

The critically ill obstetric patient

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Is this important?

“Admission of the pregnant or post partum women to the Intensive Care Unit is uncommon but may require specialised knowledge for successful management”

Stephen Lapinsky

Crit Care Med 2005;33:1616-1622

Assessment and Management may be affected by

- Physiological change associated with pregnancy
- Pregnancy specific conditions
- Presence of a fetus
- Clinicians lack of familiarity

Objectives

- Epidemiology
 - The Scale of the problem
 - Maternal and Fetal Outcomes in and post ICU
- Specific conditions
 - Obstetric Haemorrhage
 - Sepsis
 - H1N1/Influenza
- Management of the Antenatal patient
 - Ventilation Strategies
 - Decision making around delivery

Epidemiology

- **Sources of Information**
 - **CEMACH** 7th edition, “saving mothers lives” (2003-5)
 - **SCASMM** (Scottish Confidential Audit of Severe Maternal Morbidity)
 - Published work (case reports, small case series)
- **The Scale of the Problem**
 - Death and Critical illness
 - 295 UK deaths in last triennial report (13.95/100000 maternities)
 - 15 deaths in Scotland every triennial report (8.6/100000 maternities)
 - Every death there is 70-80 ‘near misses’ or women who become critically ill
 - Approx 80 patients/yr admitted to ICU (Scotland)

CEMACH

comprehensive reporting of maternal deaths in UK

Maternal deaths are extremely rare in the United Kingdom.

Identifying deaths related to pregnancy through causes stated on death certificates 149 women died between 2003-05; a maternal death rate of **7 per 100,000** maternities.

However more comprehensive data collection methods identified **295 women who died from conditions directly or indirectly related to pregnancy**, out of more than two million births.

This gives an Enquiry derived maternal mortality rate of **13.95 per 100,000** maternities.

Confidential Enquiry into Maternal and Child Health



Saving Mothers' Lives:

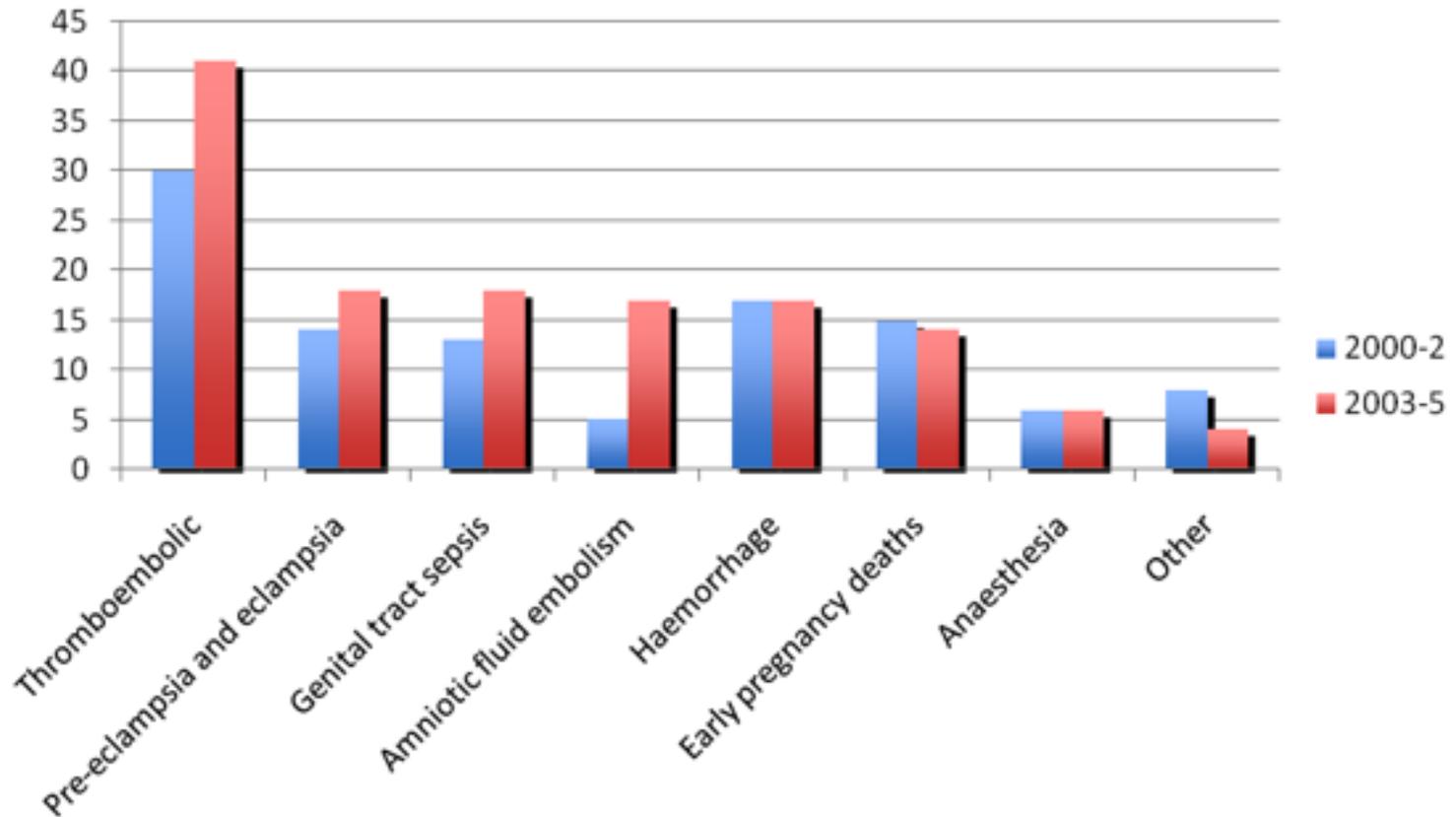
Reviewing maternal deaths to make motherhood safer - 2003-2005



December 2007

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

Causes of Maternal Death



Causes of Death and Critical Illness

- **Indirect** (new or pre existing conditions aggravated by pregnancy)
- **Direct** (condition that could only exist due to pregnancy)
- **Maternal Mortality rate not falling**
 - 50% Obese
 - 4x ↑ in IHD
 - 3 x risk of death if age >40yrs
 - 6x risk of death if black african including asylum seekers and refugees
 - Emergence of new themes (sepsis Grp A strep)

SCASMM

identifying maternal morbidity

Annual report from every consultant led obstetric unit in Scotland

- MOH
- Eclampsia
- Renal or Liver dysfunction
- Cardiac arrest
- Pulmonary Oedema
- Acute Respiratory Dysfunction
- Coma
- CVA
- Status Epilepticus
- Anaphylactic Shock
- Septicaemic Shock
- Anaesthetic problem
- Massive Pulmonary Embolus
- Intensive Care Admission or CCU admission

**DEATH : SEVERE MORBIDITY
RATIO**

1:60-80



Scottish Confidential Audit of Severe Maternal Morbidity

**6th Annual Report
2008**

Utilisation of Critical Care resource

- SCASMM identified 81 ICU/CCU admissions in 2007
 - **1.4 ICU admissions / 1000 live births**
- Other research suggests that obstetric admissions account for **0.9-1.5% of all ICU admissions**
- 3% obstetric ICU admissions will die
- Ninewells hospital
 - 4500 deliveries (Tayside)
 - Expect 6 obstetric admissions/yr
 - 1.5% of all ICU admissions
 - Maternal death every 5/6 years

ICU Admissions

- Vast majority (80%) admitted Postpartum
- Those admitted antepartum there is a high fetal mortality rate (>20%)
- ICNARC data suggesting significant % of these admissions are HDU/level2 patients
 - 45% IPPV
 - 19% vasopressors
 - 3% RRT
 - 35% had LOS <2days
- 3% mortality

Database issues

- APACHE II, III, SAPS
 - All show significant difference between predicted and observed rates of mortality
 - Are we better than we think?
 - Important differences between population and that used for scoring system development?
 - Lower threshold for ICU admission?
- APACHE II probably best fit
- Difficult to do retrospective analysis
- Should our database 'flag' obstetric admissions?

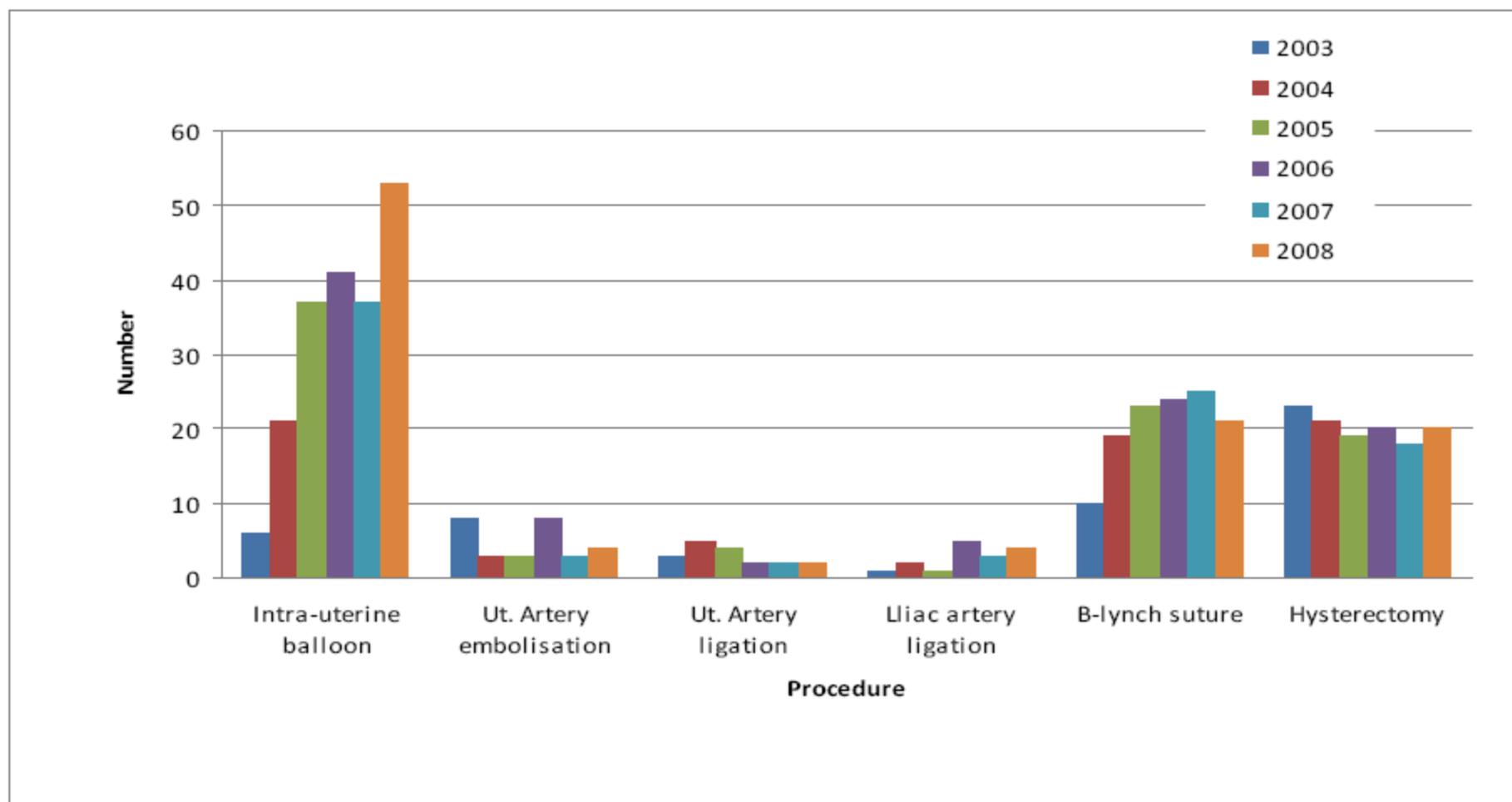
Pregnancy specific conditions

- Pre eclampsia
 - ICH, cerebral oedema, ischaemic CVA, HELP syndrome
- Eclampsia
 - 38% antenatal ,18% intrapartum,44% postpartum, 20% no PET
- Tocolytic pulmonary Oedema (0.3-10% of whom 15% require ventilatory support)
 - Decreased oncotic pressure, increased capillary hydrostatic pressure increases risk
 - Left ventricular dysfunction (catecholamine myocardial necrosis + diastolic dysfunction 2° to tachycardia)
- Peripartum Cardiomyopathy
 - Rare 1: 3500 but associated with 20-50% mortality
 - 36/52 to 5/12 postpartum
- Amniotic Fluid Embolus
- Obstetric Haemorrhage
 - Antepartum, Intrapartum, Postpartum

Management of Obstetric Haemorrhage

- **Majority (60%) is Postpartum Haemorrhage**
 - (23% vaginal delivery, 63% C-section (50% emergency 13% elective))
- **Cause of PPH**
 - 45% atony, 20% extension of uterine incision, 19% retained products, 14% vaginal laceration, 14% placenta praevia
- **Management of PPH**
- **Drugs**
 - ergometrine, oxytocin, carboprost (PGF₂), factor VIIa
- **Cell Salvage**
- **Early aggressive coagulation support**
- **Surgical**
- **Interventional Radiology**

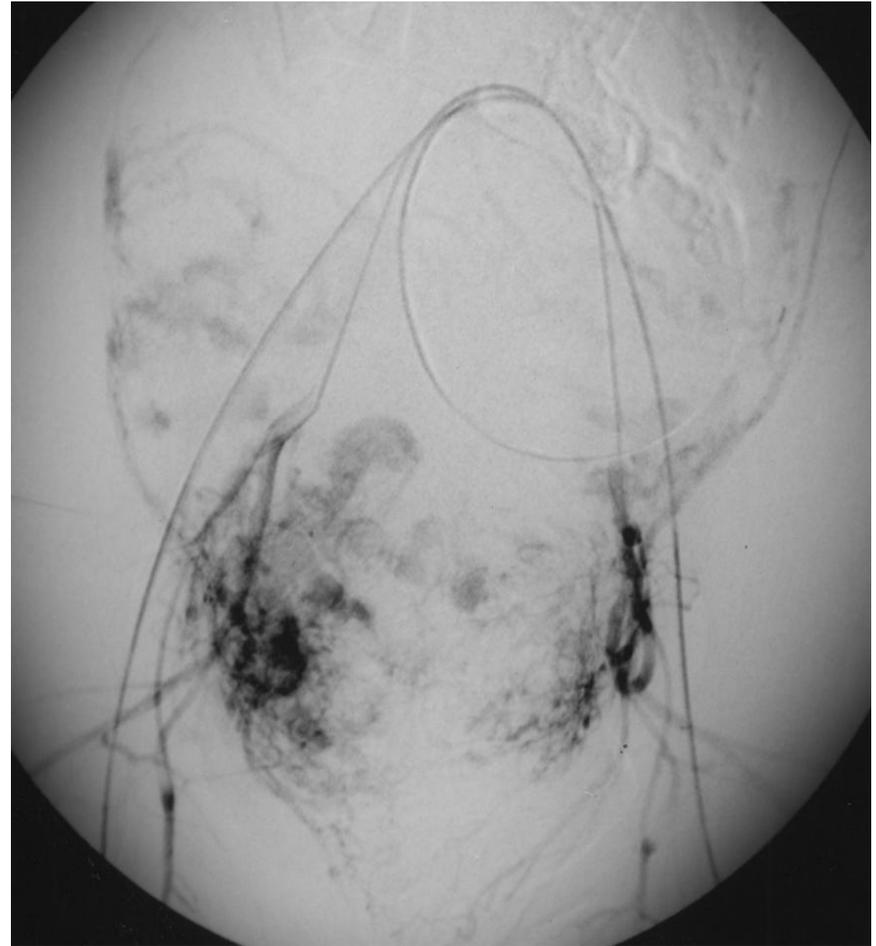
Figure 4: Numbers of haemostatic surgical procedures undertaken in cases of major obstetric haemorrhage by year (2003-2008)

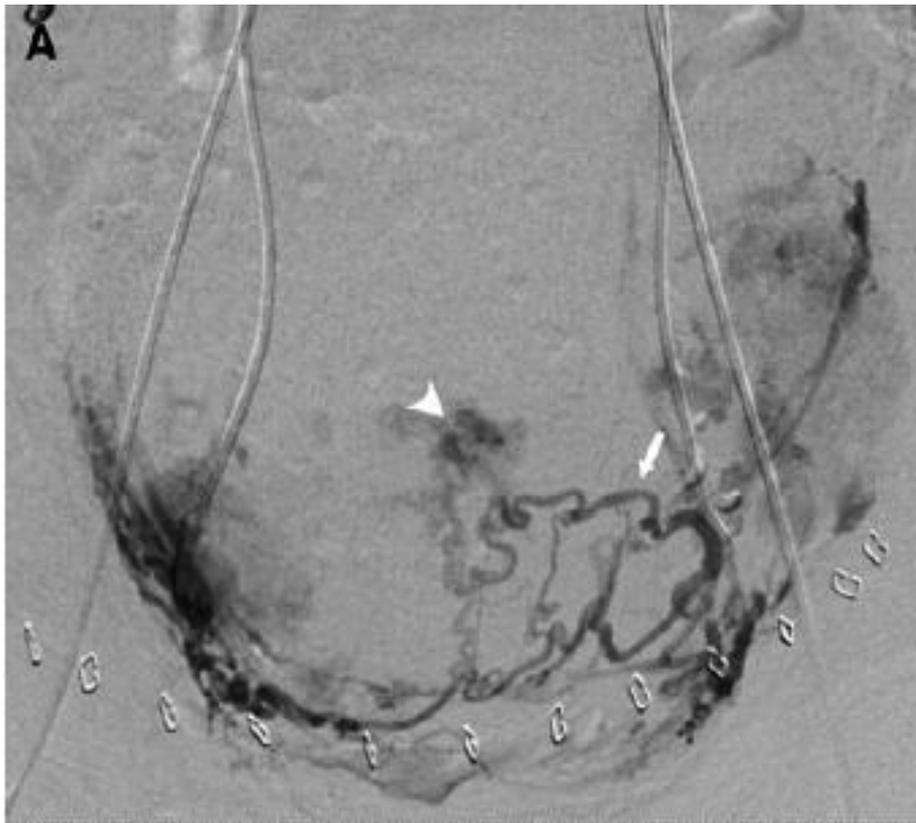


Interventional Radiology

Techniques to control Obstetric Haemorrhage

- Elective or Emergency placement of vascular occlusion balloons
- Aortic occlusion balloons
- Selective Arterial embolisation or stenting
 - Glue
 - Metal Coils
 - Gelfoam / PVA particles
 - Amplatzer plugs

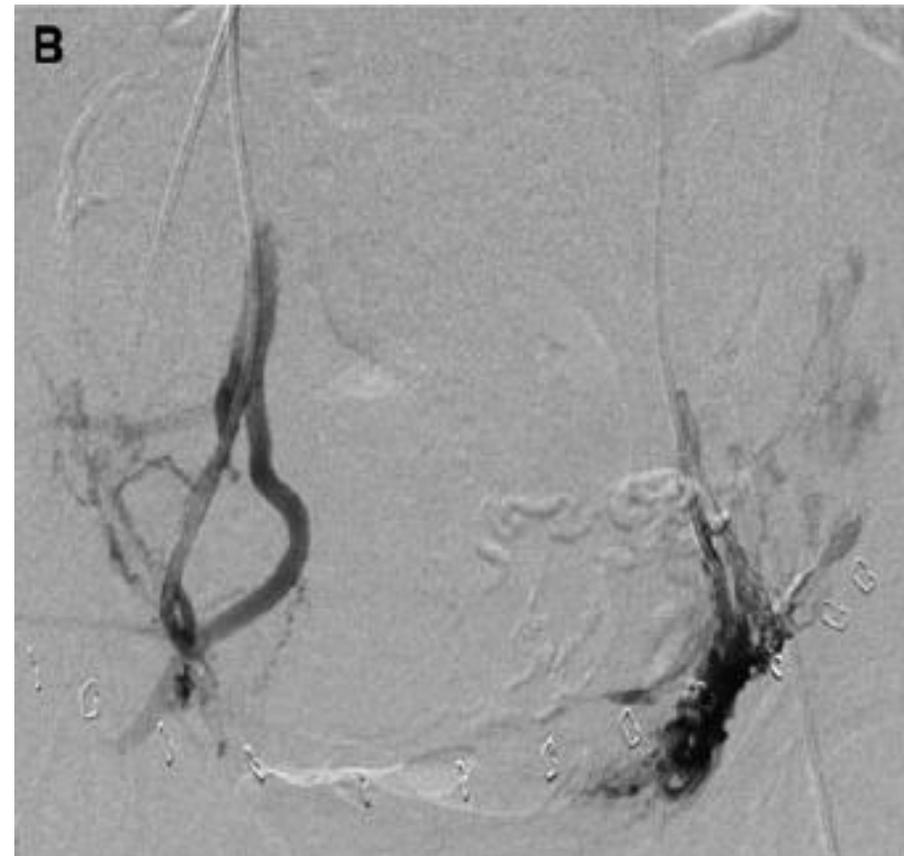




The role of Interventional Radiology
in the management of Obstetric
haemorrhage

Elective/prophylactic
Emergency

Images show selective embolisation of
the uterine artery with abolition of
placental 'flare'





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'

Whilst maternal mortality is declining overall, maternal deaths due to sepsis have risen in recent triennia, particularly those associated with Group A streptococcal infection (GAS)

	2000-2002	2003-2005	2006-2008
Rate per 100000 maternities	0.65	0.85	1.13
Numbers (all organisms)	13	21	29
Numbers (GAS)	3	8	13

Sepsis

“diarrhoea is an important sign of pelvic sepsis, the combination of abdominal pain and fetal loss should alert the clinician to the possibility of sepsis as well as consideration of abruption”

- Fetal loss of 45% associated with Group A Streptococcus
- Fatal Streptococcal A infections occurred between December and April
- All fatalities had had contact with young children
- Early recognition and treatment with Penicillin and Clindamycin plus consideration of Immunoglobulin

Sepsis

- Alteration in maternal immune response increases risk of sepsis
- Early warning scores/early detection difficult especially in labour
- Data for APC and EGDT very limited

OBSTETRIC EARLY WARNING CHART. **FOR MATERNITY USE ONLY**

NHS Forth Valley

NAME: _____ DOB: _____
 CHI: _____ WARD: _____

CONTACT DOCTOR FOR EARLY INTERVENTION IF PATIENT TRIGGERS ONE RED OR TWO YELLOW SCORES AT ANY ONE TIME

Date :													
Time :													
RESP (write rate in corresp. box)	>30												>30
	21-30												21-30
	11-20												11-20
	0-10												0-10
Saturations	90-100%												90-100%
	<90%												<90%
O2 Conc.	%												%
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
	40												40
Systolic blood pressure	200												200
	190												190
	180												180
	170												170
	160												160
	150												150
	140												140
	130												130
	120												120
	110												110
	50												50
Diastolic blood pressure	130												130
	120												120
	110												110
	100												100
	90												90
	80												80
	70												70
	60												60
	50												50
	40												40
	Passed/Urine	Y or N											
Lochia	Normal Heavy / Foul												Normal Heavy / Foul
Pretinae	2+ > 2+												2+ > 2+
Liquor	Clear / Pink Green												Clear / Pink Green
NEURO RESPONSE (-)	Alert												Alert
	Voice												Voice
	Fair / Unresponsive												Fair / Unresponsive
Pain Score (0-3)	2-3												2-3
Nausea (v)	YES (v)												YES (v)
	NO (v)												NO (v)
Looks unwell	YES (v)												YES (v)
Looks unwell	NO (v)												NO (v)
Total Yellow Scores													
Total Red Scores													

CEMACH apologises to Drs Fiona McKelvey, Chris Cairns and their colleagues at Birkenhead Royal Infirmary for not acknowledging their important role in the development of the original report. Requests for copies of the original chart in MS Excel format may be made to Dr Fiona McKelvey at: Fiona.McKelvey@fwh.scot.nhs.uk

Influenza A (H1N1)

- Pregnant women disproportionately affected by pandemic strains of Influenza
 - 1919 maternal mortality was 27%
 - 1958 50% female deaths were pregnant
 - 2009/10 4x greater than age matched controls, 7x more likely to go to ICU, & 7x increase in mortality
 - 12 maternal deaths UK (8 confirmed H1N1)
 - 17 referred to Leicester ECMO (4 deaths, 2 from ICH)
 - Australia/NZ 9.1% ICU admissions were pregnant
- Very high rate of fetal loss or poor outcome

Assessment of Fetus

- Fetal viability will depend upon
 - gestational age
 - 24 weeks viability (some survivors at 21 weeks)
 - 30-32 weeks
 - Biophysiological assessment of fetus
 - Doppler assessment of fetal Heart Rate
 - CTG (cardiotocograph) fetal HR variability > 28wks
 - USS (fetal heart rate, movement, breathing,)
 - Fetal pH

Fetal Outcome

Fetal outcomes of critically ill pregnant women admitted to the intensive care unit for non obstetric causes

Rodrigo Cartin-Ceba, Ognjen Gajic, Vivek N. Iyer, Nicholas E. Vlahakis,
(Crit Care Med 2008; 36:2746 –2751)

- Fetal loss independently associated with
 - low gestational age (OR 1.2 for every gestational week below 37 wk (95% CI=1.1–1.3)
 - Shock (no independent association with vasopressor) (OR 6.85 (95% CI=1.16-58)
 - Blood transfusion (OR 7.24 95% CI=1.4–49)
- 50% fetal loss (Hazelgrove) 20% fetal loss (ICNARC)
 - 1st trimester 65% loss
 - 2nd trimester 43% loss
 - 3rd trimester 5% loss

Feto-placental physiology

- Oxygen delivery to fetus depends upon
 - Maternal Oxygen delivery
 - Placental/uterine blood flow (position dependent)
 - High O₂ extraction
- Fetal oxygen extraction
 - HbF and high Hct shifts oxyhb curve to left
 - Favours O₂ extraction by fetus
- Fetal CO₂ Clearance
 - Down concentration gradient aided by lower maternal CO₂

Ventilating the Pregnant Patient

- **8x risk of difficult/failed intubation**
- **Non Invasive Ventilation/CPAP**
 - No evidence but assume indications remain same
 - Success will depend upon patient selection
- **Lung protective ventilation**
 - No evidence, but assume best practice?
 - Are the pressure limits the same?
 - Is permissive hypercapnia safe?

Ventilating the pregnant patient

- What are our gas exchange goals
 - **PaO₂ uncertain ? >9.3kPa**
 - PaCO₂ do we aim for normal 'mild hypocapnia' of pregnancy
 - To low = placental vasoconstriction
 - To high = fetal acidosis (fetal CO₂ = 1.3kPa > than maternal)
 - To high = R shift of oxyhb dissociation curve with decreased extraction of O₂
 - In presence of good oxygenation does fetal acidosis matter?
 - Some anecdote that **PaCO₂ range 6-8kpa is tolerated**
- Is there any evidence for using Bicarbonate in maternal acidosis ?

Ventilating the pregnant patient

- Rescue Ventilation Strategies
 - Prone Ventilation
 - Nitric Oxide
 - APRV
 - HFOV
 - ECMO
 - Australia 2009, 68 patient received ECMO support for H1N1, 6 pregnant and 4 post partum
- Delivery of Fetus

Decision making around delivery in the critically ill



- **Evidence free zone**
 - Case reports
 - Largest case series = 10 patient (Tomlinson)
 - Data not captured by ICNARC or Wardwatcher
- **Decision making will be influenced by viability of fetus.**
- **Is there maternal benefit to delivery?**
 - 28% reduction in FiO₂ (case series)
- **What are the risks of delivery to mother and fetus?**
- **What method of delivery?**
- **How to manage delivery, IOL in presence of coagulopathy**

When to deliver the fetus?

“consideration of delivery to benefit mother if intractable hypoxia or hypercarbia or possibly for fetal benefit if remains viable”

“delivery mode remains guided by obstetric indications”

vaginal vs C-section??



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Thank you