CCM Tutorial: Hypertensive complications of Pregnancy and Obstetric aspect of CPR in pregnancy

Dr W P Chan, Consultant O&G, PMH

HKCOG Territory-wide O&G Audit Report 2004

	1994		1999		2004	
Severity						
Mild	*1622*	*82.2%*	*684*	*72.3%*	*562*	*45.0%*
Severe	*351*	*7.8%*	*262*	*27.7%*	*334*	*26.7%*
Unknown	*0*	*0.0%*	*0*	*0.0%*	*354*	*28.3%*
Category						
Eclampsia	*18*	*0.9%*	*10*	*1.1%*	*17*	*1.4%*
Mild gestational hypertension	*1013*	*51.3%*	*352*	*37.2%*	*260*	*20.8%*
Severe gestational hypertension	*68*	*3.4%*	*40*	*4.2%*	*34*	*2.7%*
Gestational proteinuria	*44*	*2.2%*	*22*	*2.3%*	*83*	*6.6%*
Mild pre-eclampsia	*288*	*14.6%*	*120*	*12.7%*	*141*	*11.3%*
Severe pre-eclampsia	*198*	*10.0%*	*157*	*16.6%*	*241*	*19.3%*
Chronic hypertension with no proteinuria	*110*	*5.6%*	*45*	*4.8%*	*47*	*3.8%*
Chronic hypertension with superimposed PET	*37*	*1.9%*	*36*	*3.8%*	*27*	*2.2%*
Unclassified	*98*	*5.0%*	*74*	*7.8%*	*90*	*7.2%*
No information	*99*	*5.0%*	*90*	*9.5%*	*310*	*24.8%*
Total incidence	**1973**	**2.9%**	**946**	**2.0%**	**1250**	**2.5%**

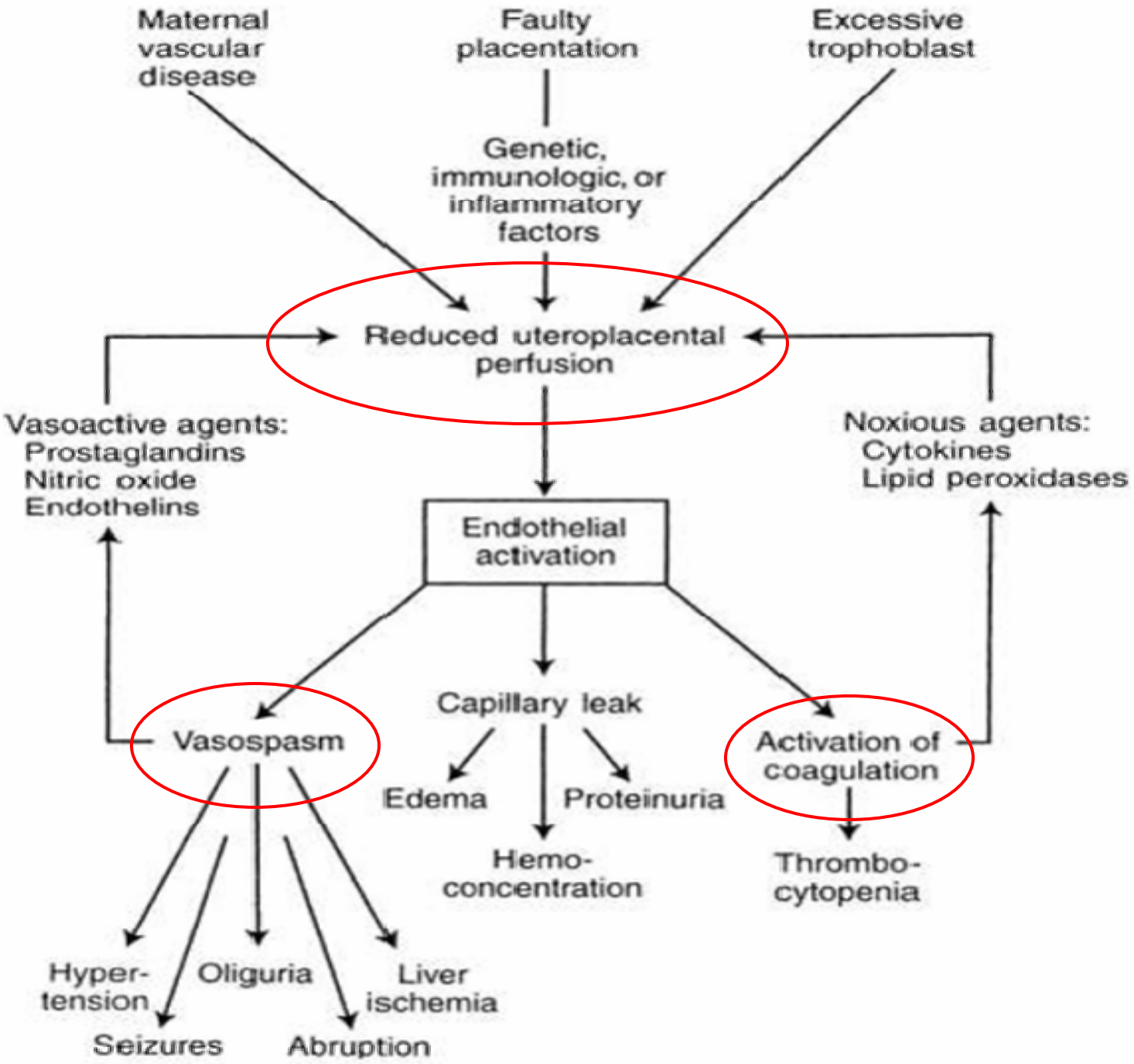
Table 1. Preeclampsia: Etiology and Risk Factors

Theories of pathogenesis	Risk factors[7,12]
Abnormal placental implantation (defects in trophoblasts and spiral arterioles)[13,14]	Antiphospholipid antibody syndrome
Angiogenic factors (increased sFlt-1, decreased placental growth factor levels)[15,16]	Chronic hypertension
Cardiovascular maladaptation and vasoconstriction	Chronic renal disease
Genetic predisposition (maternal, paternal, thrombophilias)[17-20]	Elevated body mass index
Immunologic intolerance between fetoplacental and maternal tissue[7]	Maternal age older than 40 years
Platelet activation	Multiple gestation
Vascular endothelial damage or dysfunction[7]	Nulliparity
	Preeclampsia in a previous pregnancy (particularly if severe or before 32 weeks of gestation)
	Pregestational diabetes mellitus

NOTE: *Previously, young maternal age was considered a risk factor, but this was not supported by a systematic review.*[21]

sFlt-1 = soluble fms-like tyrosine kinase 1.

Information from references 7, and 12 through 21.


Maternal vascular disease
Faulty placentation
Excessive trophoblast
Genetic, immunologic, or inflammatory factors
Reduced uteroplacental perfusion
Vasoactive agents:
Prostaglandins
Nitric oxide
Endothelins
Noxious agents:
Cytokines
Lipid peroxidases
Endothelial activation
Vasospasm
Capillary leak
Activation of coagulation
Edema
Proteinuria
Hemo-concentration
Thrombo-cytopenia
Hyper-tension
Oliguria
Liver ischemia
Seizures
Abruption

Classification of HT in Pregnancy

ASSH 2000	ISSHP 2001	NHBPEP 2000
Gestational HT	GHT	GHT
PET	PET	PET-Eclampsia
Chronic HT(CHT)	CHT	CHT
CHT + PET	CHT/GHT + proteinuria	CHT+PET
BP $\geq$ 140/90 sBP &/or dBP	BP $\geq$ 140/90 sBP &/or dBP	BP $\geq$ 140/90 sBP &/or dBP
Proteinuria $\geq$ 0.3g/24hr Spot Pr/Cr ratio $\geq$ 30mg/mmol	$\geq$ 0.3g/24hr Spot Pr/Cr ratio 30mg/mmol	$\geq$ 0.3g/24hr $\geq$300mg/L

Indication for admission to ICU

Table 5. Principle indications for admission to intensive care.

Eclampsia	12
Ventilation or airway problems	
With eclampsia	2
With pulmonary oedema	4
General concern	6
General condition requiring close observation	20
Postoperative bleeding	2
Hyperkalaemia (not needing dialysis)	1
Liver rupture	1
Reaction to anaesthesia	1
Total	49

Outcomes of severe pre-eclampsia/eclampsia in Yorkshire 1999/2003

Maternal complications

Maternal complications

- Abruptio placentae (1–4%)
- Disseminated coagulopathy/HELLP syndrome (10–20%)
- Pulmonary oedema/aspiration (2–5%)
- Acute renal failure (1–5%)
- Eclampsia (<1%)
- Liver failure or haemorrhage (<1%)
- Stroke (rare)
- Death (rare)
- Long-term cardiovascular morbidity

Lancet 2005; 365: 785–99

Neonatal complications

Neonatal complications

- Preterm delivery (15–67%)
- Fetal growth restriction (10–25%)
- Hypoxia-neurologic injury (<1%)
- Perinatal death (1–2%)
- Long-term cardiovascular morbidity associated with low birthweight (fetal origin of adult disease)

Lancet 2005; 365: 785–99

PET

- Variety of presentation
- Usually >20 weeks till postterm
- May have relatively normal BP and no proteinuria at time of presentation
- Eclampsia as end point

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Numbers of deaths from pre-eclampsia or eclampsia; United Kingdom 2003-05.

Triennium	Cerebral					Pulmonary				Hepatic				Total
	Intracranial haemorrhage	Subarachnoid	Infarct	Oedema	All	ARDS	Oedema	Other	All	Rupture	Failure/ necrosis	Other	All	
1985-87	11	0	0	0	11	9	1	2	12	0	1	3	4	27
1988-90	10	2	2	0	14	9	1	0	10	0	1	2	3	27
1991-93	5	0	0	0	5	8	3	0	11	0	0	4	4	20
1994-96	3	1	0	3	7	6	2	0	8	2	1	2	5	20
1997-99	7	0	0	0	7	2	0	0	2	2	0	5	7	16
2000-02	9	0	0	0	9	1	0	0	1	0	0	4	4	14
2003-05	10	0	2	0	12	0	0	0	0	0	2	4	6	18

Direct Death due to PET/Eclampsia : 18/132(13.6%), 0.85/100000 maternities

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CAUSES OF MATERNAL DEATH

	1994	1999	2004
Aminotic fluid embolism	5	0	0
Cardiac disease	1	0	0
Ruptured aortic aneurysm	1	0	0
Suicide	1	1	1
Pneumonia	0	1	0
Pulmonary embolism	0	1	0
Ruptured vertebral artery aneurysm	0	1	0
Massive Post-partum Haemorrhage	0	0	1
Hepatic failure	0	0	1
No cause identified	0	1	0

ASSOCIATED COMPLICATIONS

	1994		1999		2004	
Hypertension	2	25.0%	1	20.0%	0	0.0%
Antepartum haemorrhage	1	12.5%	1	20.0%	0	0.0%
Cardiac disease	1	12.5%	1	20.0%	0	0.0%
Anaemia	1	12.5%	0	0.0%	1	33.3%
Diabetes mellitus	0	0.0%	0	0.0%	1	33.3%
Post-partum haemorrhage	-	-	-	-	1	33.3%
Hysterectomy	-	-	-	-	1	33.3%

There might be more than 1 complication in each parturient

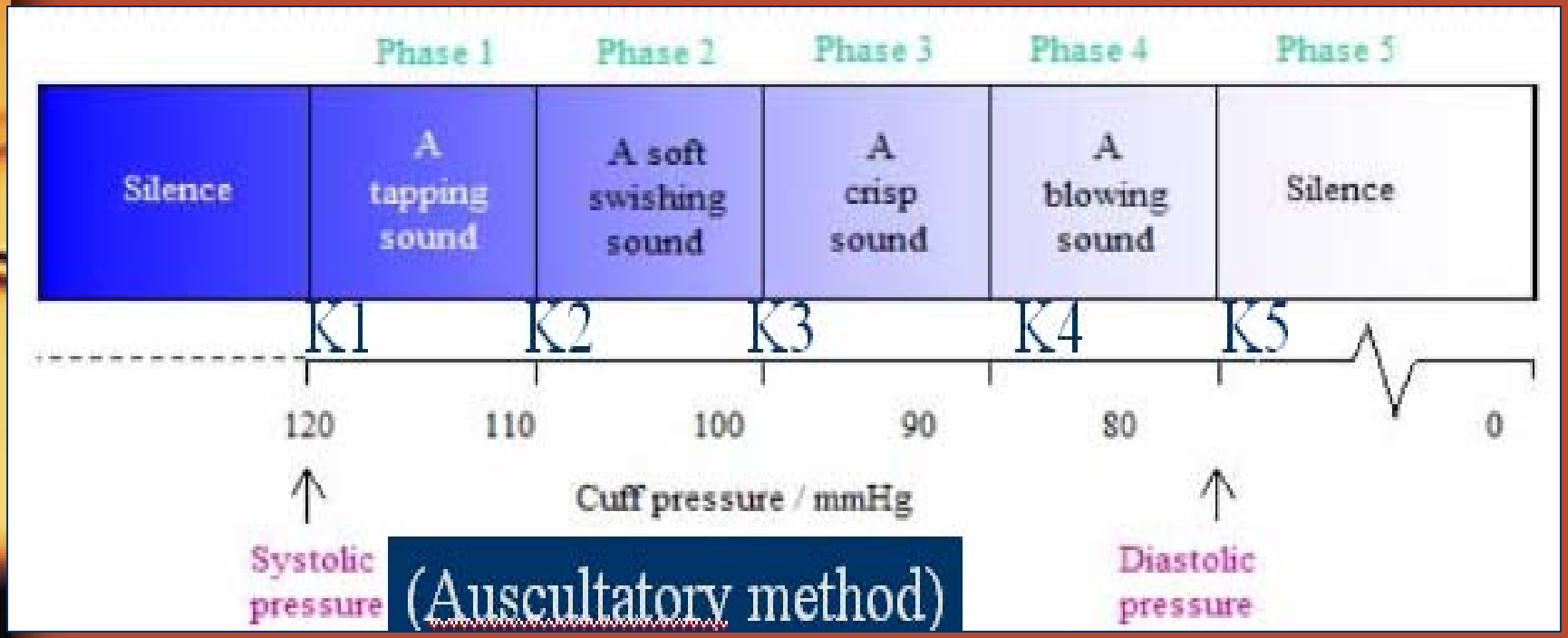
RISK ALERT

SENTINEL EVENTS ISSUE 8 Jan 2009

Case 2

- A woman of 37-week gestation presented with pre-eclampsia during onset of labour.
- Magnesium and labetalol infusion were given.
- Developed cardiac arrest after spontaneous vaginal delivery of a healthy baby.
- Developed postpartum haemorrhage, controlled by medical therapy.
- Despite stable vital signs, failed to regain consciousness.
- CT brain showed intra-ventricular haemorrhage.
- Died a week after the delivery.

BP measurement: Korotkoff 5



- The clinical significance, if any, to phases II and III has not been established

BP measurement

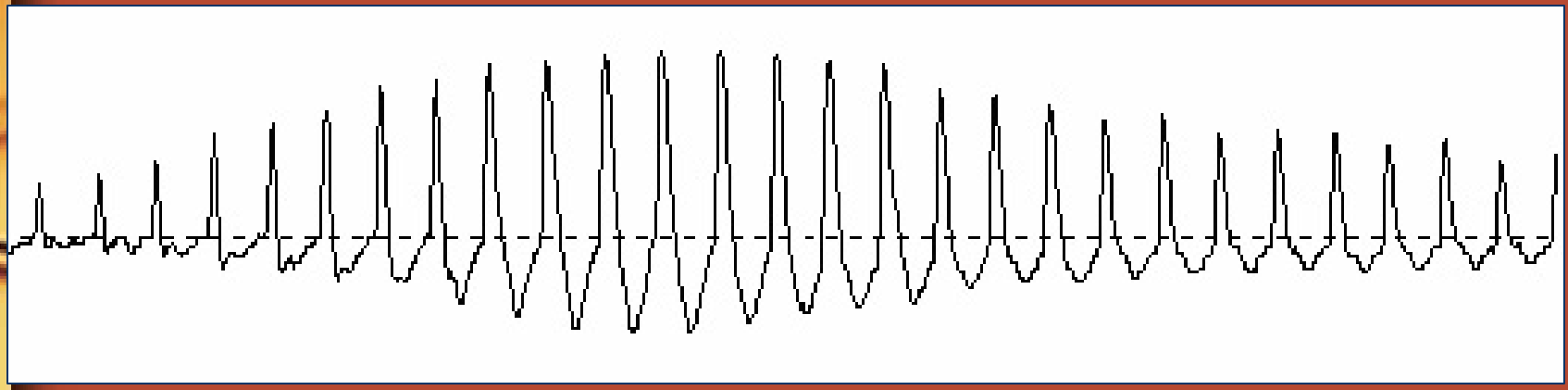
- Automated BP monitor
- Mercury sphynomanometer
- Intra-arterial device

- Which one is more accurate?

How does automatic BP device work?

BP measurement

Automated BP recording devices: Oscilatory Method



Oscillations caused by the arterial pressure pulse.

Point of max. amplitude is considered mean arterial pressure.

sBP and dBP are estimated from mean arterial pressure (MAP).

http://www.healthperfect.co.uk/Index/dphistry.htm

J. Villar et al. / International Journal of Gynecology and Obstetrics 85 Suppl. 1 (2004) S28–S41

Table 1
Validation of automated blood-pressure devices. Meta-analysis of data from 15 trials [24–38]

	Mercury device	
	Blood pressure difference (S.D.)	
Blood pressure	Pregnant women $n = 597$	Pre-eclamptic women $n = 176$
Systolic (mmHg)	−1.13 (5.80)	−4.60 (8.04)
Diastolic (mmHg)	−1.20 (6.03)	−5.16 (7.19)

- Most devices: oscillometric technique.
- Average errors are not large,
- Do under-record BP in PET
- Degree of error does not preclude clinical use

Why Mothers Die 2000–2002

…..many automated blood pressure monitoring systems systematically *underestimate systolic pressure in pre-eclampsia.*

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If automated systems are used to monitor blood pressure it is important to ensure that these have been *validated for use in pregnancy* as some systematically *underestimate systolic pressure in pre-eclampsia.*

Proteinuria

- 2+ dipstick(1+ likely overestimate)
- Spot Pr/Cr ratio: ≥ 0.03g/mmol
- 24 hr collection: > 0.3g/24hr
- Once established, increased proteinuria may not reflect more severe disease

Severe PET if one or more criteria is present:

- SBP ≥ 160 mm Hg X2 at least 6 hours apart
- dBP ≥ 110 mm Hg X2 at least 6 hours apart
- Proteinuria of ≥ 5 g/24hr or ≥ 3+ on two random urine samples collected at least 4 hours apart
- Oliguria ≤ 500 mL/24 hours
- Cerebral or visual disturbances
- Pulmonary edema or cyanosis
- Epigastric or right upper-quadrant pain
- Impaired liver function
- Thrombocytopenia
- Fetal growth restriction

Case study

- 32 wks, first pregnancy, ? LOC & convulsion in China
- CT in China, SAH. DAMA in China
- Back to HK after 24 hours of driving
- Admitted through A&E, fully conscious, no neurological symptoms, severe headache, China CT reviewed:SAH. To neurosurgery and then to ICU,
- BP 190/120, Proteinuria +++
- What is the Dx and DDX, how to Mx

Case study

- Investigation
  - MRA, CBP, RLFT, clotting, urate
- Monitor mother
  - Neuro-obs, BP, P, urine output
- Treatment of mother
  - antiHT, anti-convulsant
- Monitor fetus
  - CFHM
- Treatment to fetus
  - Antenatal corticosteroids

Drug treatment for HT

Antihypertensive treatment

- The effectiveness of antihypertensives in mild to moderate hypertension is still unclear
- Treatment of acute hypertension should prevent potential cerebrovascular and cardiovascular complications,
- Does not prevent or alter the natural course of the disease in women with mild pre-eclampsia.

What level of BP require treatment

- Definitely if > 170/110
- New suggestion: > 160/100-105
- Association of stroke with systolic HT>160

Stroke and Severe Preeclampsia and Eclampsia: A Paradigm Shift Focusing on Systolic Blood Pressure

Obstet Gynecol 2005

- Retrospective study, 28 PET + CVA
- 24 patients being treated immediately before stroke,
- sBP ≥ 160 mmHg in 23/24 (95.8%)
- sBP ≥ 155 mmHg in 24/24 (100%)
- Pre-CVA dBP > 110mmHg in 3/24 (12.5%)
- Pre-CVA mean BP >130mmHg in 6/24(25%)
- Post-CVA dBP > 105mmHg in 5/28

CONCLUSION: In contrast to severe systolic HT, severe diastolic HT does not develop before stroke in most patients with severe PET & eclampsia. A paradigm shift is needed toward considering antihypertensive therapy for severely PET & eclamptic patients when systolic BP reaches or exceeds 155–160 mm Hg

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Top ten recommendations

"All pregnant women with a systolic blood pressure of 160mm/Hg2 or more require antihypertensive treatment. Consideration should also be given to initiating treatment at lower pressures if the overall clinical picture suggests rapid deterioration and/or where the development of severe hypertension can be anticipated."

Drugs for HT in pregnancy

- Methy-dopa
- Labetalol
- Nifedipine
- Hydrallazine

Drugs for HT in pregnancy

- Methy-dopa: not for acute HT
- Labetalol: oral , iv ; avoid in asthma; fetal-IUGR,hypoglycemia
- Nifedipine: oral, not sublingual; headache; tocolytic; interact with MgSO4
- Hydrallazine: iv; very potent; more maternal and fetal side effect
- Antepartum drug: consider effect of fetus

Hydralazine for treatment of severe hypertension in pregnancy: meta-analysis

BMJ VOLUME 327 25 OCTOBER 2003

- Meta-analysis of 21 trials (n=893)
- 8 trials: hydralazine vs nifedipine
- 5 trials: hydralazine vs labetalol
- Hydralazine
  - more maternal side-effects
  - worse maternal and perinatal outcomes
    - Hypotension, Cesarean Section, abruptio placenta, oliguria, abnormal FHR, low Apgar score
  - than either labetalol or nifedipine.
- Conclusion
  - Support the use of antihypertensive agents other than hydralazine for the acute management of severe hypertension in pregnancy.

Table 4. A suggested antihypertensive regimen.

Acute management
Labetalol 200 mg orally repeated hourly until control is achieved
or
Nifedipine 10 mg orally (not sublingual)
or
Labetalol 50 mg by slow intravenous bolus
followed by
Labetalol infusion starting at a rate of 60 mg per hour doubling every 15 minutes until control is achieved or a maximum of 480 mg is reached

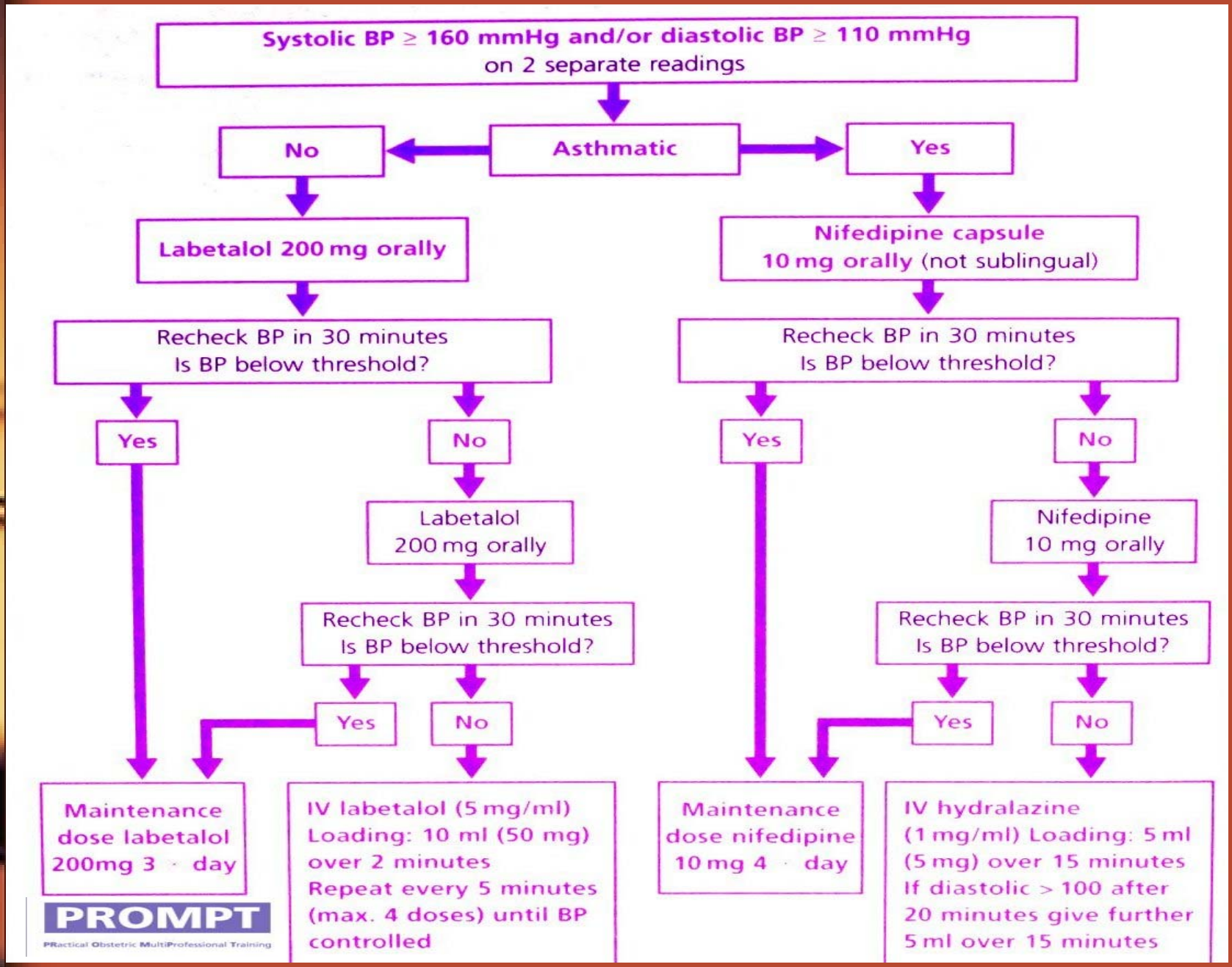
Starting daily dose for chronic therapy
Labetalol 200 mg three times daily
increasing to
Labetalol 300 mg four times daily
with the addition of
Nifedipine retard 10 mg twice a day
increasing to
Nifedipine retard 60 mg per day in divided doses

Bailliere's Clinical Obstetrics & Gynaecology 2000

Outcomes of severe pre-eclampsia/eclampsia in Yorkshire 1999/2003

Table 6. Anti-hypertensive treatment.

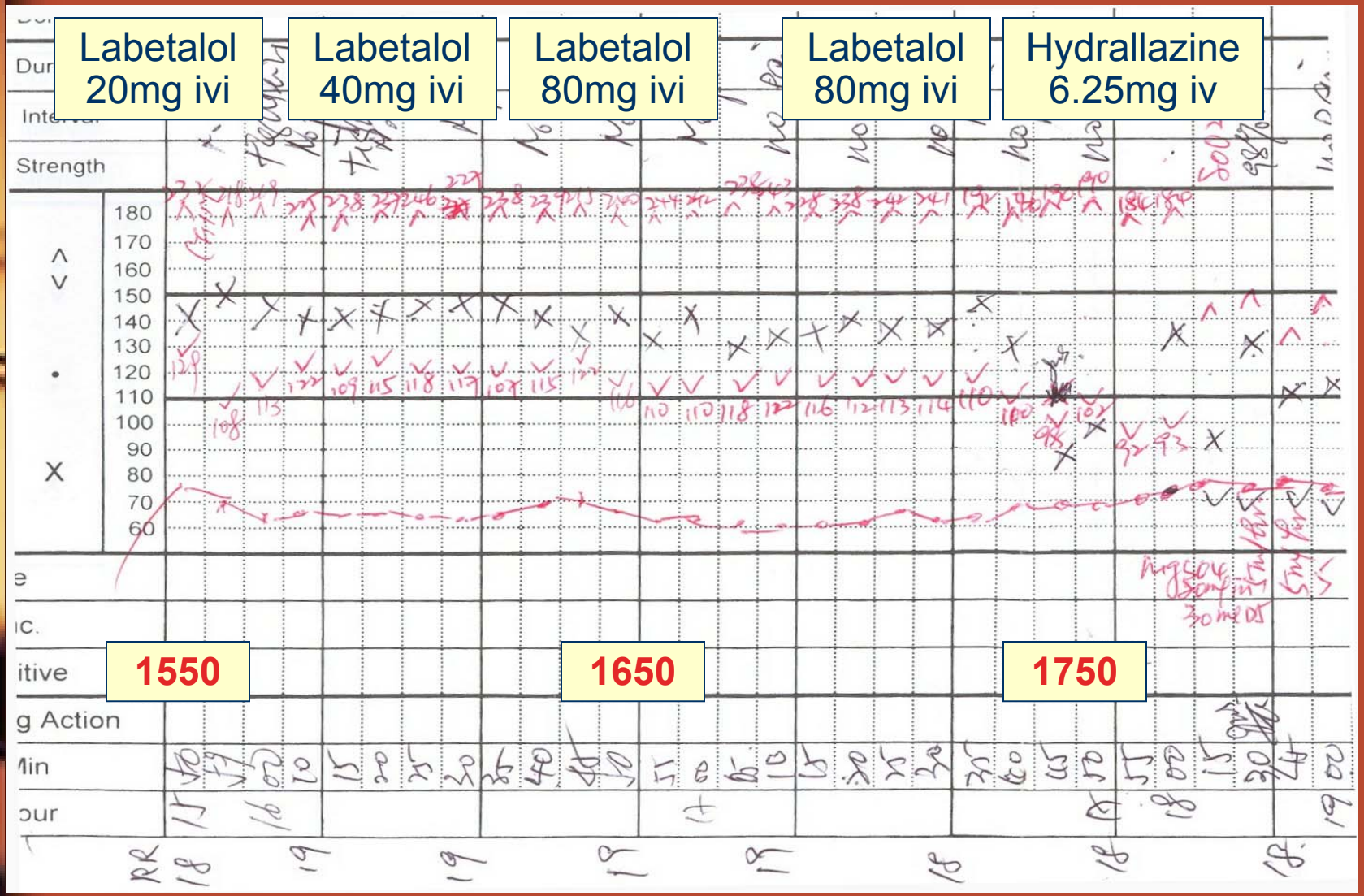
Women on treatment before eligible for guidelines	672
Woman requiring treatment once eligible for guidelines	922 (84.8%)
Not requiring treatment	165 (15.2%)
Treated women	
Oral therapy alone	489/922 (53%)
More than 1 drug	91
Intravenous therapy	
Requiring intravenous treatment	433/922 (47%)
Labetalol (with oral labetalol)	323
Labetalol with other oral drugs	110


Systolic BP ≥ 160 mmHg and/or diastolic BP ≥ 110 mmHg
on 2 separate readings
Asthmatic
No
Yes
Labetalol 200 mg orally
Nifedipine capsule
10 mg orally (not sublingual)
Recheck BP in 30 minutes
Is BP below threshold?
Yes
No
Labetalol
200 mg orally
Nifedipine
10 mg orally
Recheck BP in 30 minutes
Is BP below threshold?
Yes
No
Maintenance
dose labetalol
200mg 3 · day
IV labetalol (5 mg/ml)
Loading: 10 ml (50 mg)
over 2 minutes
Repeat every 5 minutes
(max. 4 doses) until BP
controlled
Maintenance
dose nifedipine
10 mg 4 · day
IV hydralazine
(1 mg/ml) Loading: 5 ml
(5 mg) over 15 minutes
If diastolic > 100 after
20 minutes give further
5 ml over 15 minutes
PROMPT
PRactical Obstetric MultiProfessional Training

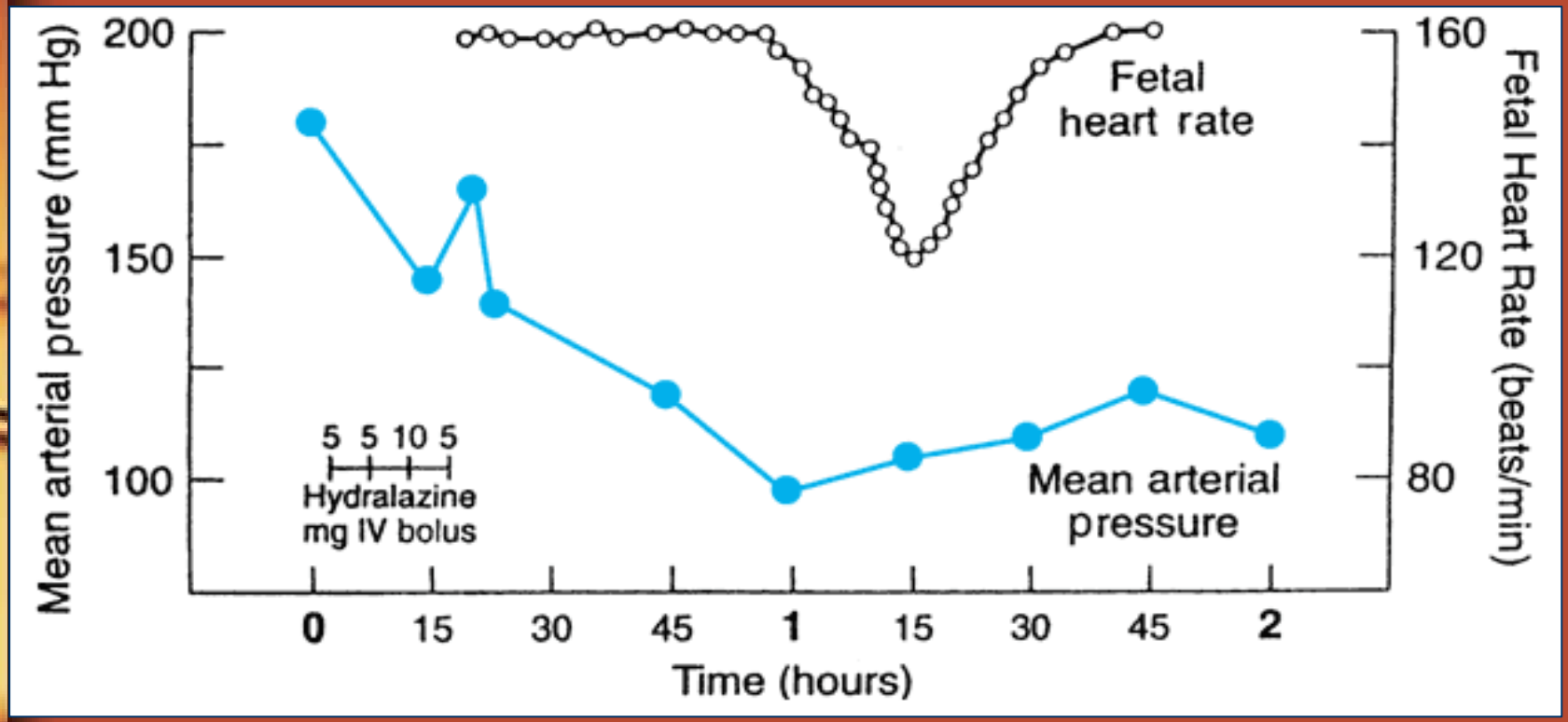
Case Study

- Age 39, Pakistan, Para 5+1
- Hx of Chronic HT on adalat retard
- Late book at 22 weeks, BP 150/80 with no medication
- Dx DM/GIDDM at 24weeks, BP 140-150/90
- 30+w, AN FU, BP 195/111, 207/122, no proteinuria
- USG 30+W, fetus=28+w,
- Admit to labour ward

Case Study: High BP Tx



Effects of acute BP decrease on fetus



Hydralazine was given at 5-minute intervals instead of 15-minute intervals, and mean arterial pressure decreased from 180 to 90 mm Hg within 1 hour; this change was associated with fetal bradycardia

Treatment of acute HT

- Routine monitoring of fetal heart beat

Peripartum Mx

- Anesthetic perspective
- Thrombo-prophylaxis
- Prevention and control of Eclampsia
- Peripartum fluid Mx

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Case in UK

- Healthy, induction for post-term, induction delayed for busy LW
- Normal BP but urine was not tested
- unwell the next morning with epigastric pain and vomiting. BP 170/90 mm/Hg
- CTG showed repetitive heart rate decelerations.
- Dx: ? placental abruption, Emerg LSCS

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- BP 200/105 mm/Hg in the anaesthetic room prior to (standard) induction of anaesthesia
- Difficult Intubation, sBP between 195 and 210 mm/Hg for the first 15 minutes of the operation
- baby was delivered in reasonable condition but the mother could not be aroused from GA
- A delayed CT scan showed massive intracranial haemorrhage. Hepatic haemorrhage was also seen at autopsy

What do we learn?

- Anesthetic measures to reduce BP before intubation
- Treatment of mother first even if there is fetal compromise

Peripartum Mx:
Anesthetic perspective

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2003-2005

Pre-eclampsia and eclampsia: Specific recommendations

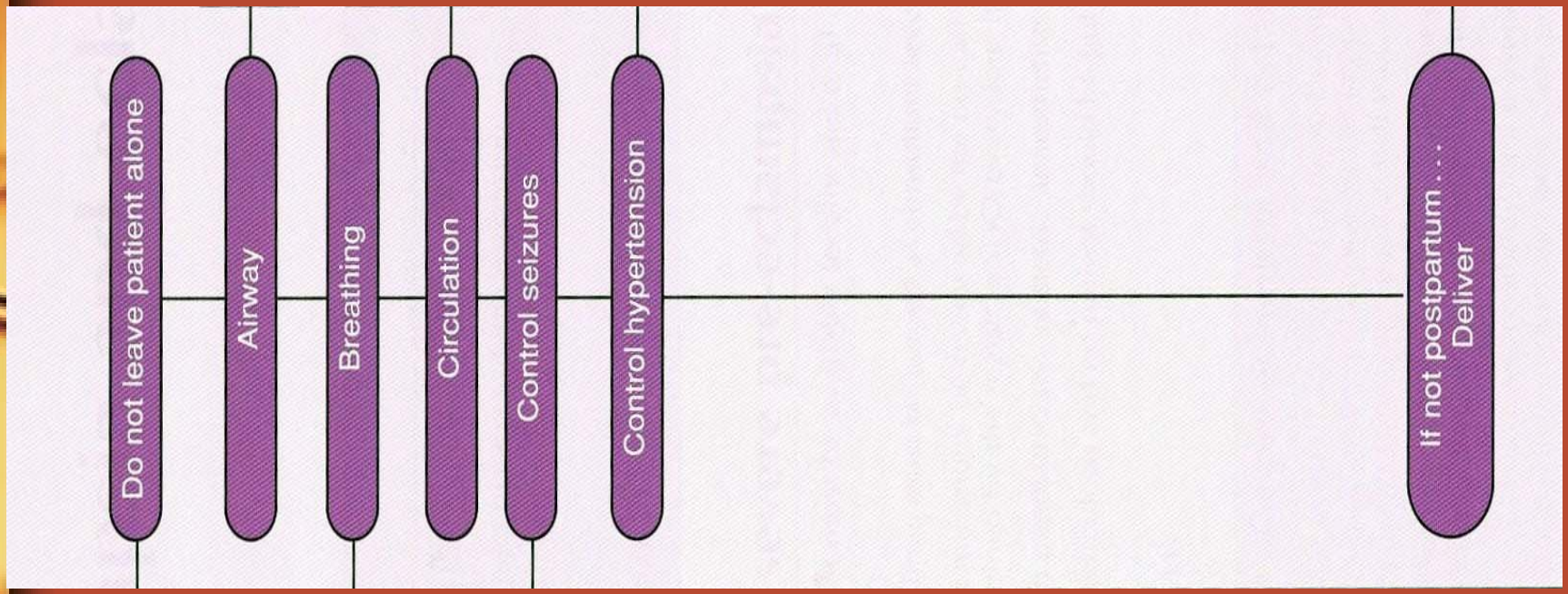
Anaesthetists should anticipate an additional rise in blood pressure at intubation in women with severe pre-eclampsia who are undergoing caesarean section under general anaesthesia and take measures to avoid a speed that compromises maternal wellbeing, even when there are concerns about fetal wellbeing.

Peripartum Mx: Thrombo-prophylaxis

- Increased risk of thromboembolism:
  - Pregnancy, haemoconcentration in PET, hypoproteinaemia, immobolization
- Elastic stocking
- LMWH
  - in Caucasian
  - Local Chinese with additional risk factor

Peripartum Mx: Eclampsia

Eclampsia: Mx

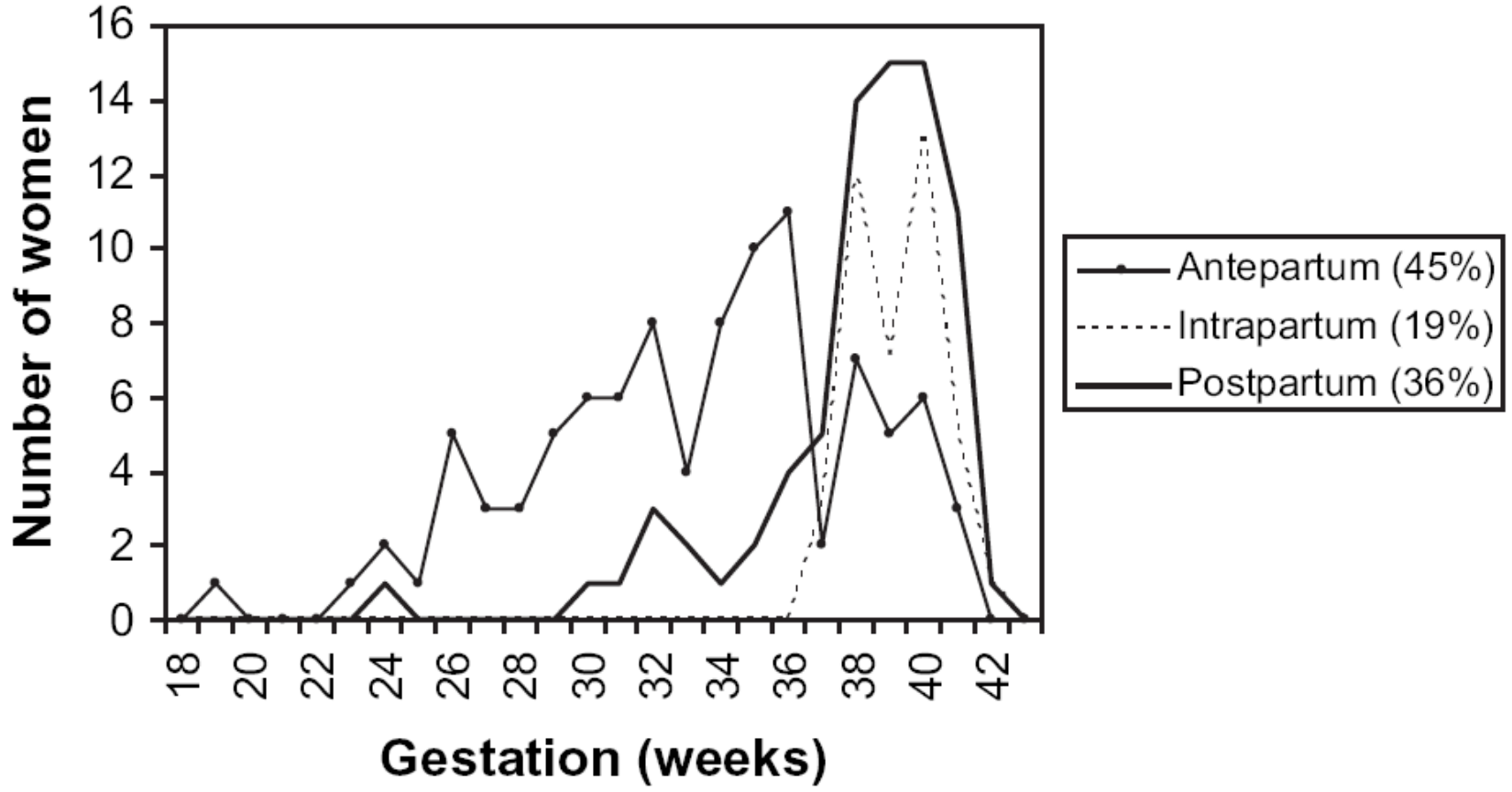


The woman's condition will always take priority over the fetal condition

Eclampsia in the United Kingdom 2005

M Knight on behalf of UKOSS

BJOG 2007;114:1072–1078



Eclmapsia: 2.68 /10000 maternities

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2-3.5/10000 maternities

Eclampsia—an 11-year experience

YM Chan, SW Ngai

HKMJ Vol 4 No 2 June 1998

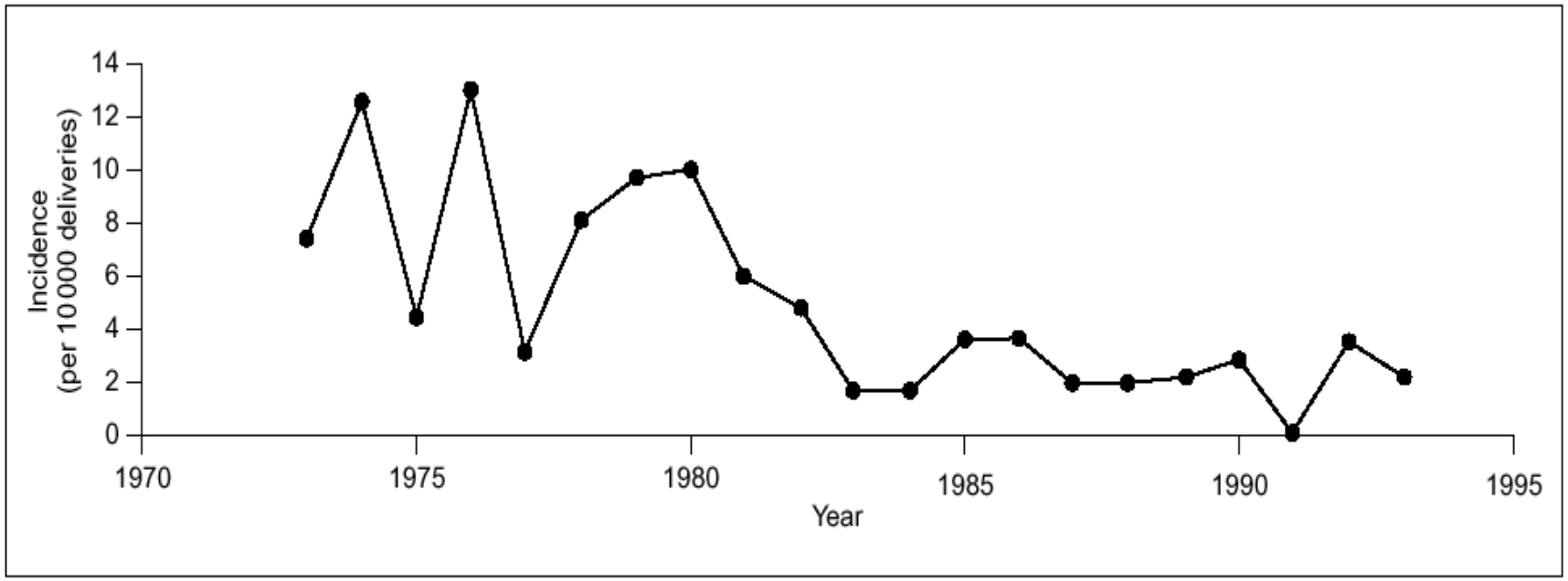


Fig. The annual incidence of eclampsia from 1973 to 1993 at the Tsan Yuk Hospital

TYH (1983-1993), Eclmapsia: 2/10000 maternities

Eclampsia in the United Kingdom 2005

M Knight on behalf of UKOSS

BJOG 2007;114:1072–1078

Table 1. Premonitory symptoms and signs in the week preceding the eclamptic episode

Symptom or sign	Women, *n* (%) (*n* = 214)
Visual disturbance	48 (23)
Headaches	119 (56)
Epigastric pain	36 (17)
Hypertension (diastolic BP >90 mmHg)	101 (48)
Proteinuria (+ or more on dipstick or >0.3 g/24 hours)	97 (46)
Hypertension and proteinuria	81 (38)
Any premonitory symptom or sign	168 (79)

Eclampsia—an 11-year experience

YM Chan, SW Ngai

HKMJ Vol 4 No 2 June 1998

Table 1. Summary of clinical features of patients with eclampsia

Period	Patient/ age (y)	Parity	Gestation (wk)	Antenatal problem	Maximum blood pressure (mm Hg)
Antepartum	A/17	0	36	—	115/70
Intrapartum	B/23	0	38	Induced labour, pre-eclampsia	150/110
	C/25	0	38	Intrapartum HT[§]	130/90
	D/31	0	38	Gestational HT	150/90
	E/28	0	39	—	120/80
	F/30	0	41	—	130/85
Post-partum	G/26	1	33	IUGR[‖], pre-eclampsia	200/120
	H/26	0	32	Pre-eclampsia	160/110
	I/21	0	35	Gestational HT	180/130
	J/20	0	37	Pre-eclampsia	170/110
	K/22	1	38	—	180/100
	L/18	0	40	—	120/85

Eclampsia: Typical features

- Generalized tonic clonic
- Short lasting, a few minutes
- Post-ictal drowsiness
- May be preceded by headache or blurred vision
- Usually no residual neurological deficit after recovery

- Mx
- ABC
- Stop convulsion

Prevention of recurrence of eclampsia

Which Drug?

- MgSO4
  - Inexpensive
  - Not affect conscious level
  - Potentially toxic and lethal if overdose
  - Used in USA, seldom in UK and Europe before 1995
- Diazepam
  - Used in UK, Europe and HK before 1995
  - Affect conscious level
  - Infusion in high conc
- Pheytoin
  - Used in Europe and UK
  - Not commonly used

Control of eclampsia: which drug

Which anticonvulsant for women with eclampsia? Evidence from the Collaborative Eclampsia Trial

Lancet 1995; **345:** 1455–63

*The Eclampsia Trial Collaborative Group**

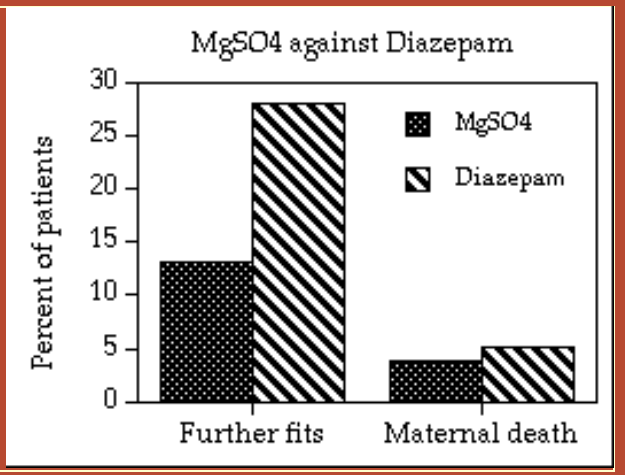
- ~1,700 women randomised to 2 separate trials – MgSO4 vs diazepam & MgSO4 vs phenytoin
- MgSO4 vs diazepam : 910 women were randomised in 23 centres in eight countries - Argentina, Brazil, Colombia, Ghana, India, Uganda, Venezuela and Zimbabwe
- MgSO4 vs phenytoin 777 women were randomised in four centres in South Africa and India.

Which anticonvulsant for women with eclampsia? Evidence from the Collaborative Eclampsia Trial

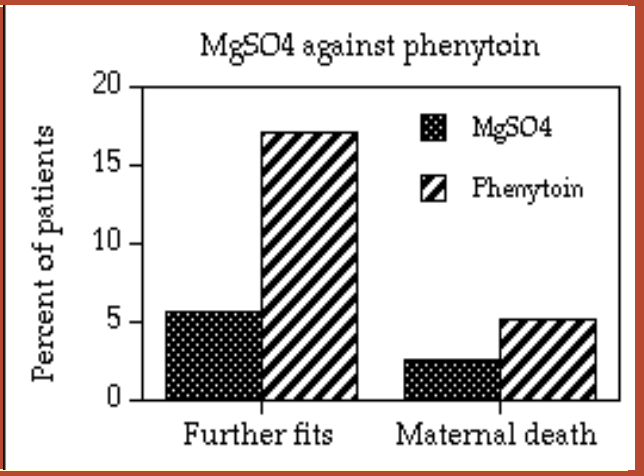
Lancet 1995; **345:** 1455–63

*The Eclampsia Trial Collaborative Group**

- MgSO4 was superior to diazepam
- significantly fewer recurrences of fits
  - MgSO4(60/453) vs diazepam (126/452)
  - relative risk was 0.48 (95%CI 0.4 - 0.6)
- reduction in maternal death(not sig)
  - (17/453 compared with 23/452)



- MgSO4 was superior to phenytoin
- significantly fewer recurrences of fits
  - MgSO4(22/388)vs diazepam (66/387)
  - relative risk was 0.33 (95%CI 0.2 - 0.5).
- reduction in maternal death(not sig)
  - (10/388 compared with 20/387)



Control of eclampsia: which drug

Which anticonvulsant for women with eclampsia? Evidence from the Collaborative Eclampsia Trial

Lancet 1995; **345:** 1455–63

*The Eclampsia Trial Collaborative Group**

- MgSO4, less recurrent seizures and maternal death than other anticonvulsant

- Loading dose 4 g (infusion pump) over 5–10 minutes, followed by 1 g/hour
- Recurrent seizures
  - should be treated with a further bolus of 2g MgSO4
- Monitoring
  - Urine output, RR, SaO2, maternal reflexes
- Maintained for 24 hours after the last seizure.

Prevention of eclampsia: MgSO4

Do women with pre-eclampsia, and their babies, benefit from magnesium sulphate? The Magpie Trial: a randomised placebo-controlled trial

Lancet 2002; **359:** 1877–90

*The Magpie Trial Collaborative Group**

- Women allocated MgSO4: 58% lower risk eclamptic seizure
- Relative risk reduction similar regardless of severity
- More women need to be treated when pre-eclampsia is not severe
- Moderate PET: treat 100 and prevent 1 seizure
- For 24 hours following delivery or 24 hours after the last seizure

Prevention of eclampsia: MgSO4

Magnesium sulphate and other anticonvulsants for women with pre-eclampsia *Cochrane Database of Systematic Reviews 2003*

- MgSO4 reduce risk of eclampsia
- trend toward a reduction in maternal mortality when used for PET (RR 0.54, 95% CI 0.26–1.10).
- Severe PET:
  - RR 0.41, 95% (CI) 0.29 to 0.58
  - NNT for benefit = 50 , 95% (CI) 34 to 100
- Not severe PET:
  - RR 0.37, 95% (CI) 0.22 to 0.64,
  - NNT for benefit = 100, 95% (CI) 100 to 500
- Side Effect: ~ 25% flushing.
- reasonable reassurance, MgSO4 is safe for the baby

RR: relative risk NNT: number need to treat

MgSO4

Indications for use in pregnancy:

- prophylaxis of pre-eclampsia seizures and
- treatment of eclamptic convulsion

Presentation

- 5ml vials = 493 mg/mL (49.3%) (Treat as ~ 50%)

Route of administration

- **IV Infusion:** via a 50ml syringe pump through a peripheral intravenous line. IV line should not be used to inject other drugs.
- Diluted to at least 20% MgSO4 solution for IV infusion.

Note: MgSO(4) infusions should only be administered in Birth Suites, Theatre or High Dependency Unit.

MgSO4

Treatment & Prophylaxis of pre-eclampsia seizure

- Loading Dose: 4 gram bolus(8ml MgSO4 + 12ml NS) is given over 15 minutes
- Maintenance: 1 gram/hr (20mlMgSO4 +30ml NS: 5ml/hour) until at least 24 hours post delivery.
- The rapid infusion of magnesium in this setting requires ECG monitoring

MgSO4: Monitoring

During administration of the loading dose

Observe for the development of side effects

Check patellar reflexes after completion of the loading dose

During maintenance infusion

1 hourly Blood Pressure, Pulse, Respiratory Rate

1 hourly patellar reflexes

1 hourly urine measures

2 hourly temperature

Continuous CTG monitoring of the viable fetus

MgSO4: Mg level

- no need to measure Mg levels routinely except oliguria or renal impairment.
- Experience from the Collaborative Eclampsia trial indicates that MgSO4 (administered according to the above regimen) can be used safely without the need to monitor serum levels.
- Magnesium is excreted by the kidneys and regular monitoring of serum levels should be considered in women with oliguria (urine output <100mL over 4 hours) or urea >10mmol/L

Mg conc (mmol/L)	Effects
0.8 -1.0	Normal plasma level
2-4	Therapeutic range
2.5 - 5.0	ECG changes (P-Q interval prolongation, widen QRS complex)
4.0 - 5.0	Reduction in deep tendon reflexes
> 5.0	Loss of deep tendon reflexes
> 7.5	Sinoatrial and atrioventricular blockade. Respiratory paralysis and CNS depression
> 12	Cardiac arrest

MgSO4: Mg level and toxicity

Magnesium toxicity

Symptom	Treatment
Urine output < 100 ml in 4 hours	If no clinical signs of magnesium toxicity, decrease rate to 0.5 g/hour
	Review overall management with attention to fluid balance and blood loss
Absent patellar reflexes	Stop $MgSO_4$ infusion until reflexes return
Respiratory depression	Stop $MgSO_4$ infusion
	Give oxygen via facemask and place in recovery position because of impaired level of consciousness
	Monitor closely
Respiratory arrest	Stop $MgSO_4$ infusion
	Give IV Calcium gluconate
	Intubate and ventilate immediately
Cardiac arrest	Commence CPR. Stop $MgSO_4$ infusion
	Give IV Calcium gluconate
	Intubate and ventilate immediately
	If antenatal, immediate delivery
Antidote	10% Calcium gluconate 10 ml IV over 10 minutes

PROMPT manual

MgSO4: overdose and toxicity

- Overdose unlikely if normal urine output and normal patellar reflex

Case of MgSO4 overdose

Case: MgSO4 overdose

- MgSO4 after Eclampsia,Emergency LSCS for eclampsia & fetal distress
- Patient given ~9 g MgSO4 within ~2.5 hr in the peri-operative period
- Post-op found to have muscle weakness with hyporeflexia.
- MgSO4 drip accidentally opened to full rate
- Use infusion pump

Peripartum Complication

Pulmonary edema

Confidential Enquiry into Maternal and Child Health 2003-2005

Numbers of deaths from pre-eclampsia or eclampsia; United Kingdom 2003-05.

Triennium	Cerebral					Pulmonary				Hepatic				Total
	Intracranial haemorrhage	Subarachnoid	Infarct	Oedema	All	ARDS	Oedema	Other	All	Rupture	Failure/ necrosis	Other	All	
1985-87	11	0	0	0	11	9	1	2	12	0	1	3	4	27
1988-90	10	2	2	0	14	9	1	0	10	0	1	2	3	27
1991-93	5	0	0	0	5	8	3	0	11	0	0	4	4	20
1994-96	3	1	0	3	7	6	2	0	8	2	1	2	5	20
1997-99	7	0	0	0	7	2	0	0	2	2	0	5	7	16
2000-02	9	0	0	0	9	1	0	0	1	0	0	4	4	14
2003-05	10	0	2	0	12	0	0	0	0	0	2	4	6	18

"no deaths from pulmonary causes alone. This is consistent with the trend of recent years and is assumed to reflect better fluid management in women with pre-eclampsia."

Peripartum Complication

Pulmonary edema

- Pathophysiology:
  - Fluid overload, hypoalbuminemia, increase permeability
- Cause: Excessive maintenance fluid
- Cause: Fluid challenge for oliguria
- Studies: average of 6 litre fluid overload
- Hypoxemia may be a early sign: SaO2 monitor
- Liberal use of lasix if suspected pul edema

Peripartum Fluid Management

- Fluid restriction is advisable in the intrapartum and postpartum periods.
- limited to 80 ml/hour or 1 ml/kg/hour

RCOG Guideline No. 10(A)

- Danger of excessive iv fluid
- Pulmonary edema has been a major cause of maternal death

(Confidential Enquiry)

Case

- 32 weeks, severe PET, BP 170/120, +++ proteinuria
- Oral labetalol, antenatal steroid
- LSCS 24 hours after stabilization
- OT: 500ml NS, 200ml syntocinion, 350ml blood loss
- Mild SOB after extubation, CXR mild pulmonary edema, need O2 and lasix

Peripartum Fluid Management

Outcomes of severe pre-eclampsia/eclampsia in Yorkshire 1999/2003

Yorkshire guidelines

- fluid restriction to 80 mL/hour in the peripartum period
- low rate of fluid related problems in the mothers
- tolerance of a low urine output: allow up to 8 hours with the equivalent of less than 20 ml/hour urine output before intervention

- 25/1087 women developed pulmonary oedema
  - six with the administration of blood products
  - one following a reaction to general anaesthesia
  - one had pre-existing known cardiomegaly,
- Blood and blood products are a major risk factor for pulmonary oedema in women with pre-eclampsia.

Peripartum Problem

Oliguria

- Happen in 30% of severe PET
- Renal failure is uncommon in uncomplicated PET except with abruptio or sepsis
- Pathophysiology:
  - edema of glomerulus, ↓ renal blood flow
- Spontaneous diuresis in 24 to 48 hours after delivery

Peripartum Problem

Oliguria

- Oliguria (usual definition)
  - Urine < 0.5ml/kg/hour
  - <100ml in 4 hours

"The aim is to restore and maintain circulating volume to preserve renal function whilst limiting the potential for pulmonary oedema. The preservation of urine output is secondary to avoiding pulmonary oedema"

(Confidential Enquiries Into Maternal Deaths 2001)

Peripartum Fluid Management

Mx of oliguria in PET

- have to exclude hypovolemia due to maternal haemorrhage
- no evidence that maintenance of a specific urine output is important to prevent renal failure
- fluid restriction should be maintained

RCOG Guideline No. 10(A)

Peripartum Fluid Management

Mx of oliguria in PET

- Frusemide and dopamine
  - May be associated with increased urine output
  - No long term benefit demonstrated
  - Spontaneous diuresis without Tx
- Predictor of dialysis
  - high creatinine level
  - double of Cr level in first 24-48hr after oliguria
- Spontaneous diuresis 24 to 48hr after delivery

Peripartum Problem

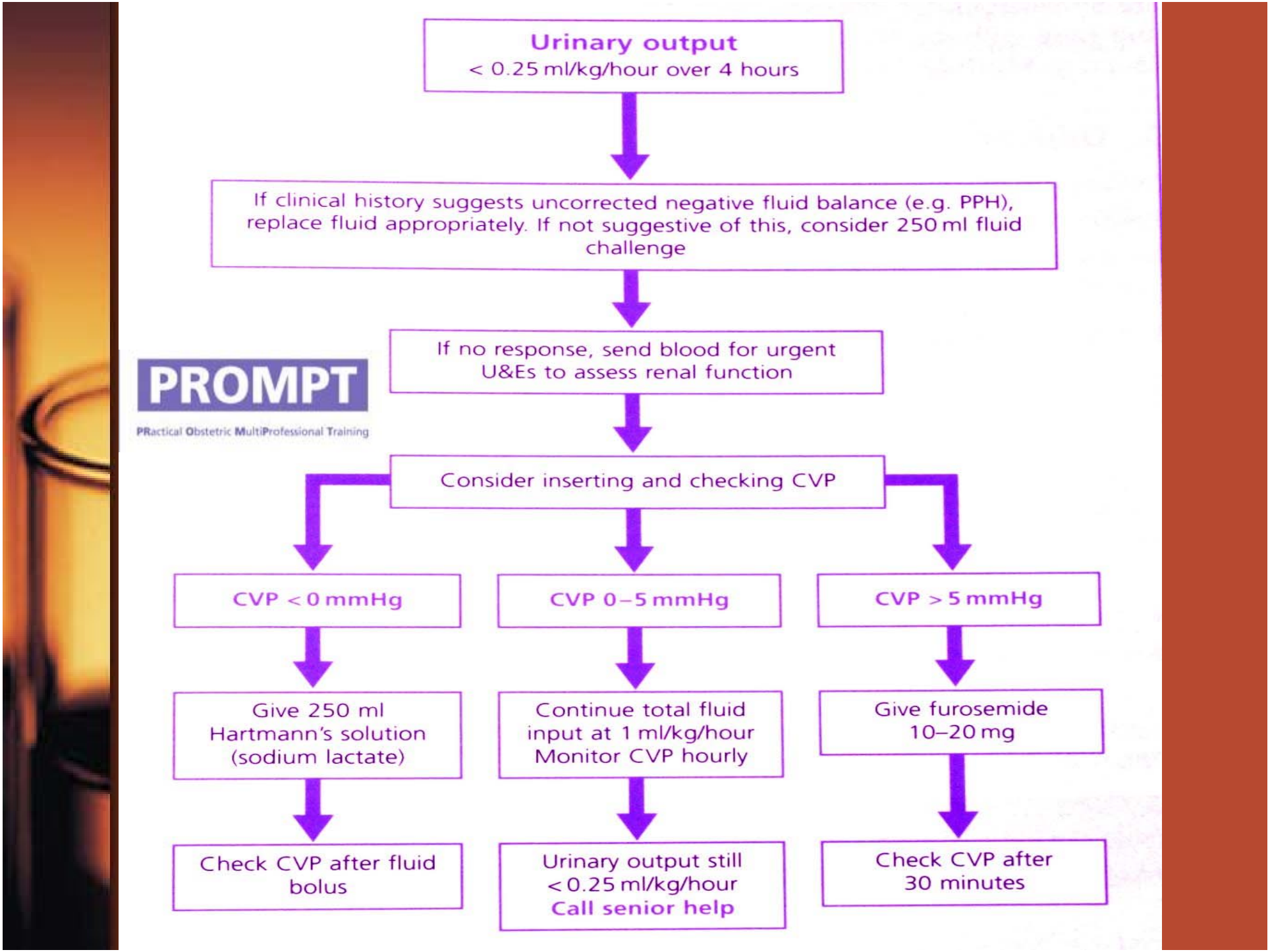
Oliguria

- In case of doubt
- Check urine osmolality
- Concentrated urine: kidney is functioning
- Low osmolality: renal failure

Peripartum Fluid Management

Invasive monitoring: CVP

- Not generally necessary
- May be misleading
- CVP should not higher than 5-7cm
- Low CVP cannot guarantee no pulmonary edema
- CVP do not reflect LA pressure


Urinary output
< 0.25 ml/kg/hour over 4 hours
If clinical history suggests uncorrected negative fluid balance (e.g. PPH), replace fluid appropriately. If not suggestive of this, consider 250 ml fluid challenge
If no response, send blood for urgent U&Es to assess renal function
PROMPT
PRactical Obstetric MultiProfessional Training
Consider inserting and checking CVP
CVP < 0 mmHg
CVP 0–5 mmHg
CVP > 5 mmHg
Give 250 ml Hartmann's solution (sodium lactate)
Continue total fluid input at 1 ml/kg/hour Monitor CVP hourly
Give furosemide 10–20 mg
Check CVP after fluid bolus
Urinary output still < 0.25 ml/kg/hour Call senior help
Check CVP after 30 minutes

Confidential Enquiry into Maternal and Child Health

- pectus excavatum, mid pregnancy with reduced fetal movements, fulminant PET & HELLP syndrome.
- severely HT, hyperreflexic with clonus, oliguric and had abnormal liver function tests.
- oral labetalol, magnesium and hydralazine
- urgent caesarean section was planned with prior insertion of arterial & CVP
- Right internal jugular cannulation was unsuccessful but the consultant anaesthetist was able to cannulate the subclavian vein at the second attempt.
- cardiac arrest, could not be resuscitated
- autopsy a large right haemothorax was found.

Case Study: Year 2006

- age 40, Para 2, NSD X2,no prev PET or HT
- Normal BP and no proteinuria
- admitted from A & E at 26 weeks, eclampsia at home
- headache, dizziness, vomiting before convulsion
- First BP 160/110, marked edema, 3+ alb
- USG after eclampsia: IUGR
- Stabilize BP and give MgSO4, LSCS 630gm

Case Study: Year 2006 cont

- Post op: no extubation after LSCS
- Reduce urine output, Oliguria 20-30ml per hour
- Repeated fluid challenge
- Post OP I/O: 3506/565
- Developed heart failure
- Home D15

- Severe PET/Eclampsia
- Oliguria is common
- Excessive IV fluid resulted in pulmonary edema

Conclusion: Intensive care setting

- Anti HT Tx: keep BP below 160/100
- Fetal monitoring in antepartum period
- Fluid restriction: 80ml/hr or 1ml/kg/hour
- Thromboprophylaxis is needed
- Oliguria is common & avoid excessive fluid challenge
- Eclampsia occurred with relative normal BP & severe headache in pregnancy may be a prodromal symptom of eclampsia
- MgSO4 prophylaxis with clinical monitoring

HELLP Syndrome