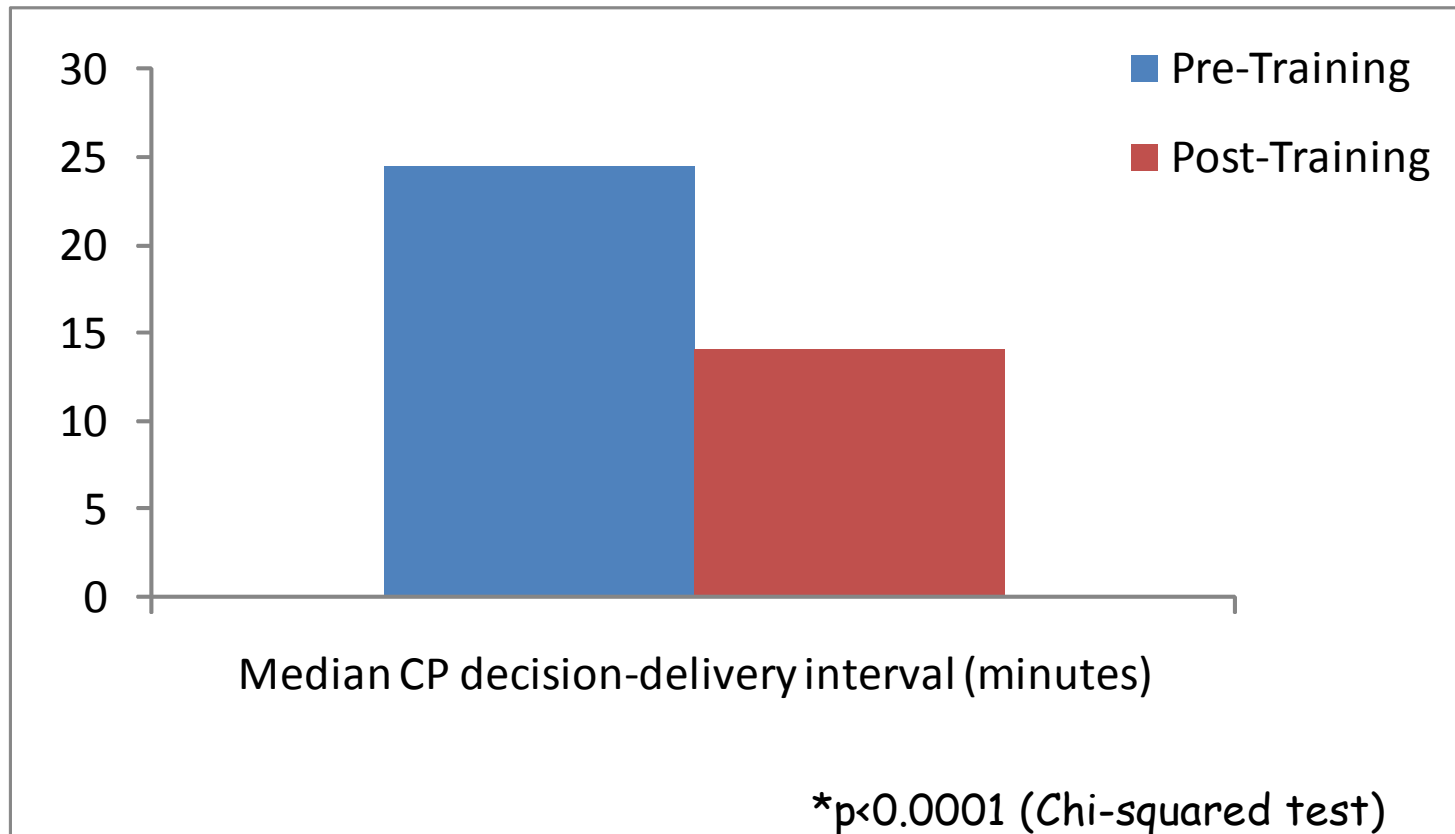
Pulse	100 bpm	Mother	"I think my waters have gone"
BP	120 / 70	CTG	Bradycardia

Dr

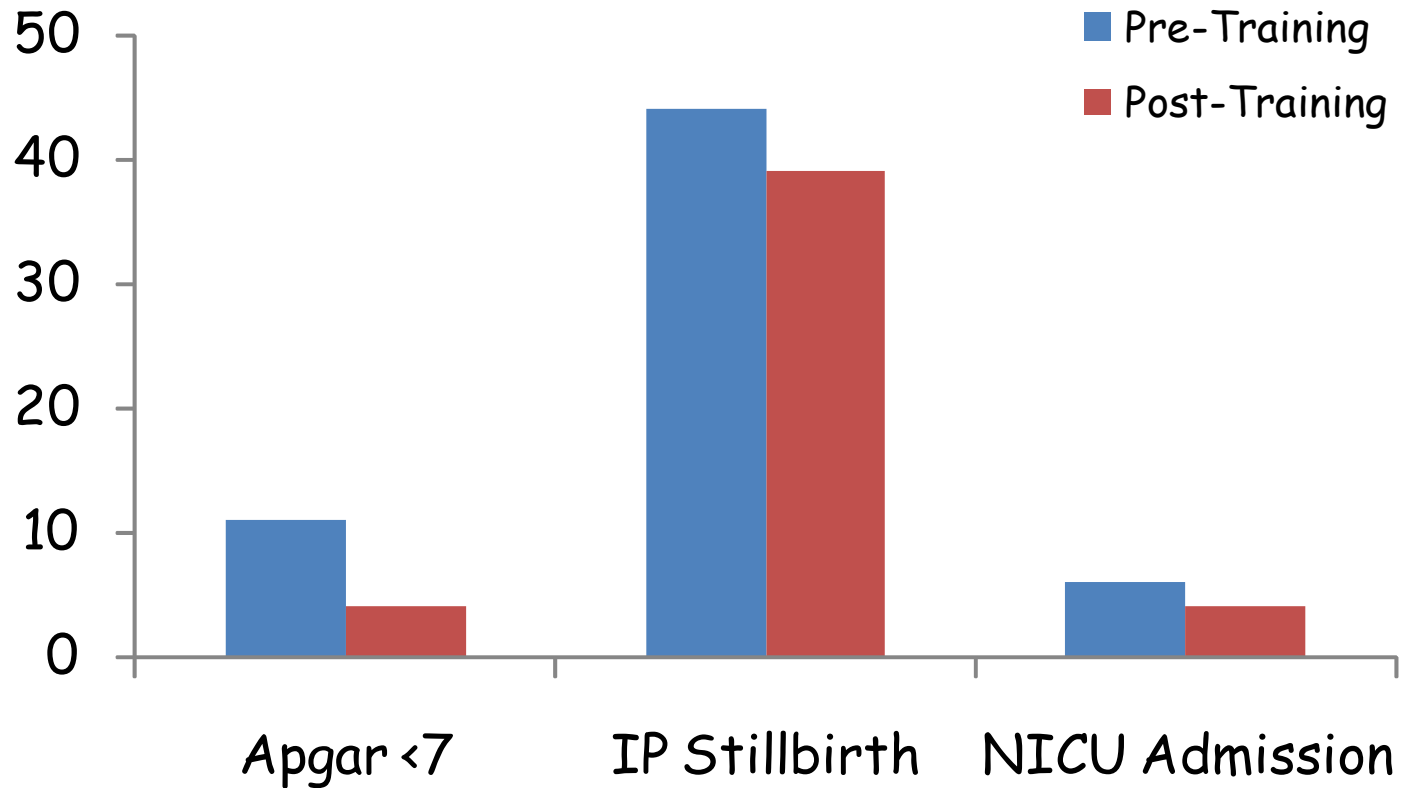
Drill procedure for cord prolapse		
Oxygen	Prompt	How may you help the fetus?
Left lateral		
Call for help	Prompt	Do you need any help?
Vaginal examination	Prompt	Can we deliver the baby?
		Cord felt 5cm dilated
Disimpact head	Prompt	How might you improve the fetal heart rate?
		CTG recovers
Knee-chest position / manual elevation of presenting part	Prompt	How are you going to prevent the head descending?
Call theatre team	Prompt	Where do you need to go now?
Catheterise (consider filling bladder)		
IV access x 1		take bloods
Consider tocolytics	Prompt	Is she over contracting still?
End point : Caesarean section	Document	ALL actions including drug dosages and timings

Dr

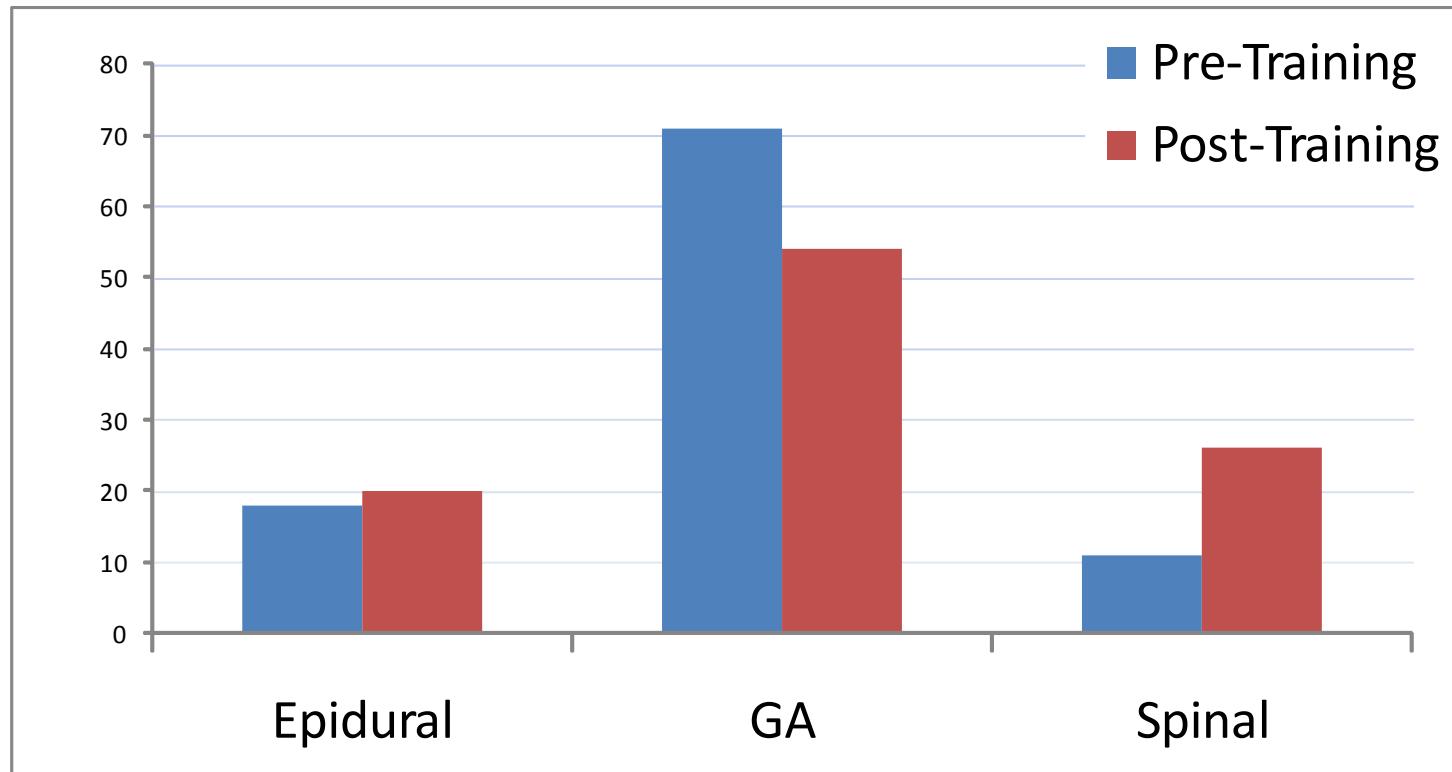
Cord Prolapse



Neonatal Outcome



Anaesthesia



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

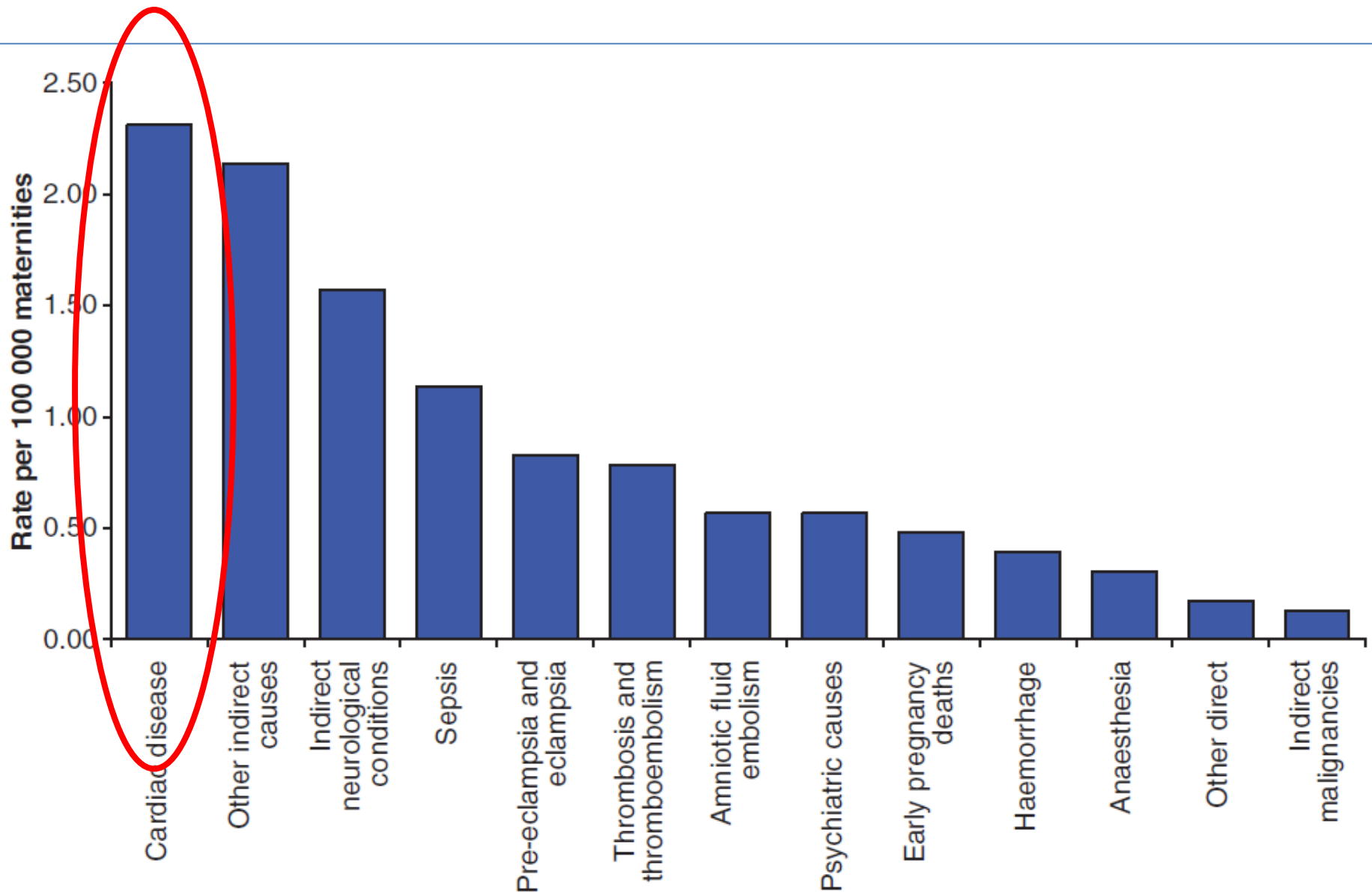
Learning Points cont.

- 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

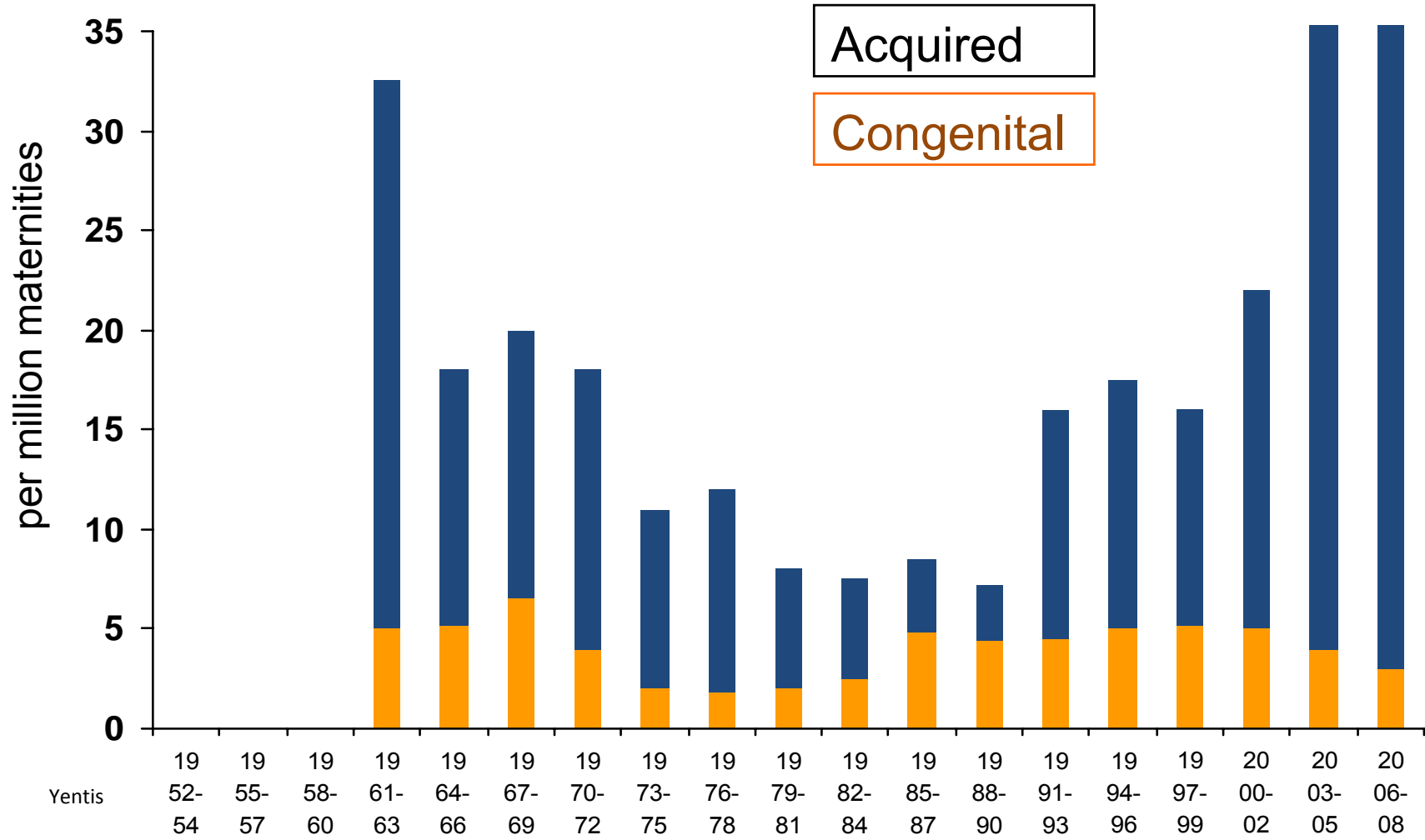
Anaesthetic deaths: Key points

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



Deaths from cardiac disease 1964-2008



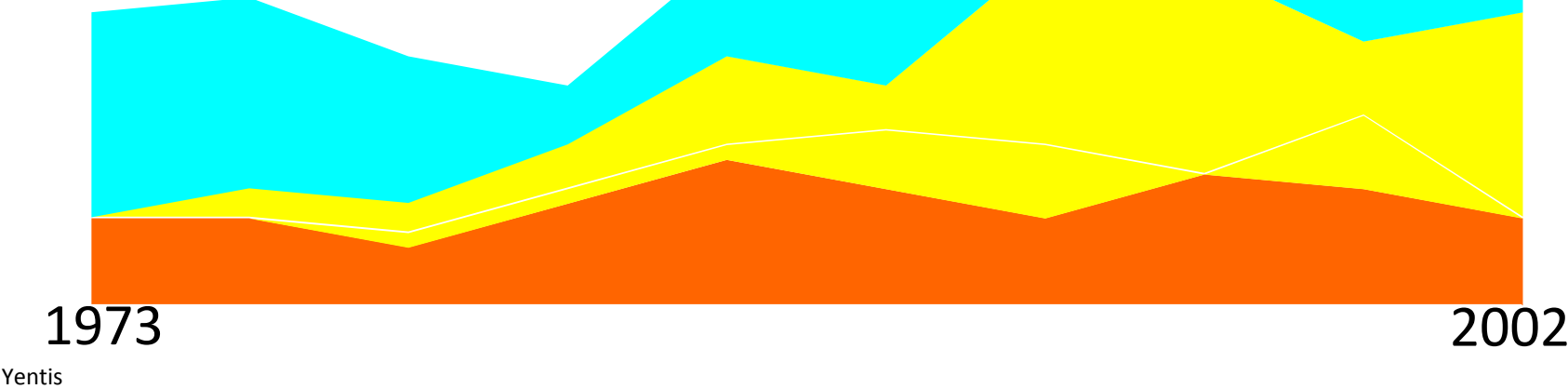
Cardiac disease

- Pre-pregnancy counselling

Pattern of cardiac deaths – UK

1973-2002

- Disease arising in pregnancy
- Risk factors
- Known pre-existing disease



Yentis

Cardiac disease

- Pre-pregnancy counselling
- Investigation & diagnosis
- Refer/discuss with specialist centre

Top 10 Recommendations 2006-8

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Nothing new?

Do the simple things well

The future?





Centre for Maternal and Child Enquiries
Improving the health of mothers, babies and children



Review of Maternal Deaths in the United Kingdom related to A/H1N1 2009 Influenza

December 2010

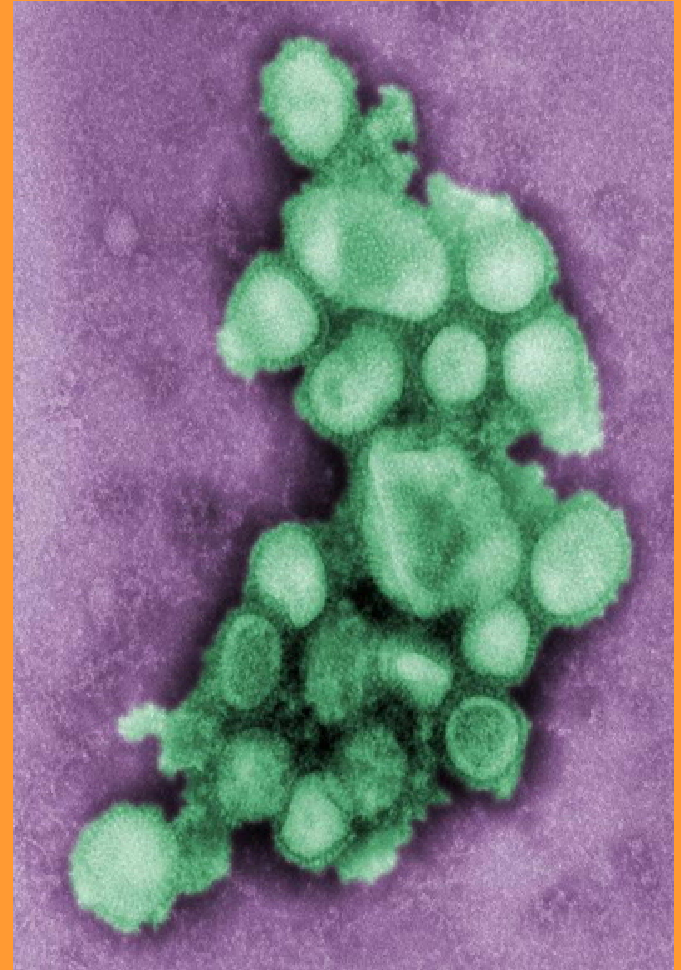
www.cemach.org.uk

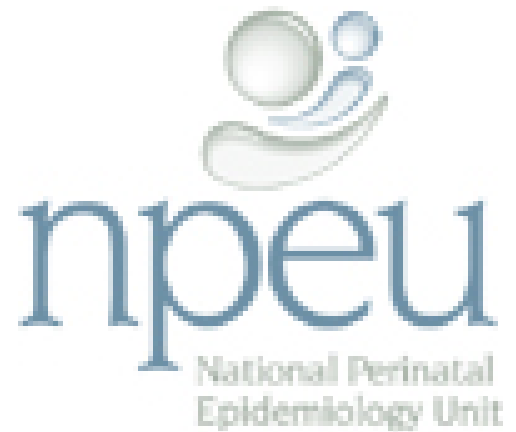
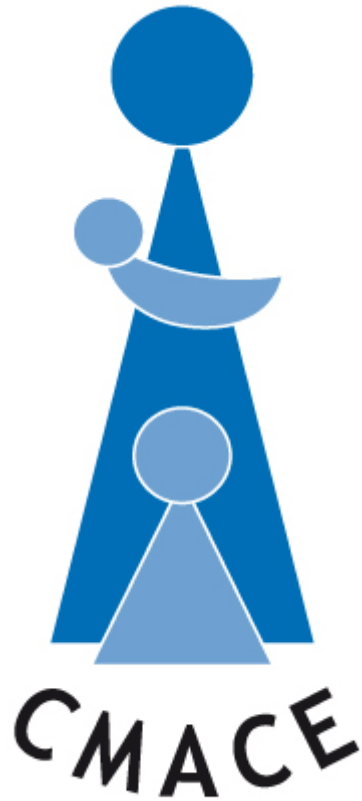
12 maternal deaths from swine flu in UK 2009

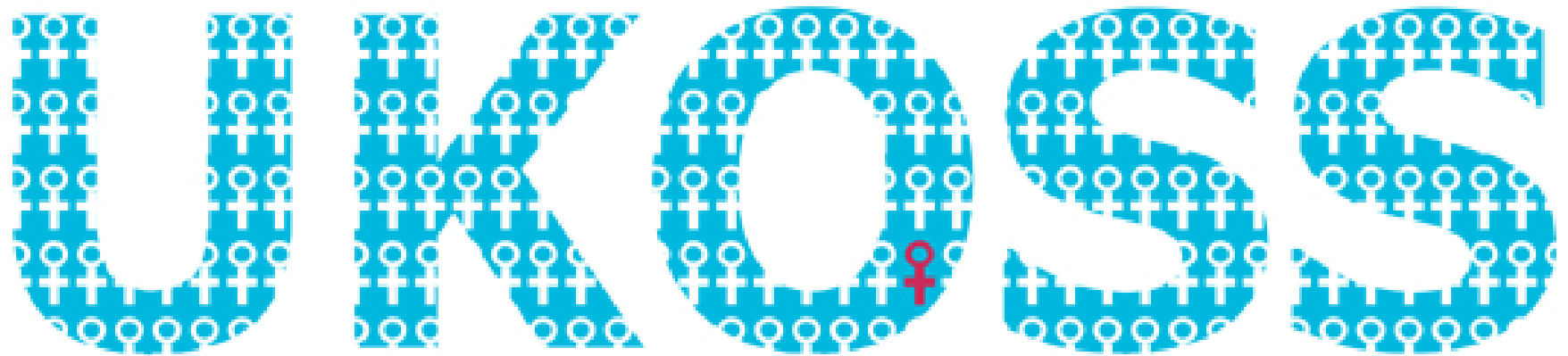
Saving Mothers' Lives 2009-2011 Report

A report of the UK confidential
enquiries into maternal deaths

www.cemach.org.uk



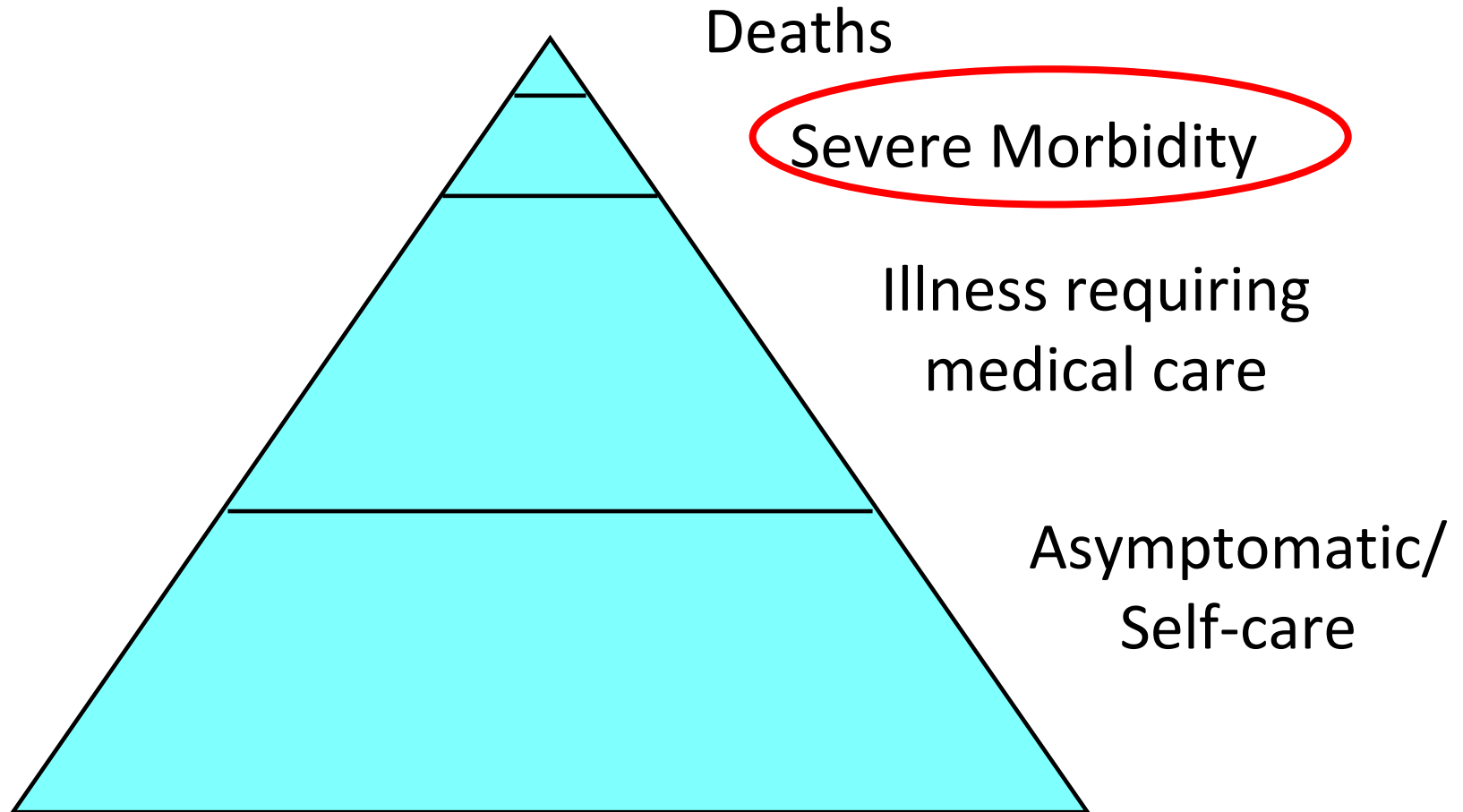




UK Obstetric Surveillance System



The Pyramid of Disease



UKOSS: Completed Studies

2006

- Eclampsia
- Peripartum Hysterectomy
- Acute Fatty Liver
- Antenatal PE
- TB

2007

- Gastroschisis

2008

- Extreme Obesity
- FMAIT

2009

- Therapies for Peripartum Haemorrhage
- Multiple repeat caesarean section
- Pregnancy in renal transplant recipients

2010

- H1N1v influenza in pregnancy
- Antenatal Stroke
- Failed Intubation
- Malaria
- Congenital Diaphragmatic Hernia
- Myocardial Infarction
- Uterine Rupture

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>

