Hypertensive Disorders of Pregnancy:

An Overview of the New Canadian Guideline through Case Presentations

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Hypertensive Disorders of Pregnancy: Objectives

To present a synopsis of the new SOGC sponsored, CHS endorsed, guidelines on HT disorders of pregnancy pertaining to:

Diagnosis

Classification

Evaluation

Prediction

Prevention

Treatment and Management

Hypertensive Disorders of Pregnancy:
Mortality Facts

10-15% of direct maternal deaths are associated with hypertensive disorders of pregnancy in both the developing world*, and in the developed world**

Duley,1992

UK Dept. of Health,1998

Schutte JM, BJOG, 2008;115 (6)

** *Mismanagement of HT disorders*

Direct Obstetric Deaths in Canada

Pulmonary Embolism	9
Pre-Eclampsia/PIH	9
Amniotic Fluid Embolism	7
Intra-Cranial Hemorrhage	7
Ectopic Pregnancy	6
Hemorrhage	4
Other (sepsis/anesthesia)	2
Total	44

Health Canada: Maternal mortality and severe morbidity in Canada, 2004

The New Canadian Guidelines

- These guidelines offer recommendations based on best evidence according to the “Canadian Task force on Periodic Health Exam” grading of evidence and level of recommendations.

  More than 1600 references were reviewed and graded

- Authored by Canadian obstetricians and internists from across Canada:

  Magee LA, Helewa M, Rey E, Cote AM, Douglas J, Gibson P, Gruslin A, Lange I, Leduc I, Logan AG, Smith GN, Cardew S, Firoz T, Moutquin JM and von Dadelszen P

Hypertensive Disorders of Pregnancy:

On Diagnosis and Measurement

Case A.

FP calls regarding an 38 yr old lady, G1, at 28 weeks pregnancy, and who works as a security officer on night shifts, and who at clinic visits had a BP or 140/94 mmHg in the last 2 visits. He labeled her as hypertensive with possible preeclampsia. He asked her to collect urine for 24 hours and asked for a blood workup.

She however brings him records of her BP with a portable electronic machine borrowed from her hypertensive sister with multiple readings throughout the day with BP never exceeding 135/80.

Case A (cont.)

She is Asymptomatic except some facial edema.

Her blood work is normal except for an albumin of 21 mg%. Because of her job, she feels collecting 24 hour urine may be difficult especially at night.

She in fact wonders whether she is overcalled Preeclamptic.

He asks you:

How reliable is the ambulatory Electronic monitoring and how should the many readings be interpreted?

Are there alternatives to a 24 hour collection to determine presence and amount of proteinuria?

Correct Measurement of BP

- Measure in a sitting position with arm at level of heart (II-2,A). Two readings needed.
- Office or Hospital measurement (II-2, A)
- Use appropriate size cuff (1.5 x circumference of arm) (II-2,A)
- Use Korotkoff phase V to designate diastolic BP (I,A)
- Automated BP machines may underestimate BP in HT and manual comparison is recommended (II-2, A). Automated BP machines used should be validated.

Hypertensive Disorders of Pregnancy: The Diastole

- Single, precise, and practical
- A diastole = or > 90 mmHg, is
  - 3 SD above the mean in 1st and 2rd trimester
  - 2 SD above the mean in 3rd trimester
- Evidence correlates a diastole > 90 mmHg to increasing risk of perinatal morbidity and mortality
- Reliance on diastole alone did not increase false negatives or false positives (HT Dx in 13% with diastole alone, vs. 15% if diastole *and* systole was used, NS)

Nelson, 55 Friedman, 76

Kyle et al, 93 Retzkek et al, 94

Hypertensive Disorders of Pregnancy

Systolic BP

- While Systolic BP was not endorsed as a criterion to diagnose HT (less predictive of adverse conditions, fluctuates frequently, may over-label), Systolic BP should not be ignored

- Follow women closely with a systolic BP >= 140 mmHg to watch for development of diastolic HTN (II, 2-B)
- CVA and Stroke can occur at systolic BP >= 160 mmHg

Note that relative increase in BP in trimesters is no longer used in diagnosis since the guidelines of 1997

Hypertensive Disorders of Pregnancy: Automated Blood Pressure Measurement

Variation of BP by Gestational Age

- Halligan A, et al, J Hypertens, 93

  Homogenous, high compliance, various ranges of GA, PP controls

  Systolic: No change 9-33 wks, Sig. increase 33-40wks

  Diastolic: Sig. Drop 18-24 wks, Sig. increase 33-40 wks

- Hermida RC, et al, J Perinatal Med, 97

  "Curve of best fit"→ drop in both systolic and diastolic BP till 20 wks, then steady rise till 40 weeks

Hypertensive Disorders of Pregnancy: Automated Blood Pressure Measurement

The Validation Process

- The Mercury Sphygmomanometer is the ***gold*** standard
- Automated device must have readings within 5mmHg, and a SD of less than 8mmHg
- Grade A: 80% of time within 5mmHg in 24hrs
  Grade B: 65% of time within 5mmHg in 24hrs
  Grade C: 45% of time within 5mmHg in 24hrs
- Lab inter-device testing, three levels of BP's, field testing, training, patient group specific, patient satisfaction

Hypertensive Disorders of Pregnancy: Automated Blood Pressure Measurement

- Most automated electronic BP devices are accurate at low BP (130/80 mmHg), less accurate at medium BP (130-160/80-100 mmHg), and least accurate at high BP (160/100 mmHg)

O'Brien E, et al, J Hypertens, 93

† Six ambulatory electronic ABPD

Hypertensive Disorders of Pregnancy

Automated Blood Pressure Measurement

- Spacelabs 90207 Validation
  - Grade A-B for systolic BP
  - Grade B for K V diastolic BP (Overestimated)
  - Grade C for K IV diastolic BP

- In ***severe*** Proteinuric Gestational HT, oscillometric devices ***under- estimated*** systolic, and more dramatically diastolic BP
  - Grade C for BP >/= 170/110 mmHg

O'Brien et al, J Hypertens, 93
Shennan et al, Br J Obstet Gynecol, 93
Quinn et al, Am J Obstet Gynecol, 94
Brown M, Et al, Aust N Z Obstet Gynecol, 98

Hypertensive Disorders of Pregnancy: Role Automated ***Ambulatory*** Blood Pressure Measurement ?

- Differentiate those patients who suffer “White Coat” HT (30%). Prognosis=Non-HT

  Bar J, et al, J Hum Hypertens, 1999
  Bellomo G, et al, JAMA, 1999

- Predictive value for future onset of GHT+P and GHT (Loss of dip in 2nd trimester, Loss of diurnal variation, Higher hyperbaric index)

  BenedettoC, et al, Acta Obstet Gynecol Scand,98
  Brown M, et al, Obstet Gynecol, 2001

- Treatment monitoring, trend analysis

Hypertensive Disorders of Pregnancy: Role Automated ***Ambulatory*** Blood Pressure Measurement

Does Ambulatory ABPM improve outcomes and control compared to conventional methods of BP monitoring

↓

NO DATA / NO RCT's

Bergel E, et al, Cochrane Database Syst Rev, 2002

(In contrast: Pickering TG, et al, Hypertension 2008)

Proteinuria
Recommendations

- All pregnant women should be assessed for proteinuria (II-2, B).

- Urinary dipstick testing may be used for screening for proteinuria when the suspicion of pre-eclampsia is low (II-2, B).

  Note: Dipsticks riddled with relatively high false positives and negatives

Proteinuria

Recommendations

More definitive testing for proteinuria:

Urinary Protein:Creatinine ratio

(P/Cr > 22-30 mg/ mmol on am spot urine) or

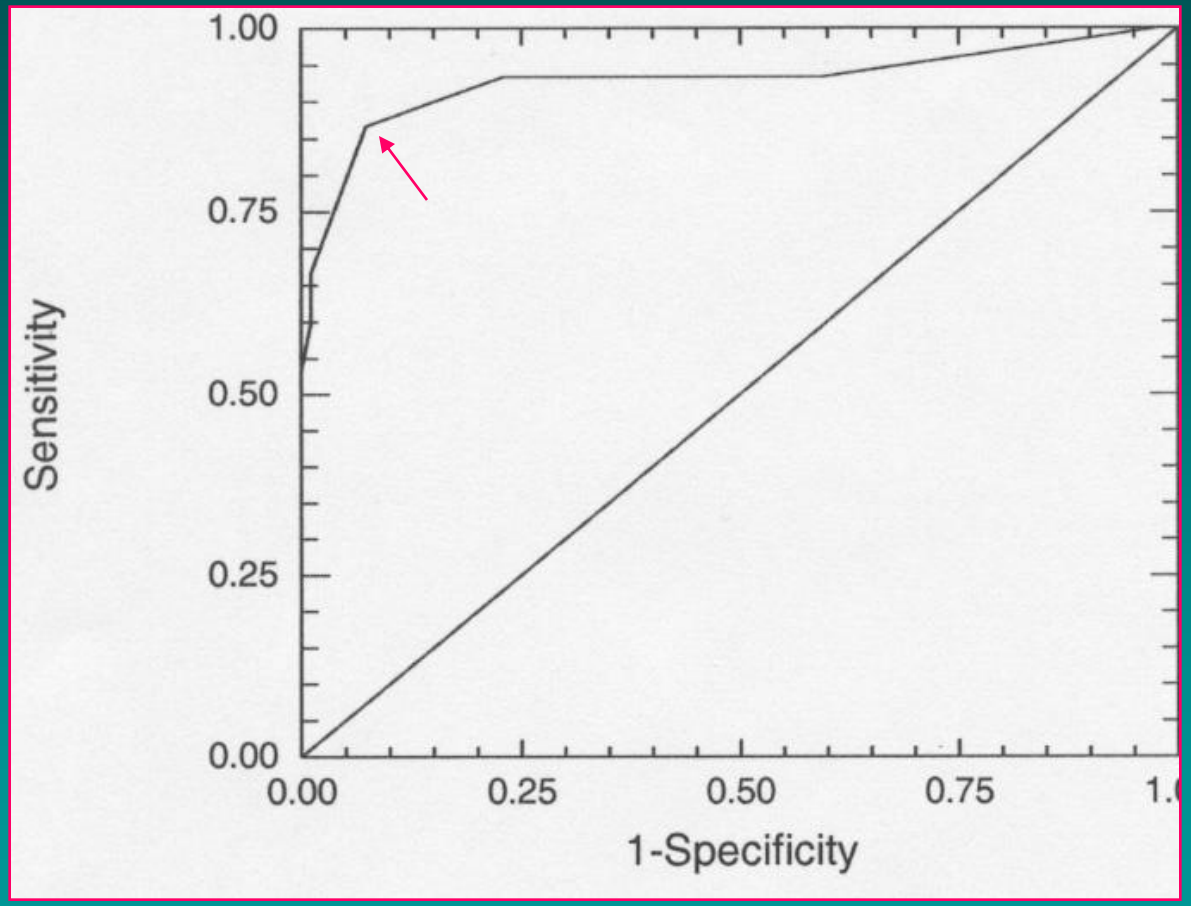
24hr urine collection

(> 0.3 g/day)

↓

when there is a suspicion of pre-eclampsia, including hypertensive pregnant women with rising BP or normotensive pregnant women with symptoms or signs suggestive of pre-eclampsia (II-2, A).

ROC curve:


1.00
0.75
0.50
0.25
0.00
Sensitivity
0.00
0.25
0.50
0.75
1-Specificity

Hypertensive Disorders of Pregnancy: Proteinuria→ P/Cr and A/Cr

	Sens.	Spec.	PPV	NPV
• P/Cr >22 mg/mmol	87%	93%	65%	98%
• A/Cr > 8 mg/mmol	80%	97%	-	-

In HT patients

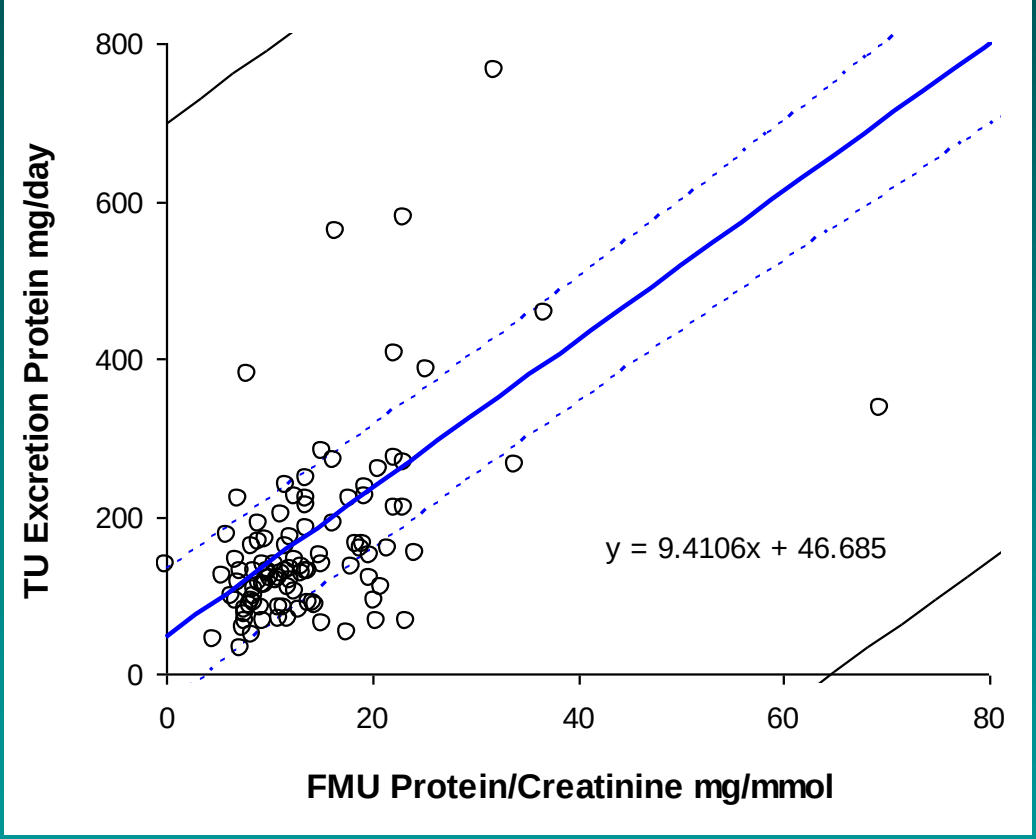
P/Cr >22 mg/mmol → PPV 100%→True Positives

→ NPV 93% → 7% False Neg

Reduction of 24 hr urine collection by 75%

Helewa M, McNaught J, Parry D, Krahn J, 2004

Correlation:



Helewa M, McNaught J, 2004

Leanos Miranda A, et al, Clinical Chem,2007

Urinary Protein:Creatinine Ratio

For a cut off point of 30 mg/mmol

- Sensitivity 83.6% (CI 77.5%-89.7%)
- Specificity 76.3% (CI 72.5%-80%)
- Positive LR 3.5 (2.8- 4.5)
- Negative LR 0.21 (0.13-0.31)

P:Cr ratio is a good “rule out” test

9 studies P:Cr vs. 24 hour Urine collection
n= 1003 of Gestational Hypertension

Cote AM, et al., BMJ 2008;336

Urinary Protein:Creatinine Ratio

Suggest 2 cutoffs:	150 mg/g	600 mg/g
• Sensitivity	99%	85%
• Specificity	65%	96%
• Neg LR	51	-
• Pos LR	-	26

Excludes Proteinuria, decreases 24h collections by 30%

Proteinuria is established, but may need 24h collection for quantity

7 studies satisfied criteria for meta-analysis

N= 1717

Papana R, et al Obstet Gynecol Jul 2008: 112(1)

Classification of HT Disorders of Pregnancy

- **Pre-existing HT** *(detected before 20 wks)*

  Uncomplicated

  With Co-Morbid conditions

  With Pre-Eclampsia* (Resistant HT, or New Onset Proteinuria, or Adverse Conditions)

- **Gestational HT** *(detected after 20 weeks)*

  Uncomplicated

  With Co-Morbid conditions

  Pre-Eclampsia* (Proteinuria, or Adverse Conditions)

(* = Pre-Eclampsia; reintroduced for brevity, international use; note that term could be used even without onset of proteinuria)

Adverse Conditions

Maternal Symptoms:

Frontal HA, visual disturbances, persistent abdominal or RUQ pain, severe N/V, chest pain or dyspnea

End Organ Dysfunction:

Pulmonary edema, eclampsia, severe HTN, abruptio

(Note that oliguria has been removed)

Abnormal Lab Values:

Increased uric acid, creatinine, AST, ALT, LDH, plt < 100 x 10^9, albumin < 20 g/L

(Note that proteinuria>3 gm/day has been removed)

Fetal Morbidity:

Oligohydramnios, IUGR, absent or reversed EDF, IUFD

Defining Severity

- Severe HT

  Diastolic BP >= 110 mmHg

  and /or

  Systolic BP >= 160 mmHg

- Severe Pre-Eclampsia:

  Occurrence of adverse conditions

  Occurrence of “heavy” Proteinuria

  Onset before 34 weeks

Maternal and Fetal Investigations for Diagnosis and Classification

Recommendations:

- For women with pre-existing hypertension, serum creatinine, serum potassium, and urinalysis should be performed early pregnancy if not previously documented (II-2, B).

- Among women with pre-existing hypertension, additional baseline laboratory testing may be based on other considerations deemed important by health care providers (III, C).

Maternal and Fetal Investigations for Diagnosis and Classification

- Women with suspected pre-eclampsia should undergo the maternal laboratory (II-2, B) and fetal (II-1, B) testing.

- If initial testing is reassuring, maternal and fetal testing should be repeated if there is ongoing concern about pre-eclampsia (e.g., change in maternal and/or fetal condition) (III, C).

Maternal and Fetal Investigations for Diagnosis and Classifcation

Maternal

- Hemoglobin, WBC and diff, Plts
- Blood Film
- INR and aPTT
- Fibrinogen
- Serum creatinine, uric acid, LDH
- AST, ALT, glucose, Bilirubin
- U/A, spot P/Cr or 24 hr urine

Fetal

- FM counts, NST
- BPP, deepest pocket, assessment of growth
- Umbilical artery +/- Uterine artery

Case B.

Your opinion is requested in the management of a 28 y.o. lady G2 P1, now at 12 weeks, with BP of 120/80 mmHg, BMI 36, nonsmoker, and who in her first pregnancy 18 months ago, suffered severe pre-eclampsia. She had to be induced at 33 weeks with proteinuria of 6g/d, diastole of 116 mmHg and a fetus that was growth restricted. Unfortunately this lady had to have a CS when FHR tracing became ominous at induction. Baby weighed 1250 gm.

This lady is now divorced from her former partner and she conceived within 2 months of a new relationship

Case B.

- *Is this patient at risk for a recurrence of the first pregnancy scenario? What are some of the risk factors?*
- *What predictive tests could be offered her to assess her risk for severe PET/ and IUGR?*
- *Does assessing her for risk status really matter? If so, why?*

Predicting Pre-Eclampsia
Risk Factors Assessed in First Trimester

Demographics:

- Maternal age >= 40 yr
- Ethnicity (Nordic, Black, South Asian, Pacific Island), lower SES

Past History:

- Previous pre-eclampsia*
- APLA*
- Pre-existing med condition (HTN, renal disease/proteinuria, DM)
- Obesity (BMI >= 35)
- Heritable thrombophilias (Factor V, Protein S def)
- Increased pre-preg triglycerides

Social History

- Non-smoking
- Non-cohabitating
- Cocaine,methampheta mine use

Family History

- Pre-eclampsia (mother or sister)
- Early onset CV disease

Other Risk Factors

Current Pregnancy

- Multiple pregnancy
- First ongoing pregnancy
- Inter-pregnancy interval >= 10 yrs
- Booking sBP >= 130 mmHg or dBP >= 80 mm Hg
- Mean BP > 90 mmHg
- Inter-pregnancy interval < 2yrs
- Reproductive technology
- New Partner
- GTD
- Excessive wt gain
- Infection in pregnancy (UTI, periodontal)

2nd or 3rd Trimester

- Increased BP
- Loss of diurnal variation
- Loss of trimester variation
- Abnormal Serum Screening (T1=PAPP A, Inhibin, Activin A, PP13)
- Abnormal Uterine Artery Doppler
- Cardiac output >7.4 L/min
- Increased Uric Acid

Why Bother ?

Categorizes pregnancies into “at low risk”, or “at high risk”

- Identifies pregnancies complicated by hypertensive disorders that need referral for advanced care
- Identifies patients who may benefit from preventative measures

Predicting Hypertensive Disorders of Pregnancy

- There is no single predictor of pre-eclampsia among women at either low or increased risk of pre-eclampsia

Recommendations:

- At booking for antenatal care, Women with markers of increased risk for pre-eclampsia should be offered obstetric consultation (II-2, B)

- Women at increased risk of pre-eclampsia should be considered for risk stratification involving a multivariable clinical and laboratory approach (II-2, B).

Preventing Pre-Eclampsia and its Complications

Low Risk

vs

High Risk

Preventing Pre-Eclampsia and its Complications in ***Low-Risk*** Women

- **Calcium Supplementation**

  At least 1 gm/d for women with low dietary intake (< 600 mg/d, 2 dairy servings/d) (I-A), but no Benefit in those with adequate intake.

  Oral supplementation decreases incidence of pre-eclampsia RR 0.68, CI 0.49-0.94 (7 trials 14,619 women) and Maternal death or serious morbidity RR 0.80, CI 0.65-0.97

  No adverse effects with calcium

- **No Preventative role for**:

  ASA, Excersize, Smoke/ Alcohol cessation, Zn, Mg, PG precursors, Vitamins C nor E, Folic acid, Salt/ Caloric restriction, Diuretics

Preventing Pre-Eclampsia and its Complications in ***High-Risk*** Women

Recommendations

- **Low dose ASA** 75-100 mg/d (I, A)

  Decrease in pre-eclampsia RR 0.85 CI 0.78-0.92 (NNT 69), preterm delivery RR 0.9 CI 0.8-0.96 (NNT 83), and perinatal death RR 0.86 CI 0.7-0.94 (NNT 227)

  Should start before pregnancy or at diagnosis, best before 16 weeks (III,A), till delivery (I,A), best at bedtime (I,A)

- **Calcium Supplementation** (at least 1 g/d) (I,A)

  Decrease incidence of pre-eclampsia RR 0.22, CI 0.12-0.42 and preterm delivery

Preventing Pre-Eclampsia and its Complications in ***High-Risk*** Women

May be Recommended to prevent onset

Avoidance of inter-pregnancy weight gain (II-2, E)

Rest at home in the third trimester (I, C)

Reduction of workload or stress (III, C).

Not Recommended as a Preventative Measure but may promote fetal and maternal wellbeing in general:

Alcohol avoidance (II-2, E)

Periconceptual folic acid (I, A)

Smoking cessation (I, E)

Prostaglandin precursors (I, C)

Magnesium supplementation (I, C).

Preventing Pre-Eclampsia and its Complications in ***High-Risk*** Women

Not Recommended:

Dietary salt restriction during pregnancy (I, D)

Calorie restriction in overweight women during pregnancy (I, D)

Weight maintenance in obese women during pregnancy (III, D)

Antihypertensive therapy specifically to prevent pre-eclampsia (I, D)

Vitamins C and E supplementation (I, E),

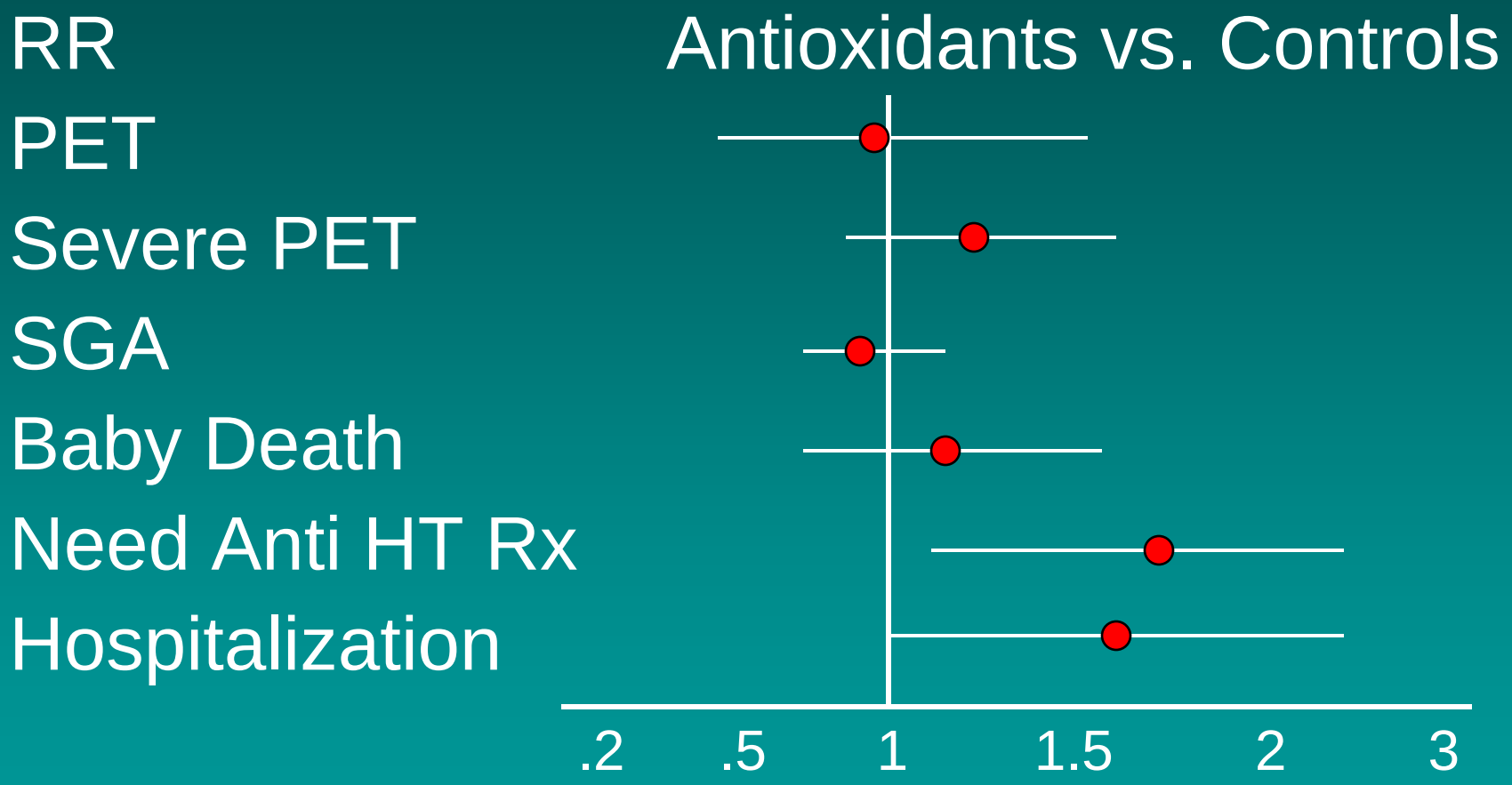
Preventing Pre-Eclampsia and its Complications : Antioxidants

Study (N)	Outcome	Study Gp	Control Gp	RR
Rumboldt (1877) 2006	PET	6%	5%	1.2 (.8-1.7)
	Death	9.5%	12%	.79 (.6-1.02)
	SGA	8.7%	9.9%	.87 (.6-1.6)
Spinnato (707) 2007	PET	13%	15%	.87(.6-1.2)
	PNM	5.1%	5.4%	1.0 (.5-1.8)
	SGA	17.4%	17.8%	.98 (.7-1.4)

- Fraser W. et al., INTAPP Trial, Canada 2007
- Shennan A, et al., UK trial, 2008

} In Press

Preventing Pre-Eclampsia and its Complications : Antioxidants



10 trials, n=6533

Rumbold A, et al, Cochrane 2008

Monitoring of Maternal and Fetal well being in HT of Pregnancy

Recommendations:

- Serial maternal surveillance at least once weekly (II-3, B), and at least once in the first 3 days postnatally

  (reduces adverse outcomes from 5% to 1.2%)

- Serial fetal surveillance should include umbilical artery doppler (I,A)

  (reduces PNM RR 0.7 CI 0.5-1.01)

Surveillance Justification

- Falling platelet count associated with worsening disease and is a risk to the mother
- An AST level > 150 associated with increased morbidity to mother
- Albumin < 20 g/L places patient at greatly increased risk of pulmonary edema (consider as a contraindication for conservative management)
- Perinatal mortality rates significantly different based on diastolic umbilical flow: Normal EDF 4%, AEDF 41%, REDF 75%[2]

Von Dadelszen P et al. Front Biosci 2007 May1;12:2876-89
Karsdorp VH et al. Lancet. 1994 Dec 17;344(8938):1664-8

On Treatment of HT Disorders of Pregnancy

Case C.

A 28 y.o. G1 at 26 weeks, essentially previously healthy, is noted to have a persistent BP of 135/98 mmHg (sitting-Hg), ASx. Your workup reveals a Plat Ct. of 130,000/cc, AST and ALT of 60 and 75 U/L resp., UA of 320 mg%, and a Proteinuria of 800 mg/d. BPS and Doppler are Normal.

You decide to start her on Labetolol po of 100mg tid. And arrange weekly F/U.

Case C.

- *Would you put this patient off work? Hospitalize? AHCP?*
- *Was Labetolol necessary, given the levels of BP?*
- *What BP level would aim for in titrating the Labetolol ?*
- *When would you feel the need to add another agent?*

Non-Pharmacologic Control of HT

Not Recommended

new dietary salt restriction (II-2, D)

Strict bed rest for Preeclampsia (I, D)

Insufficient Evidence

exercise, workload reduction, or stress reduction (all III, I).

May be Recommended

Some bed rest in hospital for gestational hypertension (without pre-eclampsia), (compared with unrestricted activity at home) (I, B).

Recommended

Inpatient care should be provided for women with severe hypertension or severe pre-eclampsia (II-2, B)

Hospital day units (I, B) or home care (II-2, B) for women with non-severe pre-eclampsia or non-severe (pre-existing or gestational) hypertension.

Pharmacologic Control of *Non-Severe* HT

Recommendations

- Without co-morbid conditions:
  keep sBP 130-155 mmHg and dBP 80-105 mmHg (III,C)

- With co-morbid conditions:
  keep sBP 130-139 mmHg and dBP 80-89 mmHg (III, C)

- Use Methyldopa, labetalol, calcium channel blockers (I,A), other B blockers (I,B)

- Contraindicated: ACE Inhibitors (II-2, E), Prazosin, Atenolol (I, D)

Pharmacologic Control of *Severe* HT (dBP>110, sBP>160 mmHg)

- BP should be lowered to < 160 mmHg systolic and < 110 mm Hg diastolic (II-2, B)

- Initial Therapy should be with:

  Labetolol (I, A)

  Nifedipine capsules (I, A)

  Nifedipine PA tablets (1, B)

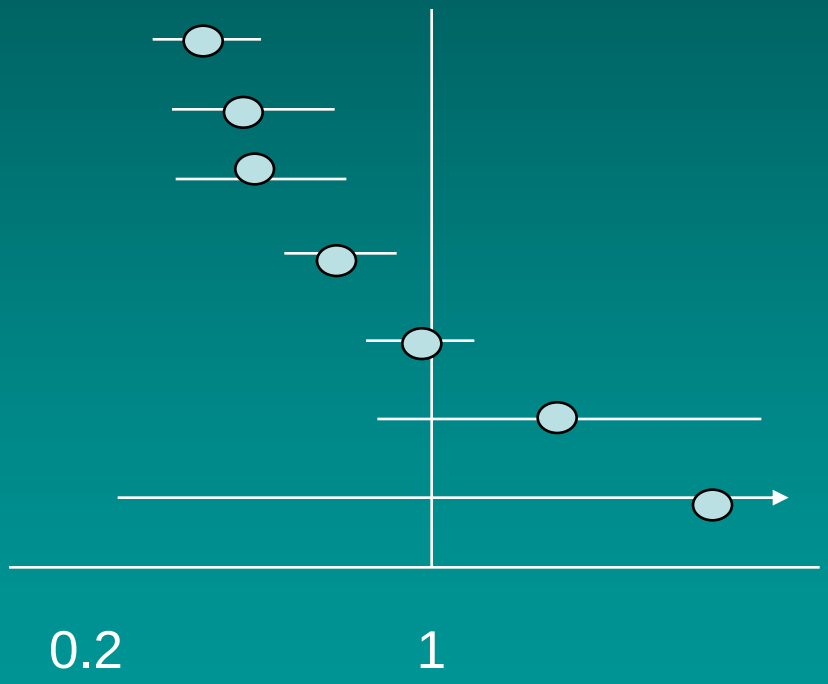
  Hydralazine (1, A)

- Continuous fetal monitoring is advised until BP is stable (III, I)

Hypertensive Disorders of Pregnancy: Anti Hypertensive Rx in Gestational Hypertension

Maternal Outcomes

Severe Hypertension
Additional anti HT Rx
Hospitalization
Proteinuria
Cesarean Section
Abruptio
Maternal Mortality



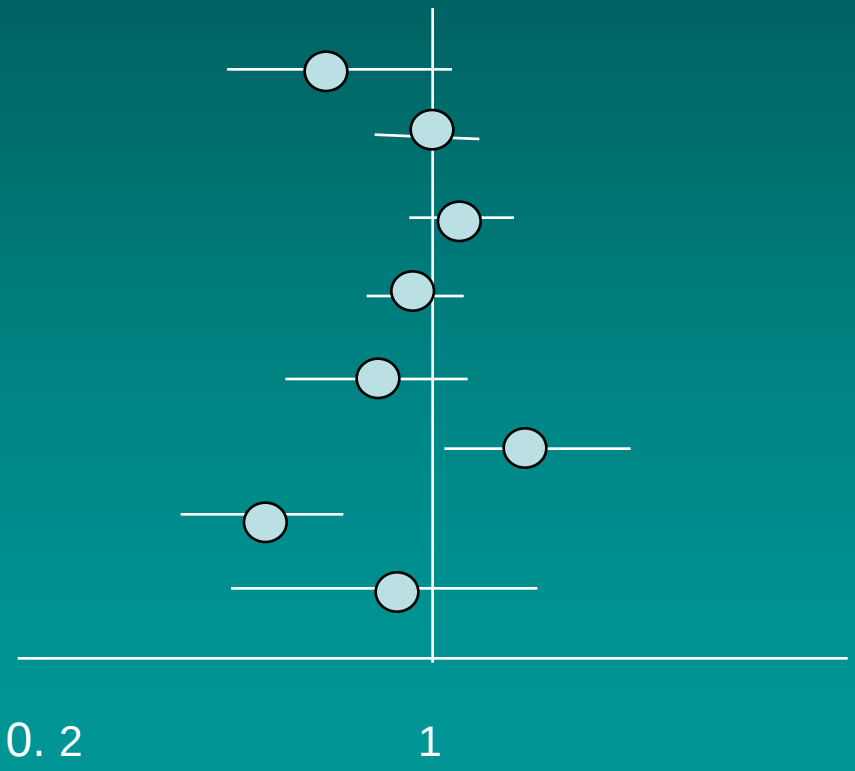
Meta-analysis of 15 RCT

Laura Magee et al,

Hypertensive Disorders of Pregnancy: Anti Hypertensive Rx in Gestational Hypertension

Perinatal Outcomes

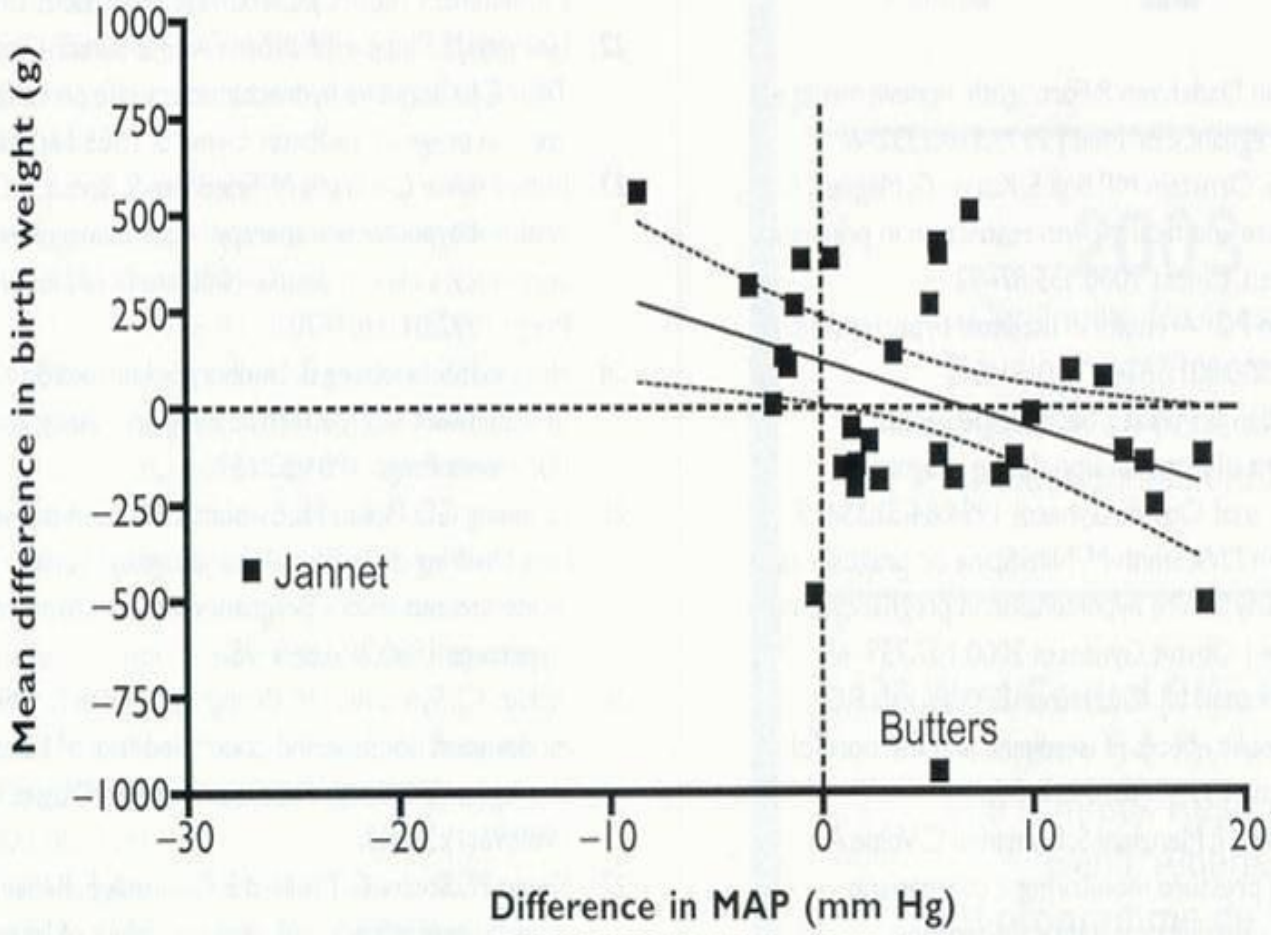
Perinatal Mortality
Prematurity
SGA
NICU
Hypoglycemia
Bradycardia
RDS
Low Apgars



Meta-analysis 15 RCT

Laura Magee et al

RELATIONSHIP BETWEEN FALL IN MEAN ARTERIAL PRESSURE AND LOW BIRTH WEIGHT*



Peter von Dadelszen, Laura Magee
JOGC,2002; 24(12): 941-5

Case C. (Pt. 2)

- *Two weeks later, with patient at 28 weeks, she complains of RUQ pain and feels “spaced out”. You note her BP sitting is 170/ 112 mmHg despite the Labetolol.*

- *Blood work reveals an Plat. Ct 80,000/cc, ALT and AST of 340 and 280 U/L, UA is 450 mg%, and Proteinuria of 2.8 g/d. You find that she is clinically irritable, and hypereflexia is demonstrated.*

Case C. (Pt. 2)

- *Would you initiate process of delivery?*

OR

- *Is there a place for expectant management? If so, what would the expectations be for prolonging the pregnancy?*

- *When, where and under what conditions?*
- *What would be necessary pharmacologic interventions?*
- *Who should get involved in her care?*

Hypertensive Disorders of Pregnancy: Parenteral Drugs for Acute Severe HT

Drug	Dose	Onset	Duration
Hydralazine	5- 10 mg IV q 20’	10-20’	3-6 h
Labetolol	20-80 mg IV q 10’	5-10’	3-6 h
Nifedipine	10mg po q 30’	10-15’	4-5 h
Nitroprusside	10ug/kg/min IV	1’	1-2 h
Nitroglycerine	5-100ug/min IV	2-5’	3-5’
Nicardipine	5-15mg/hr IV	5-10’	1-4h

N.B. Recent RCT, IV NG vs. Nifidipine capsules

Manzur-Verastegui, et al, Clin Exp Pharmacol Physiol 2008

Hypertensive Disorders of Pregnancy:

Comparison of Anti Hypertensives Drugs Given for

Acute Severe HT

Maternal Outcomes

Severe HT

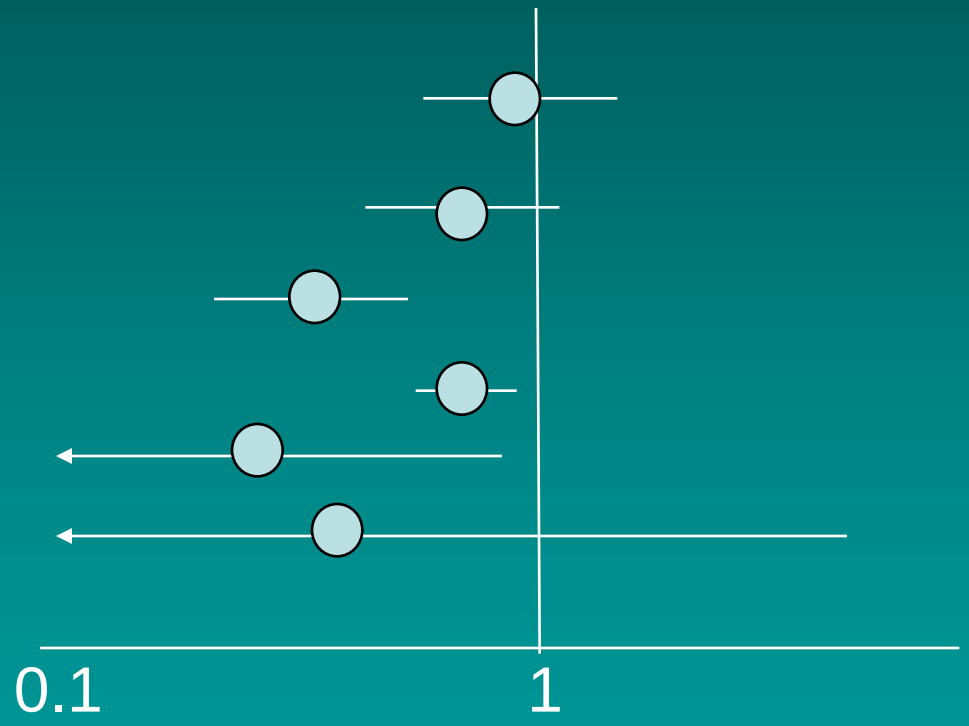
Additional Anti Ht Rx

Hypotension

Cesarean section

Abruptio

Mortality



Meta-analysis of 11 RCT

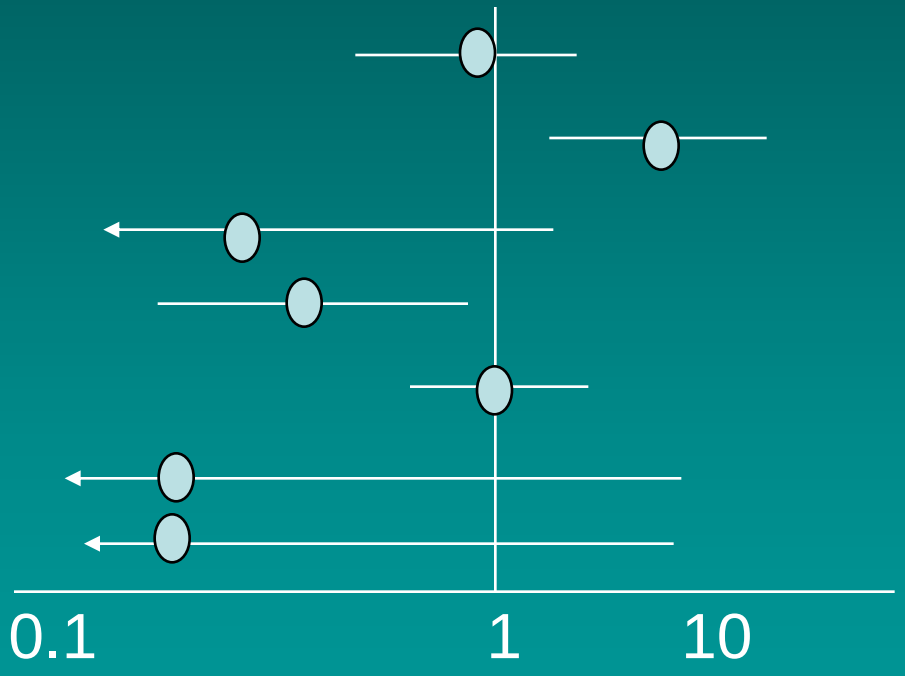
IV Antihypertensives vs Hydralazine

Laura Magee et al

Hypertensive Disorders of Pregnancy: Comparison of Anti Hypertensives Drugs Given for Acute Severe HT

Perinatal Outcomes

Perinatal Mortality
Bradycardia
Hypotension
Low Apgar scores
RDS
IVH
NEC



Meta analysis 11 RCT, Anti HT Rx/hydralazine

Laura Magee et al

Role of Corticosteroids

- Antenatal corticosteroid therapy should be considered for all women who present with pre-eclampsia before 34 weeks' gestation (I, A).

- Antenatal corticosteroid therapy may be considered for women who present at <34 weeks' with gestational hypertension (despite the absence of proteinuria or 'adverse conditions') if delivery is contemplated within the next 7 days (III, I).

Timing of Delivery

- A bit confusing in the new guideline!!
- Occurrence of adverse conditions are not necessarily indication for delivery…should consider severity of the adverse condition and rate of deterioration.

Timing of Delivery

- For women at <34 weeks, expectant management of pre-eclampsia (severe or non-severe) may be considered, but only in perinatal centres capable of caring for very preterm infants (I, C). Such care should be provided in a centre capable of supporting a premature neonate (I, C)

- For women at 34-36 weeks with non-severe pre-eclampsia, there is insufficient evidence to make a recommendation about the benefits or risks of delivery. Expectant management may be considered (III, I).

- For women at ≥37 weeks with pre-eclampsia (severe or non-severe), delivery should be considered (III, B).

Aspects of Management of Labor in HDP

- For any HDP, induction should be undertaken, C/S for usual obstetrical indications (II-2, B)
- Reversed end diastolic flow is a contraindication to induction (II-1,A)
- Inform Anaesthesiologist of admission
- Platelet count on all women with HDP (III, A)
- Consider regional anaesthesia if plt > 75 x 10^9/L
- Early insertion of epidural for control of BP (1, A)

Aspects of Management of Labor in HDP

- Avoid bolus of IV fluid prior to regional anaesthesia
- Fluids should not be routinely administered to treat oliguria (<15 ml/hr)
- Urine output as low as 10 cc/hr should be considered adequate in absence of pre-existing renal disease
- Total IV fluid should be limited to 80ml/hr (approx 1ml/kg/hr current wt)
- Oxytocin should be at high concentration (20U/500ml NS or Ringers)

Hypertensive Disorders of Pregnancy

The MAGPIE Trial

n	$MgSO_4$ 5068	Placebo 5068	RR (CI)
Eclampsia*	0.8 %	1.9 %	**0.4 (0.3 - 0.6)**
Maternal Death	0.2 %	0.4 %	0.5 (0.2 - 1.1)
Serious Morbidity	3.9 %	3.6 %	NS
PNM	11.4 %	11.5 %	NS
Abruptio	2 %	3 %	0.6 (3 - 21)

* NNT overall = 91
  NNT for severe pre-eclampsia = 63
  NNT for non severe pre-eclampsia = 109

L. Duley, Lancet 2002

Management in the Post Partum Period

- BP should be measured until day six after delivery (III, B)
- Severe postpartum hypertension should be treated with antihypertensive therapy, to keep sBP <160mmHg and diastolic BP <110mmHg (II-2, B)
- Antihypertensive therapy may be used to treat non-severe postpartum hypertension, particularly in women with co-morbidities (III, I)
- Antihypertensive agents acceptable for use in breastfeeding include: nifedipine XL®, labetalol, methyldopa, captopril, and enalapril (III, B)
- Consider withholding non-steroidal anti-inflammatory drugs (NSAIDs) postpartum if hypertension is difficult to control, or there is oliguria, an elevated creatinine (i.e., ≥100μM), or platelets <50x109/L (III, I).

Pharmacologic Control of *Non-Severe* HT

- Management of non-severe hypertension is much debated
- Aim is to optimize pregnancy outcomes
- Any anti-hypertension tx will decrease risk of transient, severe HTN, but no clear difference in other maternal or perinatal outcomes
- May be harmful with increased risk of SGA
- Lower limit of 80 mmHg chosen, as concern that lower may compromise uteroplacental perfusion

Eclampsia Prevention

Recommend:

- $MgSO_4$ as first line treatment of eclampsia (1, A)
- $MgSO_4$ for prophylaxis against eclampsia in women with severe pre-eclampsia (1, A)
- $MgSO_4$ may be considered for women with non-severe pre-eclampsia (1, C)
- Phenytoin and benzodiazepines are not be used for prophylaxis or treatment, unless contraindication to $MgSO_4$ or is ineffective (1, A)

Eclampsia

- Remember that $MgSO_4$ has renal excretion
- Oliguria can lead to toxic levels
- Monitor reflexes, RR, urine output (min 100 ml/4h)[1]
- If not criteria not met – withhold further dose as if not excreted, serum levels will not fall

1. Von Dadelszen P et al. Front Biosci 2007 May1;12:2876-89

Hypertensive Disorders of Pregnancy

Mortality Facts

- More than 600,000 women die each year worldwide from causes related to pregnancy
- More than 50,000 maternal deaths each year occur secondary to pre-eclampsia and eclampsia

History of Canadian Guidelines on HT in Pregnancy

- 1994: Canadian Hypertension Society initiated consensus project on hypertension in pregnancy
- 1997: Guidelines published in CMAJ, endorsed by SOGC
- 2000: American and Australian guidelines updated incorporating many of the Canadian recommendations.
- 2005: SOGC (endorsed by CHS) initiated process to update the Canadian Guidelines
- 2007: Process completed, to be published in JOGC in Nov.-Dec. 2007.

Maternal and Fetal Investigations for Surveillance

Maternal

- CBC
- Coagulation tests
- Serum creatinine, uric acid
- AST, ALT, LDH
- U/A, spot P/Cr or 24 hr urine
- Albumin
- Blood film if suspect HELLP

Fetal

- FM counts, NST
- BPP, deepest pocket, assessment of growth
- Umbilical artery doppler

Severe Maternal Morbidity Canada, 1991/92 – 2000/01

(excludes Manitoba, Nova Scotia, Quebec)

	Number	Rate per 1000 deliveries	In-hospital death rate per 100 deliveries
Venous thromboembolism	334	0.13	4.2
Cerebrovascular disorders in puerperium	412	0.16	4.6
Pulmonary, cardiac, CNS complications of anaesthesia	1,246	0.49	0.2
Eclampsia	973	0.38	0.4
Uterine rupture	1,898	0.74	0.2
PPH – transfusion	2,317	0.91	0.3
PPH – hysterectomy	892	0.35	1.6

Wen SW. CMAJ 2005

Hypertensive Disorders of Pregnancy:
Proteinuria

How Much is “too Much”?

Adverse Maternal Outcomes

(DBP> 110 mmHg, renal insufficiency, liver dysfunction and hematologic disturbances)

P/Cr > 900mg/mmol (= 9g/d) in all GHT +P

P/Cr > 500mg/mmol (= 5g/d) in women> 35y

Chan P et al, Br J Obstet Gynecol, 2005