Best of ACC.22: Hypertensive Disorders of Pregnancy

Eugene Yang, MD, MS, FACC
Chair, ACC Prevention of Cardiovascular Disease Section
Clinical Professor of Medicine, Division of Cardiology
Carl and Renée Behnke Endowed Professorship for Asian Health
University of Washington School of Medicine

UW Medicine
HEART INSTITUTE

UNIVERSITY of WASHINGTON

@DrEugeneYang

DISCLOSURES

- Consulting
  - Genentech
- Medical Advisory Board
  - Clocktree
  - Measure Labs
- Research Funding
  - Amgen
  - Microsoft Research

OUTLINE

- Learn about the association between hypertensive disorders of pregnancy (HDP) and cardiovascular disease/mortality
- Review definitions, diagnostic thresholds, blood pressure treatment goals for HDP and discuss treatment options for HDP
- Summarize results of CHAP trial from ACC.22 and how to incorporate them into clinical practice
- Review prevention guidelines and incorporation of pregnancy associated conditions in ASCVD risk assessment

CASE #1:

- 34 year old woman (G1P0) with no significant past medical history is 27 weeks pregnant and comes to your office for pre-term care. Her BP during her past 3 office visits have been 142/92 mm Hg, 145/88 mm Hg, and 149/83 mm Hg. She is asymptomatic, fetal checks have been normal.

- Current Meds: Prenatal vitamin

- Exam: Well appearing, no distress
  - BP 144/93 mm Hg (on recheck 146/88 mm Hg)
  - Physical exam is unremarkable

- Labs: CBC, BMP. LFTs are normal. U/A negative for protein

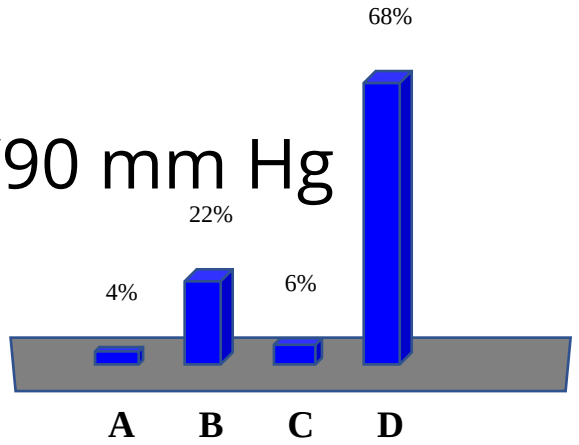
BASED ON CURRENT GUIDELINES YOU RECOMMEND:

A. Monitor blood pressures at home, treat if BP>160/110 mm Hg

B. 24 hour ambulatory blood pressure monitor to assess BPs

C. Give aspirin to prevent preeclampsia

D. Start antihypertensive therapy with target BP <140/90 mm Hg



CASE #2:

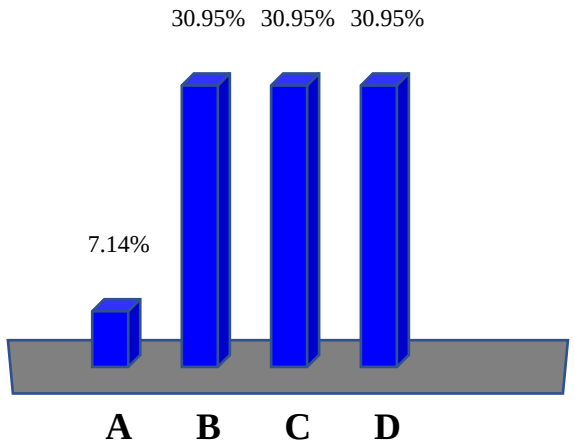
- 32 year old woman (G2P1) with past medical history significant for preeclampsia, class I obesity presents to your clinic for routine prenatal visit. She is 23 weeks pregnant, prenatal care has been unremarkable (normal milestones for baby). BPs in the clinic have been running in the 130s/80s mm Hg on previous visits. Overall she feels well.

- Current Meds:
  - Prenatal vitamins

- Exam:
  - Well appearing woman in no distress
  - VS: BP 134/84 mm Hg, recheck 138/88 mm Hg
  - PE: Unremarkable

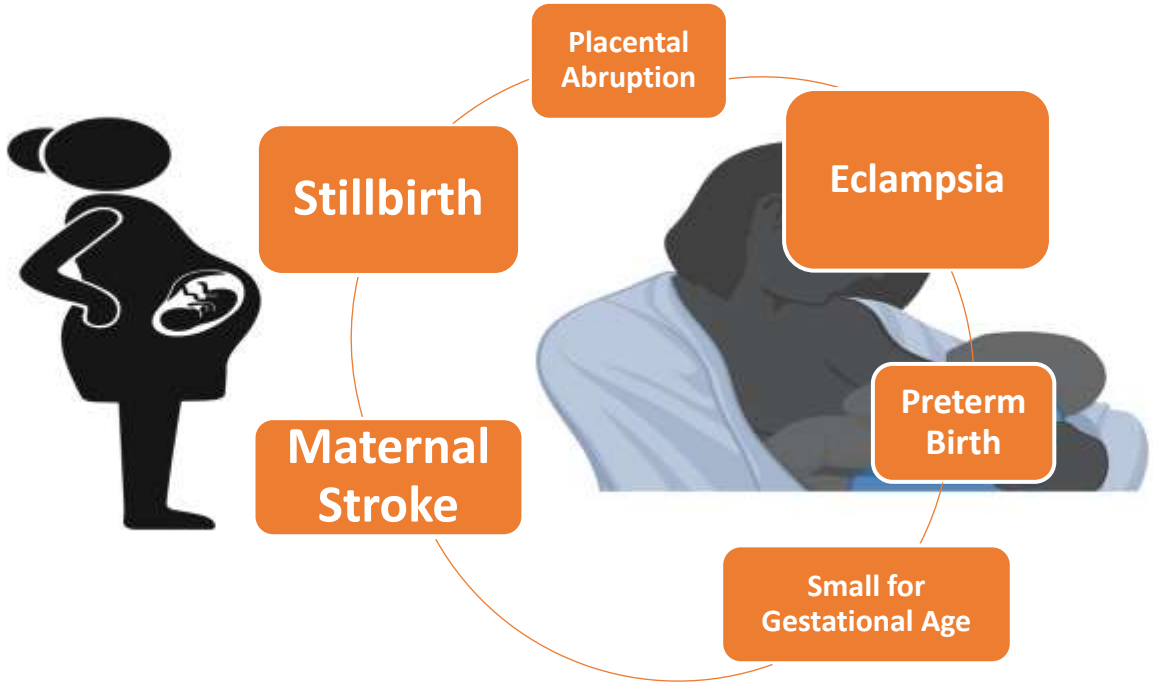
BASED ON CURRENT GUIDELINES YOU RECOMMEND:

A. Monitor blood pressures at home, treat if BP>160/110 mm Hg
B. 24 hour ambulatory blood pressure monitor to assess BPs
C. Give aspirin to prevent preeclampsia
D. Start antihypertensive therapy with target BP <130/80 mm Hg



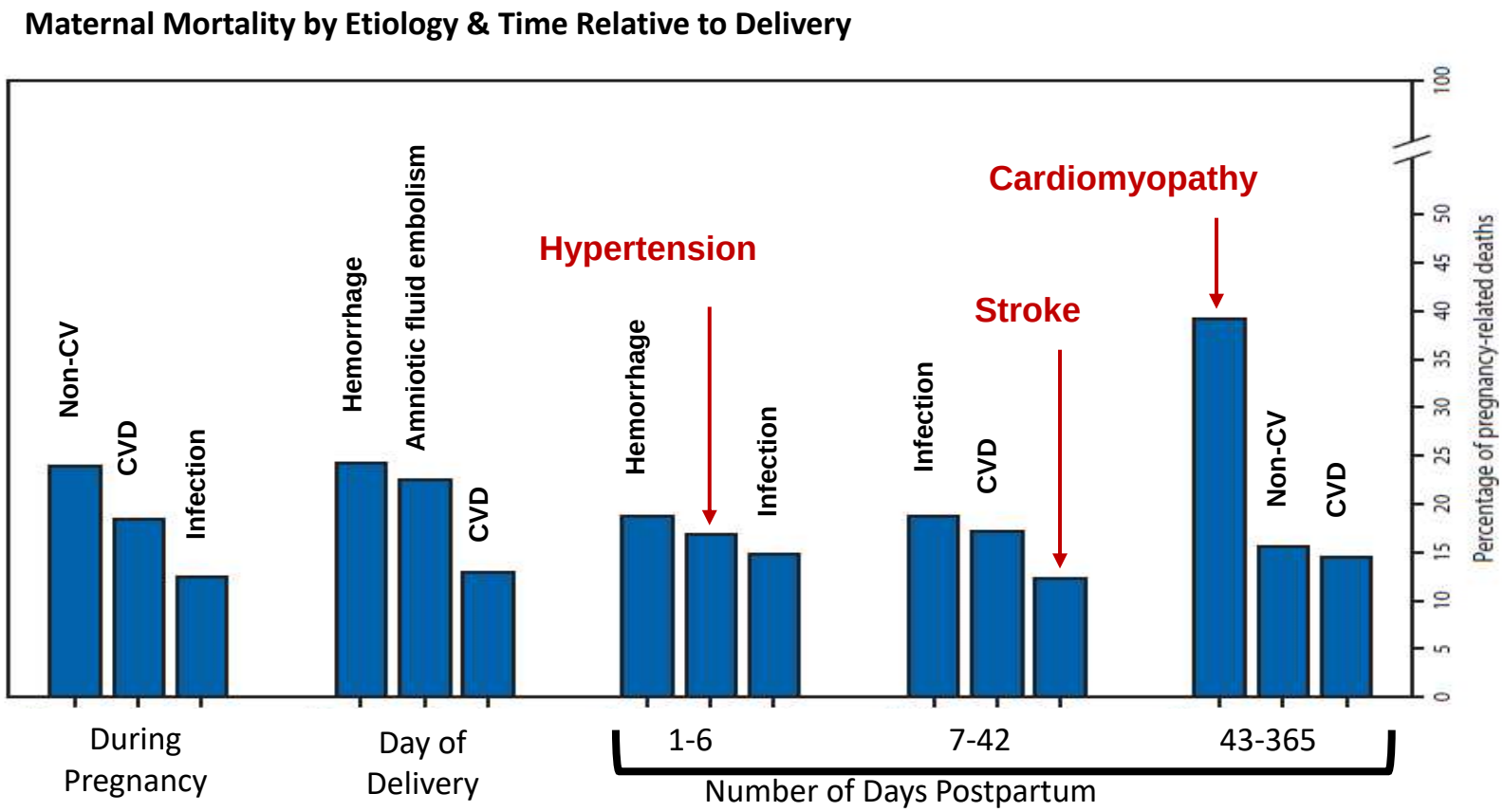
HYPERTENSIVE DISORDERS OF PREGNANCY

- Hypertensive disorders of pregnancy (HDP) complicates up to 10% of pregnancies and are globally are responsible for up to 16% of maternal deaths



Used with permission from Dr. Natalie Bello, Cedars Sinai

HYPERTENSION DURING PREGNANCY CAN BE DEADLY



Peterson et al. *MMWR*. 2019

HYPERTENSIVE DISORDERS OF PREGNANCY– DIAGNOSTIC CRITERIA FOR HYPERTENSION

- Based on *office blood pressure* (BP) measurements:
  - Hypertension: Systolic BP (SBP) ≥140 mm Hg and/or Diastolic BP (DBP) ≥90 mm Hg
  - Severe Hypertension: SBP ≥160 mm Hg and/or DBP ≥110 mm Hg

- **Diagnostic cut-offs for elevated out of office blood pressure based on ambulatory or home monitoring have not been established in pregnancy**

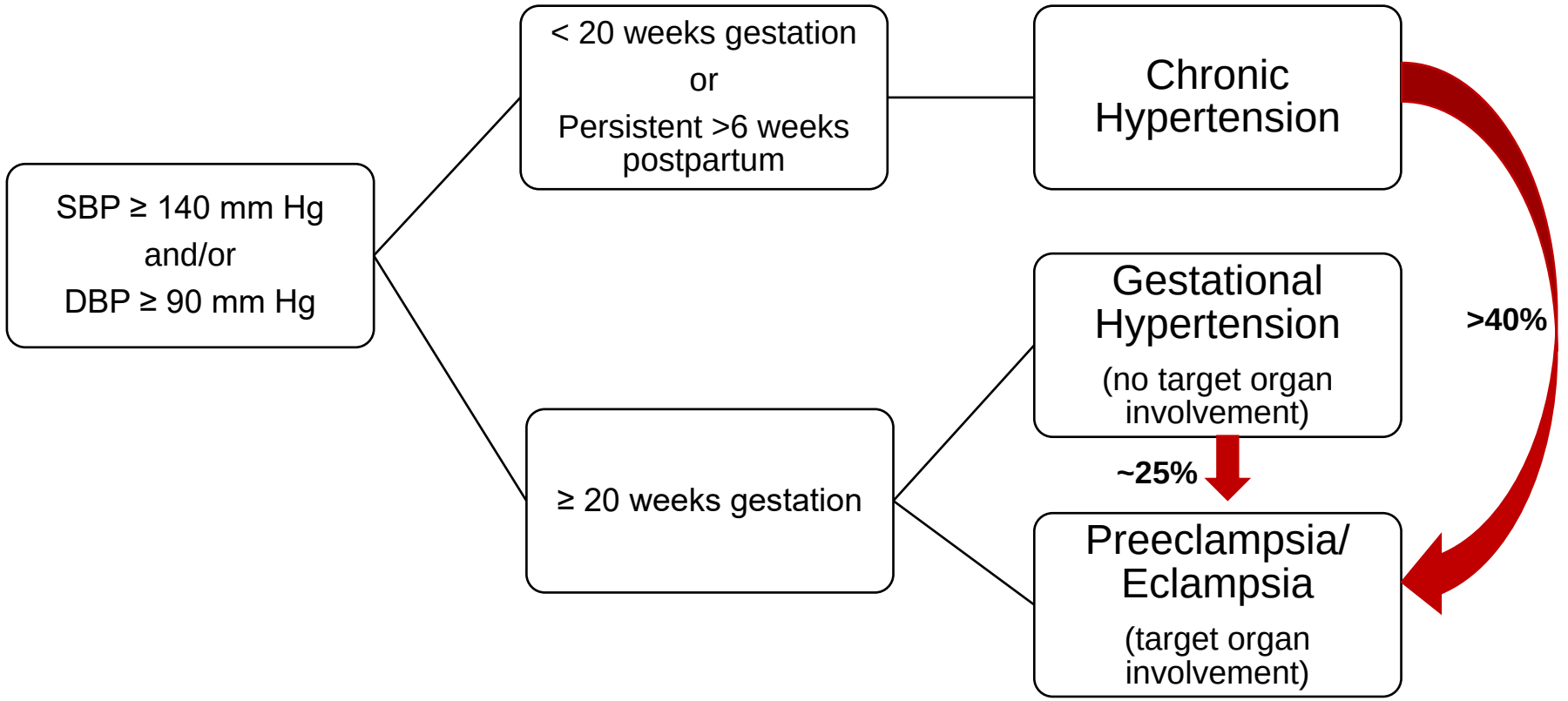
HYPERTENSIVE DISORDERS OF PREGNANCY–DIAGNOSTIC CRITERIA

- Chronic hypertension
  - SBP ≥140 mm Hg and/or DBP ≥90 mm Hg
  - < 20 weeks gestation or persistent >6 weeks postpartum

- Gestational hypertension (no target organ damage)
  - SBP ≥140 mm Hg and/or DBP ≥90 mm Hg
  - ≥ 20 weeks gestation

- Preeclampsia/eclampsia (with target organ damage)
  - SBP ≥140 mm Hg and/or DBP ≥90 mm Hg
  - ≥ 20 weeks gestation

HYPERTENSIVE DISORDERS OF PREGNANCY



Used with permission from Dr. Natalie Bello, Cedars Sinai

ACOG Practice Bulletin Nos. 202 and 203. Jan 2019; USPSTF. Sept 2021

BLOOD PRESSURE MANAGEMENT DURING PREGNANCY– ACC/AHA

- ACC/AHA BP guideline does not provides specific recommendations for treatment
  - References the American College of Obstetricians and Gynecologists (ACOG) for treatment recommendations

Recommendations for Treatment of Hypertension in Pregnancy References that support recommendations are summarized in Online Data Supplement 53.		
COR	**LOE**	**Recommendations**
I	C-LD	1. Women with hypertension who become pregnant, or are planning to become pregnant, should be transitioned to methyldopa, nifedipine, and/or labetalol (1) during pregnancy (2-6).
III: Harm	C-LD	2. Women with hypertension who become pregnant should not be treated with ACE inhibitors, ARBs, or direct renin inhibitors (4-6).

American Heart Association

BLOOD PRESSURE MANAGEMENT DURING PREGNANCY– ACOG

	Chronic HTN*	Gestational HTN	Preeclampsia
Start/ Titrate	<140/90	SBP ≥ 160 mm Hg or DBP ≥ 110 mm Hg	
Goal	???	< 160/110 mm Hg	

- Weight loss and extremely low sodium diets not recommended for BP management in pregnancy
- Moderate exercise OK
- In the setting of comorbidities or kidney disease, treating to a lower threshold can be considered

ACOG Practice Advisory April 2022. ACOG Practice Bulletin 222 Obstet Gynecol 2020.

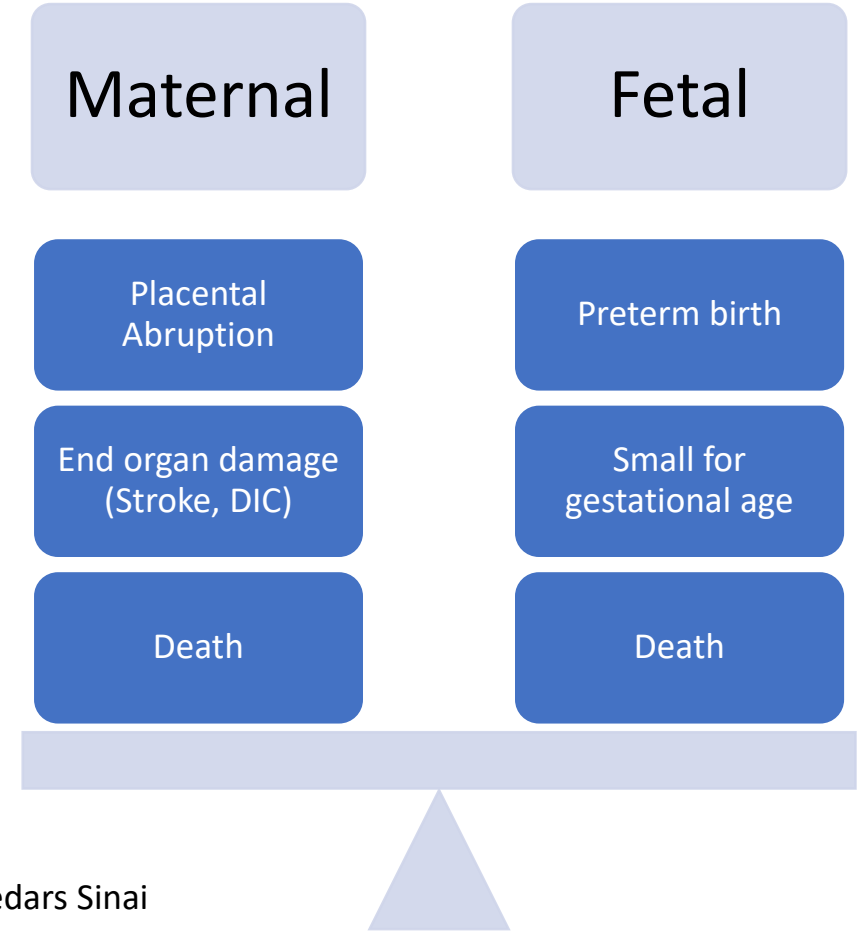
INTERNATIONAL GUIDELINES– LACK OF CONSENSUS

Table 4. Summary and Key Features of Published Guidelines for the Diagnosis and Treatment of HDP

Guideline		Hypertension in pregnancy diagnosis*	Treatment threshold, mm Hg	Treatment target, mm Hg	Continuation of antihypertensive therapy
Guideline		**Preeclampsia diagnosis§**	**Superimposed preeclampsia on chronic hypertension diagnosis§**	**Treatment threshold, mm Hg**	**Treatment target, mm Hg**
ACOG	2019[2]		Chronic hypertension+sudden change in preeclampsia diagnostic parameters	≥160/110[2]	Not specified
National Institute for Health and Care Excellence	2019[144]	Symptoms include utero-placental dysfunction‖	Not specified	≥140/90	≤135/85
Society of Obstetricians and Gynaecologists, Canada	2014[145]2018[149]	Symptoms include ≥1 severe complications	≥20 wk of gestation+resistant hypertension+new or worsening proteinuria or ≥1 adverse conditions or severe complications of preeclampsia	≥140/90[149]	DBP, 85[149]
International Society for the Study of Hypertension in Pregnancy	2018[110]	Symptoms include utero-placental dysfunction‡	Chronic essential hypertension+≥1 sign of maternal organ dysfunction consistent with preeclampsia, or new-onset proteinuria in the setting of a rise in BP	≥140/90	110–140/85
European Society of Cardiology	2018[147]	Proteinuria necessary, only high suspicion if hypertension+abnormal biochemistry/symptomatic	Hypertension <20 wk of gestation+superimposed gestational hypertension+proteinuria	≥140/90	Not specified
Society of Obstetric Medicine of Australia and New Zealand	2014[148]	Symptoms include fetal growth restriction	Preexisting hypertension with proteinuria or ≥1 systemic features of preeclampsia	160/100 140–160/90–100, optional	Individual assessment
Society of Obstetric Medicine of Australia and New Zealand	2014[148]		≥160/100 ≥140/90, optional	Based on clinician assessment	Consider discontinuation if BP fall <20 wk of gestation

Hypertension. 2022;79:e21–e41.

TREATING HYPERTENSION: BALANCING RISK AND BENEFITS



Used with permission from Dr. Natalie Bello, Cedars Sinai

ORAL ANTIHYPERTENSIVE THERAPIES

Labetalol 100-200 mg BID, increase Q2-3d; max 2400 mg/24h
Nifedipine ER 30-60 mg QD, increase Q7-14d; max 120 mg/24h
Methyldopa 250 mg BID-TID, increase Q2d; max 3000 mg/24h

Hydralazine* 10mg QID, increase Q2-5d; max 200 mg/24h
HCTZ 12.5mg QD, increase Q 7-14d; max 50mg/24h

CONTRAINDICATED: ACEI/ARB, Renin Inhibitors, MRAs

**Hydralazine should not be used in isolation due to reflex tachycardia*

ACOG Practice Bulletin Nos. 203 and 222. Obstet Gynecol, 2019 and 2020.

ACC.22 LATE BREAKING CLINICAL TRIAL- CHAP

- 2408 women, open-label, multicenter, randomized control trial (70 US sites) examining the safety and efficacy of BP target <140/90 mm Hg compared to usual care (no treatment unless SBP ≥160 mm Hg or DBP ≥105 mm Hg)

- Primary Outcomes:
  - Composite of preeclampsia with severe features, medically indicated preterm birth at <35 weeks' gestation, placental abruption, or fetal or neonatal death

- Secondary Outcomes:
  - Composites of serious neonatal or maternal complications, preeclampsia, and preterm birth.

- Safety Outcome:
  - Small-for gestational age, birth weight <10th percentile for gestational age

CHAP TRIAL- ENROLLMENT CRITERIA

- Pregnant women with a known or new diagnosis of chronic hypertension and a viable singleton fetus before 23 weeks' gestation

- New chronic hypertension was defined as a SBP> 140 mm Hg, DBP >90 mm Hg or both on at least two occasions at least 4 hours apart before 20 weeks' gestation in patients without chronic hypertension

- Known chronic hypertension was confirmed by a documented elevation in BP and previous or current antihypertensive therapy

CHAP TRIAL- EXCLUSION CRITERIA

- Severe hypertension or a BP level requiring antihypertensive treatment with more than one medication (indicating the risk of severe hypertension)
- Known secondary hypertension
- Multiple fetuses
- Prespecified high-risk coexisting illnesses or complications that warrant treatment to lower BP target
- Obstetric conditions that increase fetal risk
- Contraindications to first-line antihypertensive drugs recommended for use in pregnant women

CHAP TRIAL- ANTIHYPERTENSIVE THERAPIES

- Treated with labetalol (61.7%) or nifedipine (35.7%) at randomization
- Other medications used include amlodipine, methyldopa, HCTZ, metoprolol

Table S4. Antihypertensive use at last blood pressure visit.

Antihypertensive	Active Treatment Group; On Meds (n=1047/1178)	Standard Treatment Group; On Meds (n=284/1163)	Active Treatment Group; Overall (n=1178)	Standard Treatment Group; Overall (n=1163)
Labetalol	662 (63.2%)	175 (61.6%)	662 (56.2%)	175 (15.1%)
Nifedipine	350 (33.4%)	87 (30.6%)	350 (29.7%)	87 (7.5%)
Almodipine	18 (1.7%)	5 (1.8%)	18 (1.5%)	5 (0.4%)
Methyldopa	5 (0.5%)	4 (1.4%)	5 (0.4%)	4 (0.3%)
HCTZ	3 (0.3%)	1 (0.4%)	3 (0.3%)	1 (0.1%)
Metoprolol	2 (0.2%)	4 (1.4%)	2 (0.2%)	4 (0.3%)
Other	2 (0.2%)	0 (0%)	2 (0.2%)	0 (0%)
Missing/Unknown	5 (0.5%)	8 (2.8%)	5 (0.4%)	8 (0.7%)
Not on Meds	-	-	131 (11.1%)	879 (75.6%)

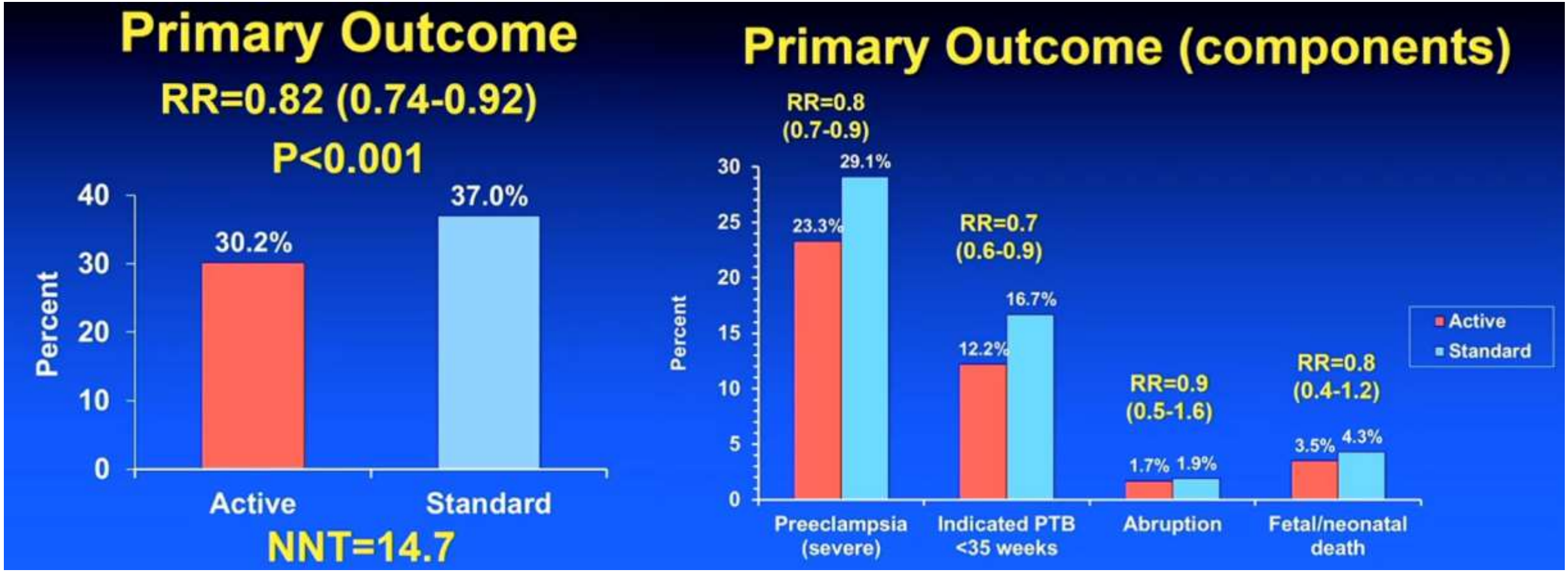
N Engl J Med 2022;386:1781-92.

CHAP TRIAL- BASELINE CHARACTERISTICS

Characteristic	Active Treatment (N=1208)	Control (N=1200)
Age — yr	32.3±5.6	32.3±5.8
Race or ethnic group — no. (%)†		
Non-Hispanic White	347 (28.7)	326 (27.2)
Non-Hispanic Black	574 (47.5)	570 (47.5)
Hispanic	238 (19.7)	250 (20.8)
Other	49 (4.1)	54 (4.5)
Mother's type of insurance — no. (%)		
Government-assisted insurance or Medicaid	673 (55.7)	656 (54.7)
Private insurance	459 (38.0)	463 (38.6)
None	60 (5.0)	65 (5.4)
Missing data	16 (1.3)	16 (1.3)
Type of chronic hypertension — no. (%)		
Newly diagnosed	263 (21.8)	258 (21.5)
Diagnosed and receiving medication	677 (56.0)	681 (56.8)
Diagnosed and not receiving medication	268 (22.2)	261 (21.8)
Blood pressure — mm Hg		
Systolic	134.3±12.7	133.7±12.4
Diastolic	83.9±9.5	83.4±9.6
Previous pregnancy — no. (%)	1007 (83.4)	989 (82.4)
Body-mass index‡		
Mean	37.7±10.0	37.5±9.6
Distribution — no. (%)		
<30	295 (24.4)	259 (21.6)
30 to <40	460 (38.1)	517 (43.1)
≥40	434 (35.9)	402 (33.5)
Gestational age <14 wk — no. (%)	496 (41.1)	481 (40.1)
Coexisting illness or lifestyle factor — no. (%)		
Diabetes mellitus	191 (15.8)	189 (15.8)
Current smoker	92 (7.6)	82 (6.8)
Aspirin use	539 (44.6)	536 (44.7)

N Engl J Med 2022;386:1781-92.

CHAP TRIAL RESULTS



Does not impair fetal growth

No other maternal or perinatal harm

N Engl J Med 2022;386:1781-92.

CHAP TRIAL- RESULTS

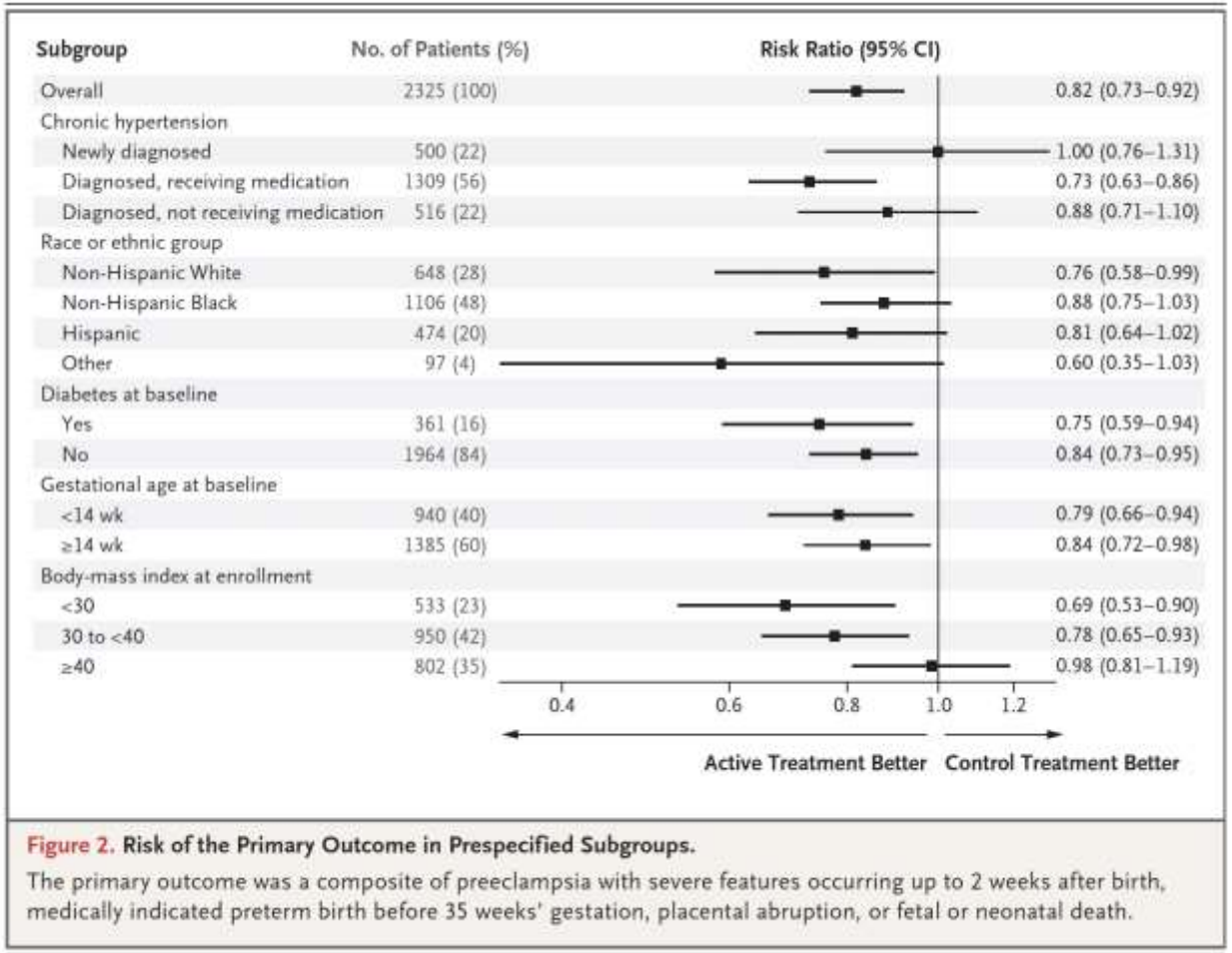


Figure 2. Risk of the Primary Outcome in Prespecified Subgroups.

The primary outcome was a composite of preeclampsia with severe features occurring up to 2 weeks after birth, medically indicated preterm birth before 35 weeks' gestation, placental abruption, or fetal or neonatal death.

Table 3. Maternal Outcomes.*

Outcome	Active Treatment (N=1208)	Control (N=1200)	Treatment Effect (95% CI)†
Composite cardiovascular complications — no. (%)	25 (2.1)	33 (2.8)	0.75 (0.45 to 1.26)
Maternal death	1 (0.1)	2 (0.2)	0.50 (0.05 to 5.47)
Heart failure	1 (0.1)	1 (0.1)	0.99 (0.06 to 15.9)
Stroke	0	0	NA
Myocardial infarction or angina	0	0	NA
Pulmonary edema	5 (0.4)	11 (0.9)	0.45 (0.16 to 1.30)
ICU admission or intubation	12 (1.0)	16 (1.3)	0.75 (0.35 to 1.57)
Encephalopathy	1 (0.1)	0	1.00 (1.00 to 1.00)
Renal failure	9 (0.8)	14 (1.2)	0.64 (0.28 to 1.47)
Severe hypertension — no. (%)	436 (36.1)	531 (44.3)	0.82 (0.74 to 0.90)
Any preeclampsia — no. (%)	295 (24.4)	373 (31.1)	0.79 (0.69 to 0.89)
Severe hypertension plus proteinuria	189 (15.7)	215 (17.9)	0.87 (0.73 to 1.04)
Eclampsia	0	1 (0.1)	NA
HELLP	0	3 (0.3)	NA
Hypertension plus end-organ dysfunction	136 (11.3)	181 (15.1)	0.75 (0.61 to 0.92)
Nonsevere preeclampsia	23 (1.9)	37 (3.1)	0.62 (0.37 to 1.03)
Worsening chronic hypertension — no. (%)	132 (10.9)	156 (13.0)	0.84 (0.68 to 1.04)
Mean blood pressure during prenatal visits — mm Hg‡			
Systolic	129.5±10.0	132.6±10.1	−3.11 (−3.95 to 2.28)
Diastolic	79.1±7.4	81.5±8.0	−2.33 (−2.97 to 0.04)
Gestational age at delivery — wk§	36.6±4.3	36.3±5.1	0.24 (−0.15 to 0.62)
Cesarean delivery — no. (%)	592 (49.0)	582 (48.5)	1.01 (0.93 to 1.10)
Any blood transfusion — no. (%)	46 (3.8)	53 (4.4)	0.86 (0.59 to 1.27)

N Engl J Med 2022;386:1781-92.

CHAP TRIAL LIMITATIONS

- Open-label design
- High screening ratio (12:1)
  - Generalizability?
- Small study (low event rates overall)
- *Lack of Asians in trial- do results apply?*

ACOG- NEW BP RECOMMENDATIONS

Based on these findings, **ACOG recommends utilizing 140/90 as the threshold for initiation or titration of medical therapy for chronic hypertension in pregnancy, rather than the previously recommended threshold of 160/110** [2].

PREECLAMPSIA

- Complication in approximately 4% of pregnancies in the US
  - Contributes to both maternal and infant morbidity and mortality
  - Accounts for 6% of preterm births and 19% of medically indicated preterm births in the USO
  - Occurs in up to 40% of women with chronic hypertension and 25% with gestational hypertension

- Severe hypertension/pre-eclampsia is a **medical emergency** and requires prompt recognition and treatment
  - If occurs during pregnancy, early delivery may be indicated

SIMILAR RATES OF PREECLAMPSIA IN INDIA

Hypertension type	India (*N* = 6,149)	Pakistan (*N* = 10,904)	Mozambique (*N* = 4,253)	Nigeria (*N* = 7,114)	*p*-Value[†]
Chronic hypertension (without pre-eclampsia)	39 (0.6%)	40 (0.4%)	14 (0.3%)	30 (0.4%)	0.047
Gestational hypertension (without pre-eclampsia)	464 (7.5%)	753 (6.9%)	497 (11.7%)	441 (6.2%)	<0.001
Pre-eclampsia (including eclampsia)	353 (5.7%)	468 (4.3%)	198 (4.7%)	235 (3.3%)	<0.001
From chronic hypertension	15/54 (27.8%)	25/65 (38.5%)	2/16 (12.5%)	2/32 (6.3%)	
From gestational hypertension	74/372 (19.9%)	129/690 (18.7%)	56/349 (16.1%)	34/475 (7.2%)	
Eclampsia	17 (0.3%)	13 (0.1%)	15 (0.4%)	3 (0.0%)	<0.001
Hypertension type uncertain	7 (0.1%)	4 (0.04%)	4 (0.1%)	16 (0.2%)	
Overall estimate of pregnancy hypertension	863 (14.0%)	1,265 (11.6%)	713 (16.8%)	722 (10.2%)	<0.001

Data are number (%) of pregnancies.

*Trial surveillance data were not available for Nigeria.

†The *p*-value was based on comparisons of all groups by chi-squared test for categorical variables.

POM, Pre-eclampsia Integrated Estimate of Risk on the Move.

https://doi.org/10.1371/journal.pmed.1002783.t004

PREECLAMPSIA: DIAGNOSTIC CRITERIA

Blood pressure	• Greater than or equal to 140 mm Hg systolic or greater than or equal to 90 mm Hg diastolic on two occasions at least 4 hours apart after 20 weeks of gestation in a woman with a previously normal blood pressure • Greater than or equal to 160 mm Hg systolic or greater than or equal to 110 mm Hg diastolic, hypertension can be confirmed within a short interval (minutes) to facilitate timely antihypertensive therapy
and	
Proteinuria	• Greater than or equal to 300 mg per 24-hour urine collection (or this amount extrapolated from a timed collection) or • Protein/creatinine ratio greater than or equal to 0.3* • Dipstick reading of 1+ (used only if other quantitative methods not available)
Or in the absence of proteinuria, new-onset hypertension with the new onset of any of the following:	
Thrombocytopenia	• Platelet count less than 100,000/microliter
Renal insufficiency	• Serum creatinine concentrations greater than 1.1 mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease
Impaired liver function	• Elevated blood concentrations of liver transaminases to twice normal concentration
Pulmonary edema	
Cerebral or visual symptoms	

*Each measured as mg/dL.

Severe feature

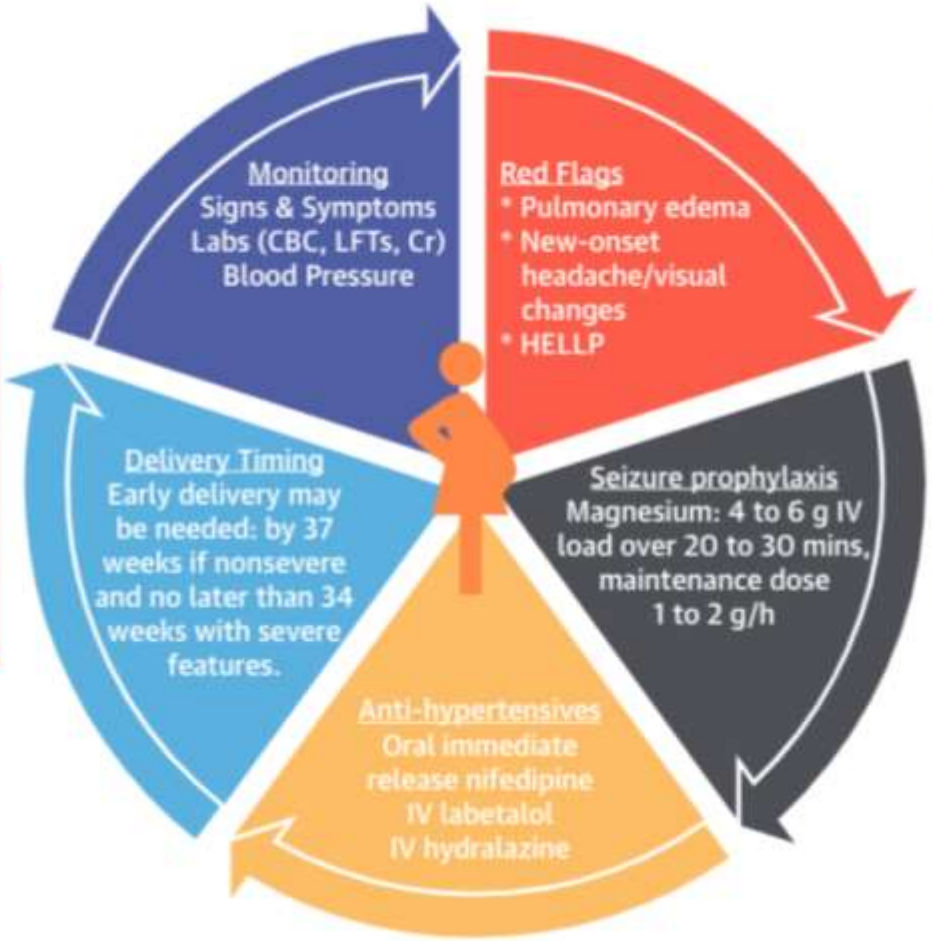
Severe features

Used with permission from Dr. Natalie Bello, Cedars Sinai

ACOG *Hypertension in Pregnancy* 2013.

MANAGEMENT OF SEVERE HTN AND PREECLAMPSIA

Severe Features of Pre-eclampsia
- BP ≥160 and/or 110 mm Hg
- Thrombocytopenia (<100 × 10^9/L)
- LFTs >2× ULN or Persistent RUQ/epigastric pain
- Renal Insufficiency
- Pulmonary Edema
- New headache
- Visual disturbances



Diagnostic Criteria for HELLP
LDH ≥600 IU/l
AST and ALT >2× ULN
Platelets <100 × 10^9/l

mg Concentration (mg/dl)	Clinical Effect
5-9	Therapeutic range
>9	Loss of reflexes
>12	Respiratory paralysis
>30	Cardiac arrest

Davis, Arendt, Bello, et al. J Am Coll Cardiol. 2021;77:1763-77.

BP CONTROL FOR SEVERE HYPERTENSION

- Labetalol
  - 10-20 mg IV, then 20-80mg IV Q 20-30 min to max 300mg or 1-2 mg/min IV gtt
- Nifedipine (immediate release)
  - 10-20 mg PO repeat x1 in 30 min, then 10-20 mg Q2-6h
- Hydralazine
  - 5 mg IV or IM, then 5-10 mg IV Q 20-40min or 0.5-10 mg/h IV gtt
- Nitro gtt
  - Can be used for pulmonary edema
- Magnesium sulfate
  - Prevent eclampsia and treat seizures in women with severe preeclampsia or eclampsia

ASPIRIN CAN PREVENT PREECLAMPSIA

Risk level	Risk factors	Recommendation
High[b]	• History of preeclampsia, especially when accompanied by an adverse outcome • Multifetal gestation • Chronic hypertension • Pregestational type 1 or 2 diabetes • Kidney disease • Autoimmune disease (ie, systemic lupus erythematous, antiphospholipid syndrome) • Combinations of multiple moderate-risk factors	Recommend low-dose aspirin if the patient has ≥1 of these high-risk factors
Moderate[c]	• Nulliparity • Obesity (ie, body mass index >30) • Family history of preeclampsia (ie, mother or sister) • Black persons (due to social, rather than biological, factors)[d] • Lower income[d] • Age 35 years or older • Personal history factors (eg, low birth weight or small for gestational age, previous adverse pregnancy outcome, >10-year pregnancy interval) • In vitro conception	Recommend low-dose aspirin if the patient has ≥2 moderate-risk factors Consider low-dose aspirin if the patient has 1 of these moderate-risk factors[d]
Low	Prior uncomplicated term delivery and absence of risk factors	Do not recommend low-dose aspirin

JAMA 2021;326:1186-1191.

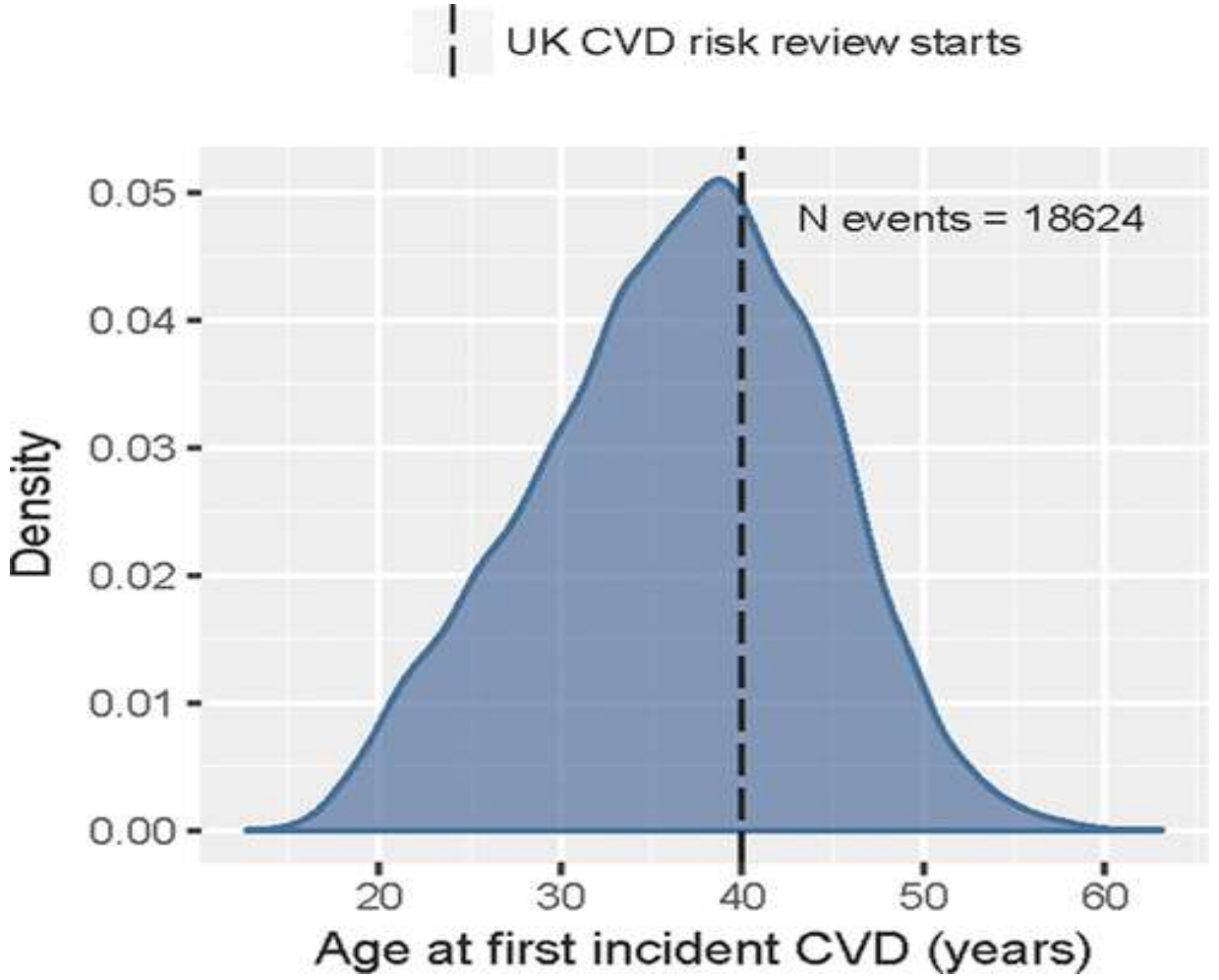
LONG TERM RISKS ASSOCIATED WITH HDP

- HDP are associated with increased risk of hypertension and overt ASCVD

- Women with history of gestational HTN and preeclampsia have >2x higher risk of developing chronic HTN in 1-5 years compared to normotensives (Elfassi, Bello, et al, AHA HTN 2020)

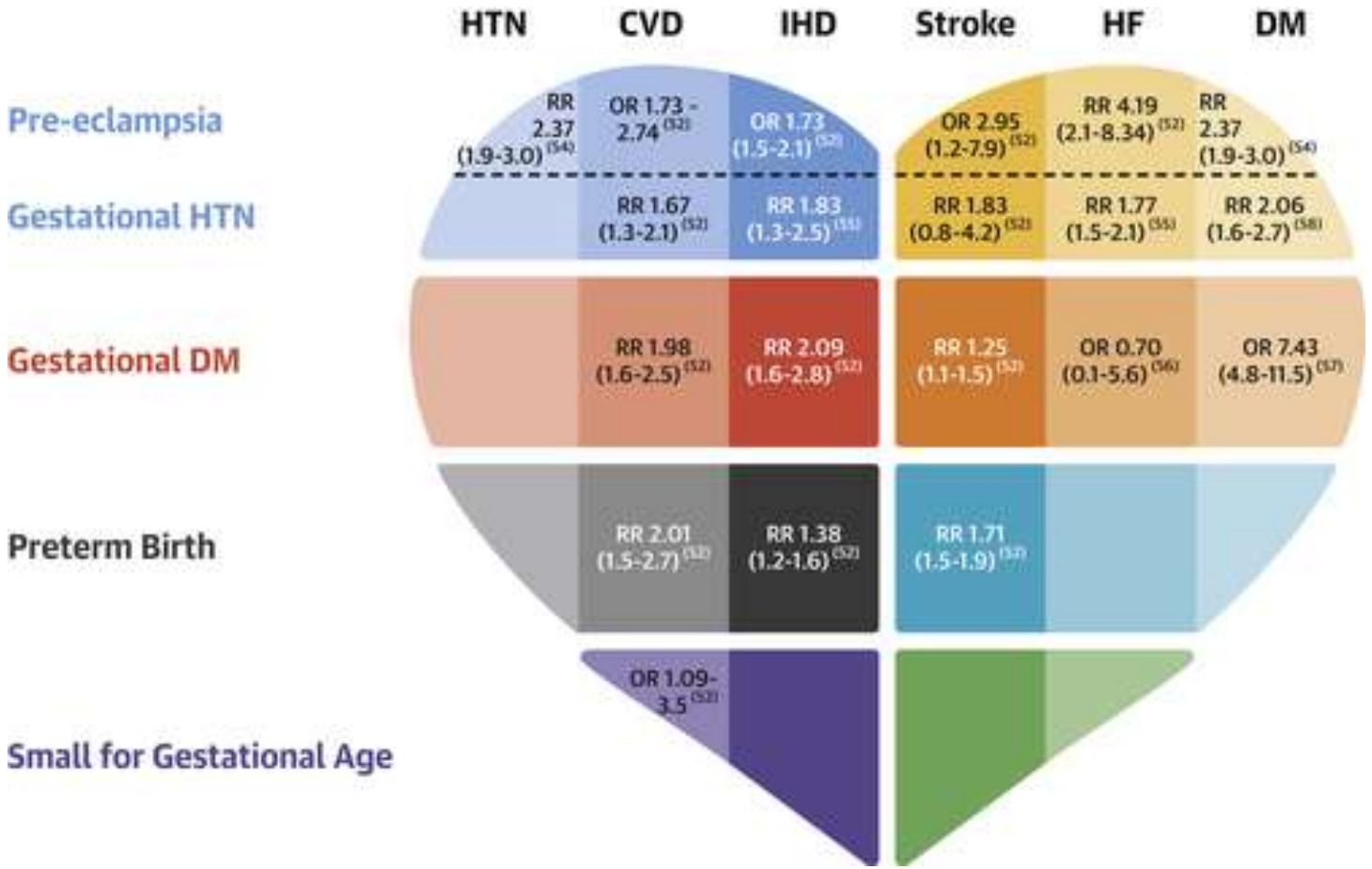
- HDP associated with earlier onset of ASCVD and is a risk enhancer in CVD prevention guidelines

CVD OCCURS EARLY AFTER PREECLAMPSIA



Leon L et al, Circulation. 2019;140:1050-1060.

ADVERSE PREGNANCY OUTCOMES/HYPERTENSION AND FUTURE CARDIOMETABOLIC RISKS



Davis, Arendt, Bello, et al. J Am Coll Cardiol. 2021;77:1763-77.

ACC/AHA 2019 PREVENTION GUIDELINE

- Includes risk enhancers for refinement of ASCVD risk
- Pregnancy-associated conditions included (preeclampsia) as risk enhancers
- Need to obtain comprehensive pregnancy history for risk stratification

ACC/A

Risk-Enhancing Factors

- **Family history of premature ASCVD** (males, age <55 y; females, age <65 y)
- **Primary hypercholesterolemia** (LDL-C 160–189 mg/dL [4.1–4.8 mmol/L]; non–HDL-C 190–219 mg/dL [4.9–5.6 mmol/L])*
- **Metabolic syndrome** (increased waist circumference [by ethnically appropriate cutpoints], elevated triglycerides [>150 mg/dL, nonfasting], elevated blood pressure, elevated glucose, and low HDL-C [<40 mg/dL in men; <50 mg/dL in women] are factors; a tally of 3 makes the diagnosis)
- **Chronic kidney disease** (eGFR 15–59 mL/min/1.73 m^2 with or without albuminuria; not treated with dialysis or kidney transplantation)
- **Chronic inflammatory conditions,** such as psoriasis, RA, lupus, or HIV/AIDS
- **History of premature menopause (before age 40 y) and history of pregnancy-associated conditions that increase later ASCVD risk, such as preeclampsia**
- **High-risk race/ethnicity** (e.g., South Asian ancestry)
- **Lipids/biomarkers**: associated with increased ASCVD risk
  - Persistently elevated* primary hypertriglyceridemia (≥175 mg/dL, nonfasting);
  - If measured:
    - **Elevated high-sensitivity C-reactive protein** (≥2.0 mg/L)
    - **Elevated Lp(a):** A relative indication for its measurement is family history of premature ASCVD. An Lp(a) ≥50 mg/dL or ≥125 nmol/L constitutes a risk-enhancing factor, especially at higher levels of Lp(a).
    - **Elevated apoB** (≥130 mg/dL): A relative indication for its measurement would be triglyceride ≥200 mg/dL. A level ≥130 mg/dL corresponds to an LDL-C >160 mg/dL and constitutes a risk-enhancing factor
    - **ABI** (<0.9)

*Optimally, 3 determinations.

nett et al. Circulation. 2019.

CASE #1:

- 34 year old woman (G1P0) with no significant past medical history is 27 weeks pregnant and comes to your office for pre-term care. Her BP during her past 3 office visits have been 142/92 mm Hg, 145/88 mm Hg, and 149/83 mm Hg. She is asymptomatic, fetal checks have been normal.

- Current Meds: Prenatal vitamin

- Exam: Well appearing, no distress
  - BP 144/93 mm Hg (on recheck 146/88 mm Hg)
  - Physical exam is unremarkable

- Labs: CBC, BMP. LFTs are normal. U/A negative for protein

BASED ON CURRENT GUIDELINES YOU RECOMMEND:

A. Monitor blood pressures at home, treat if BP>160/110 mm Hg

B. 24 hour ambulatory blood pressure monitor to assess BPs

C. Give aspirin to prevent preeclampsia

D. Start antihypertensive therapy with target BP <140/90 mm Hg

CASE #2:

- 32 year old woman (G2P1) with past medical history significant for preeclampsia, class I obesity presents to your clinic for routine prenatal visit. She is 23 weeks pregnant, prenatal care has been unremarkable (normal milestones for baby). BPs in the clinic have been running in the 130s/80s mm Hg on previous visits. Overall she feels well.

- Current Meds:
  - Prenatal vitamins

- Exam:
  - Well appearing woman in no distress
  - VS: BP 134/84 mm Hg, recheck 138/88 mm Hg
  - PE: Unremarkable

BASED ON CURRENT GUIDELINES YOU RECOMMEND:

A. Monitor blood pressures at home, treat if BP>160/110 mm Hg

B. 24 hour ambulatory blood pressure monitor to assess BPs

C. Give aspirin to prevent preeclampsia

D. Start antihypertensive therapy with target BP <130/80 mm Hg

TAKE HOME POINTS

- Hypertension is common during pregnancy and if untreated can be associated with significant morbidity and mortality
- Hypertension during pregnancy is defined as BP>140/90 mm Hg
  - New treatment threshold is BP>140/90 mm Hg (ACOG)
- Results of CHAP Trial indicate more aggressive BP lowering may reduce adverse maternal and fetal outcomes without greater risks to mother or baby
- First line antihypertensive therapies for pregnancy are labetalol and nifedipine

TAKE HOME POINTS

- Preeclampsia is a medical emergency that requires prompt intervention
  - Pregnancy related disorders are associated with increased CVD risk

- Low dose aspirin can prevent preeclampsia and other pregnancy related disorders (preterm birth, growth restriction, perinatal mortality) in moderate-high risk women

- Pregnancy associated conditions should be included for ASCVD risk stratification and a complete pregnancy history should be obtained

ACKNOWLEDGEMENT

- Special thanks to Dr. Natalie Bello, Cedars-Sinai Hospital, for providing use of her slides for this talk

THANKS!

Eugene Yang, MD, MS, FACC

Email: eyang01@uw.edu

Website: http://wwww.uwmedicine.org/bios/eugene-yang