# NHBPEP Report on High Blood Pressure in Pregnancy: A Summary for Family Physicians

MARK A. ZAMORSKI, M.D., M.H.S.A., and LEE A. GREEN, M.D., M.P.H.
University of Michigan Medical School, Ann Arbor, Michigan

**The National High Blood Pressure Education Program's Working Group on High Blood Pressure in Pregnancy recently issued a report implicating hypertension as a complication in 6 to 8 percent of pregnancies. Hypertension in pregnancy is related to one of four conditions: (1) chronic hypertension that predates pregnancy; (2) preeclampsia-eclampsia, a serious, systemic syndrome of elevated blood pressure, proteinuria and other findings; (3) chronic hypertension with superimposed preeclampsia; and (4) gestational hypertension, or nonproteinuric hypertension of pregnancy. Edema is no longer a criterion for preeclampsia, and the definition of blood pressure elevation is 140/90 mm Hg or higher. Patients with gestational hypertension have previously unrecognized chronic hypertension, emerging preeclampsia or transient hypertension of pregnancy, an obstetrically benign condition. Because distinguishing among these conditions can be done only in retrospect, clinical management of gestational hypertension consists of repeated evaluations to look for signs of emerging preeclampsia. Women with chronic hypertension should be followed for evidence of fetal growth restriction or superimposed preeclampsia. Management options for chronic hypertension in most women include discontinuing antihypertensive medications during pregnancy, switching to methyldopa or continuing previous antihypertensive therapy. (Am Fam Physician 2001;64:263-70,273-4.)**

*A patient information handout on hypertension in pregnancy, written by the authors of this article, is provided on page 273.*

***See editorial on page 225.***

Hypertensive disorders complicate 6 to 8 percent of pregnancies and are a leading cause of maternal and fetal morbidity and mortality.[1] Important advances in knowledge in this field and the diverse opinions promulgated by different groups[1–4] led the National Heart, Lung, and Blood Institute to establish a Working Group on high blood pressure in pregnancy. The group included broad representation, including the American Academy of Family Physicians. This article summarizes the group's findings,[5] focusing on issues of greatest interest to family physicians.

*The diagnostic criterion for elevated blood pressure in preeclampsia is ≥ 140 mm Hg systolic pressure or ≥ 90 mm Hg diastolic pressure as opposed to a change in blood pressure.*

## Classification

The Working Group identified four hypertensive disorders of pregnancy: chronic hypertension, in which blood pressure elevation is documented before the 20th week of pregnancy; preeclampsia-eclampsia, a syndrome peculiar to pregnancy characterized clinically by hypertension and proteinuria; preeclampsia superimposed on chronic hypertension; and gestational hypertension, and nonproteinuric hypertension that develops in the latter half of pregnancy.[5]

This scheme and the criteria for each category differ importantly from older diagnostic schemes[6] and the current schemes of other groups.[1,2,4] Key features of the preeclampsia category include: (1) elimination of a change in blood pressure as a diagnostic criterion (the group recommends using the familiar cut-off of 140/90 mm Hg instead); (2) elimination of edema as a criterion, because this

finding is so common in healthy pregnant women; and (3) absolute requirement of proteinuria (more than 300 mg per 24 hours [0.3 g per day]) for the diagnosis. The gestational hypertension category is used in women with nonproteinuric hypertension of pregnancy, in which the pathophysiologic perturbations of the preeclampsia syndrome do not develop before delivery.

## Pathophysiology

Preeclampsia is characterized by widespread physiologic changes, including vasospasm, activation of the coagulation system and disturbances in the humoral and autocoid systems.[5] These changes result in ischemic changes in the placenta, kidney, liver and brain, as well as a risk for bleeding complications. The hypertension of preeclampsia can contribute to immediate consequences, such as cerebral hemorrhage; however, it is principally considered a diagnostic sign of the perturbed physiology, because serious maternal or fetal complications can occur even if the blood pressure elevation is mild. Although the specific mechanism of eclamptic seizures is not known, these seizures appear to be the result of more than simple hypertensive encephalopathy. Preeclampsia may be associated with a number of laboratory findings *(Table 1)*.[5]

## Differential Diagnosis

Women who are first noted to be hypertensive in the second half of pregnancy present a sizable diagnostic challenge.[5] This group may be divided into three diagnostic categories: (1) women with previously undiagnosed chronic hypertension who present late for prenatal care; (2) women with mild preeclampsia who have not yet developed noticeable pathophysiologic perturbations; and (3) women with transient hypertension of pregnancy, in whom the derangements of preeclampsia will not develop and whose blood pressure will normalize by

TABLE 1
**Women Who Develop Hypertension After Midpregnancy: Laboratory Evaluation and Rationale**

| *Evaluation* | *Rationale* |
|---|---|
| Hemoglobin and hematocrit | Hemoconcentration supports diagnosis of preeclampsia and is an indicator of severity. Values may be decreased, however, if hemolysis accompanies the disease. |
| Platelet count | Thrombocytopenia $<100 \times 10^3$ per μL ($100 \times 10^9$ per L) suggests severe preeclampsia. |
| Quantification of protein excretion | Pregnancy hypertension with proteinuria should be considered preeclampsia (pure or superimposed) until proved otherwise. |
| Serum creatinine | Abnormal or rising levels, especially when associated with oliguria, suggest severe preeclampsia. |
| Serum uric acid | Increased levels suggest the diagnosis of preeclampsia. |
| Serum transaminase | Rising values suggest severe preeclampsia with hepatic involvement. |
| Serum albumin, lactic acid dehydrogenase (LDH), blood smear and coagulation profile | In women with severe disease, these values indicate extent of endothelial leak (albumin), presence of hemolysis (LDH increase, schistocytosis, spherocytosis) and possible coagulopathy. |

*Adapted with permission from Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Am J Obstet Gynecol 2000;183(1):S1-22.*

TABLE 2
**Baseline Laboratory Studies for Women at High Risk for Preeclampsia**

| |
|---|
| Hemoglobin |
| Hematocrit |
| Platelet count |
| Serum creatinine |
| Serum uric acid |
| 24-hour collection for urine protein (if random dipstick measurements are 1+ or greater) |
| Sonographic determination of gestational age as early as possible in pregnancy (if conditions for clinical dating are not optimal)* |

**—Baseline sonography for evaluating fetal growth at 25 to 28 weeks' gestation should be considered.*

*Information from Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Am J Obstet Gynecol 2000;183(1):S1-22.*

12 weeks postpartum. Transient hypertension is always a retrospective diagnosis.[5]

The Working Group has intentionally chosen a strict definition of preeclampsia: proteinuric hypertension that develops late in pregnancy. The group advises that the diagnosis is "highly suspect" in hypertensive patients without proteinuria if they have headache, blurred vision, abdominal pain or abnormal laboratory results such as low platelet counts and abnormal liver enzyme levels.[5] Because of the serious nature of preeclampsia and the difficulties in its diagnosis, the report recommends that clinicians maintain a high degree of suspicion. The report also recommends obtaining the baseline laboratory studies shown in *Table 2* in early pregnancy for women at the highest risk for preeclampsia *(Table 3)*.[5]

## Chronic Hypertension in Pregnancy

### PREPREGNANCY COUNSELING

Because target organ damage, especially renal disease, can progress during pregnancy, assessment for ventricular hypertrophy, retinopathy and renal disease should be considered in women with a history of hypertension for more than several years.[5] Women should be informed of the sizable (25 percent) risk of superimposed preeclampsia[5] and its attendant risks, particularly preterm delivery.

*Medications might safely be withheld in hypertensive patients without target organ damage and with blood pressure less than 150 to 160 mm Hg systolic and 100 to 110 diastolic.*

### TREATMENT

Most hypertensive women of childbearing age have stage I or II hypertension (systolic blood pressure of 140 to 179 mm Hg or diastolic blood pressure of 90 to 109 mm Hg) without target organ damage, in which the risk for acute cardiovascular consequences during pregnancy is very low.[5,7] Improved maternal or neonatal outcomes with antihypertensive therapy have not been documented in this group.[8,9] Accordingly, the Working Group advises that antihypertensive medication might be safely withheld in such

TABLE 3
**Factors Putting Patients at High Risk for Preeclampsia**

| |
|---|
| History of increased blood pressure before conception or in a previous gestation, especially before week 34 or when the patient is multiparous |
| Pregestational diabetes |
| Collagen vascular disease |
| Underlying renal vascular or renal parenchymal disease |
| Multi-fetus pregnancy |

*Information from Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Am J Obstet Gynecol 2000;183(1):S1-22.*

*Fetal surveillance in the pregnancy complicated by preeclampsia should consist of daily fetal movement counts and periodic fetal NST and BPP.*

patients, provided that blood pressure remains less than 150 to 160 mm Hg systolic and 100 to 110 diastolic while the patient is off medications.[5] Continuing previous antihypertensive medication is another option, although angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers should not be used during pregnancy.[5] Because methyldopa (Aldomet) has the longest track record of safety in pregnancy,[10,11] it is preferred by many clinicians.[5]

#### RECOGNITION OF SUPERIMPOSED PREECLAMPSIA

The recognition of preeclampsia superimposed on chronic hypertension is challenging.[5] In addition to suspecting the condition if preeclamptic symptoms or laboratory abnormalities develop, superimposition should be suspected when any one of the following is present: (1) blood pressure elevations are severe (greater than 160/110 mm Hg); (2) heavy proteinuria (more than 2,000 mg per 24 hours [2 g per day]) develops or proteinuria abruptly worsens; (3) blood pressure suddenly increases after a period of good control; or (4) serum creatinine increases to more than 1.2 mg per dL (110 μmol per L).[5]

#### FETAL ASSESSMENT IN CHRONIC HYPERTENSION

Antepartum fetal assessment is used to facilitate early recognition of fetal compromise related to the development of superimposed preeclampsia.[5] If such suspicion is absent, specific fetal assessment is less essential. Initial sonography should be performed at 18 to 20 weeks' gestation. Further fetal growth can usually be monitored by using fundal height measurements, but if maternal obesity or other factors render this measurement inaccurate, repeat sonograms should be obtained monthly starting at 28 to 32 weeks' gestation. If growth restriction or preeclampsia is documented or suspected, the fetal nonstress test (NST) or a biophysical profile (BPP) is indicated.

#### POSTPARTUM MANAGEMENT

Antihypertensive medication may be required if blood pressure elevation persists postpartum.[5] In women who were not previously known to be hypertensive, a trial off medication for three to four weeks after delivery is reasonable. Little information is available on the effects of antihypertensive medication during lactation. For this reason, withholding antihypertensive medications for several months is acceptable in most patients with stage I and, perhaps, stage II hypertension.

## Preeclampsia-Eclampsia

#### PREVENTION

Despite initial enthusiasm for the use of calcium supplements[12] and low-dose aspirin therapy,[13] these agents appear to be ineffective, at least in women in the United States.[5,14]

#### FETAL ASSESSMENT

The definitive treatment for preeclampsia is delivery of the fetus.[5] Although this is always appropriate therapy for the mother, it may not


## The Authors

MARK A. ZAMORSKI, M.D., M.H.S.A., is clinical assistant professor of family medicine at the University of Michigan Medical School, Ann Arbor. A graduate of Michigan State University's College of Human Medicine, East Lansing, he completed a residency in family practice at the University of Michigan. He also earned a master's degree in health services administration from the University of Michigan School of Public Health, Ann Arbor. Dr. Zamorski is medical editor for online CME cases in *American Family Physician*.

LEE A. GREEN, M.D., M.P.H., is associate professor and assistant chair for research in the Department of Family Medicine at the University of Michigan Medical School and co-directs the Michigan Consortium for Family Practice Research, which is sponsored by the American Academy of Family Physicians (AAFP). He serves on the AAFP's Commission on Clinical Policies and Research and represents the AAFP on the National High Blood Pressure Education Program Coordinating Committee. He is an author of the sixth report of the Joint National Committee and the Working Group Report on High Blood Pressure in Pregnancy.

*Address correspondence to Mark A. Zamorski, M.D., M.H.S.A., Department of Family Medicine, University of Michigan Medical School, 4260 Plymouth Rd., Ann Arbor, MI 48109-2702 (e-mail: zamorski@umich.edu). Reprints are not available from the authors.*

TABLE 4
**Fetal Monitoring in Gestational Hypertension and Preeclampsia**

| |
|---|
| Gestational hypertension (hypertension only, without proteinuria, normal laboratory testing and absent symptoms) |
| Estimation of fetal growth and amniotic fluid status at time of diagnosis; if normal, repeat testing only if there is significant change in maternal condition. |
| NST at time of diagnosis. If nonreactive, perform a biophysical profile BPP; if BPP ≥ 8 or NST is reactive, repeat testing only if there is a significant change in maternal condition |
| Mild preeclampsia (mild hypertension, normal platelet count, liver enzymes and absent maternal symptoms) |
| Estimation of fetal growth and amniotic fluid status at time of diagnosis; if normal, repeat testing every three weeks |
| NST and/or BPP at time of diagnosis; if NST is reactive or if BPP ≥ 8, repeat weekly. Testing should be repeated immediately if there is an abrupt change in maternal condition. |
| If estimated fetal weight by ultrasonography is <10th percentile for gestational age or if there is oligohydramnios (amniotic fluid index ≤ 5 cm), testing should be performed at least twice weekly |

*NST = nonstress test; BPP = biophysical profile.*

*Adapted with permission from Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Am J Obstet Gynecol 2000;183(1):S1-22.*

be so for the fetus. Fetal surveillance in a pregnancy complicated by preeclampsia should consist of daily fetal movement counts and periodic fetal NST and BPP.[5] Weekly or biweekly testing is appropriate in most women, but daily testing is indicated in women with severe disease. Details of fetal assessment are shown in *Table 4*.[5] If the results will affect clinical decision making, amniocentesis for fetal lung maturity can be performed.[5]

#### MATERNAL ASSESSMENT/ANTEPARTUM MANAGEMENT

The goals of maternal assessment are twofold: first, to recognize preeclampsia early, and second, to monitor the mother for evidence of disease progression that would mandate either delivery or more intensive fetal surveillance.[5] Once blood pressure elevation is documented during the second half of pregnancy, the patient should be assessed for symptoms of preeclampsia and laboratory evidence of the disease by checking the platelet count, liver enzyme levels and serum creatinine level, and by obtaining a 12- to 24-hour urine collection to check protein level. In the absence of severe preeclampsia, serum albumin and lactic acid dehydrogenase levels, blood smear and coagulation profile need not be checked.

Depending on the patient's clinical condition and the results of laboratory studies, the patient may be managed as an inpatient, in an intensive day-hospitalization program[15] (if available) or as an outpatient, possibly with home testing of blood pressure and urinary protein.[16] Patients managed as outpatients should be re-evaluated within one to three days. Laboratory studies and fetal surveillance should be followed at frequent intervals. The Working Group indicated that restriction of maternal activity was a "usual and reasonable practice," but it acknowledged that there was no evidence of efficacy. Evidence that antihypertensive therapy improves perinatal outcomes is also lacking.[8,17,18]

*Hypertension and other signs of preeclampsia should remit by 6 to 12 weeks' postpartum.*

#### TIMING AND ROUTE OF DELIVERY

Decisions about the timing of delivery hinge on whether the infant will fare better in utero or in the nursery, and whether the mother's condition will tolerate continued pregnancy. Proposed indications for delivery are presented in *Table 5*.[5] Even if the maternal and fetal conditions appear stable, all women with preeclampsia should be considered for delivery at 38 weeks' gestation if the cervix is favorable, and by 40 weeks if it is not. Delivery should be considered in women with severe preeclampsia after 32 to 34 weeks' gestation. Vaginal delivery is preferred and, if maternal and fetal conditions allow, labor induction should be carried out aggressively when the decision to deliver is made, even if the cervix is unripe.[5]

TABLE 5
**Indications for Delivery in Preeclampsia***

| |
|---|
| **Maternal indications** |
| Gestational age 38 weeks if cervix is favorable |
| Platelet count <100 × $10^3$ per µL (100 × $10^9$ per L) |
| Progressive deterioration in liver function |
| Progressive deterioration in renal function |
| Suspected abruptio placentae |
| Persistent severe headaches or visual changes |
| Persistent severe epigastric pain, nausea or vomiting |
| **Fetal indications** |
| Severe growth restriction |
| Nonreassuring fetal testing results |
| Oligohydramnios |

**—Delivery should be based on maternal and fetal conditions as well as gestational age.*

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#### INTRAPARTUM MANAGEMENT

Peripartum anticonvulsive therapy is clearly indicated to prevent recurrent seizures in a patient with eclampsia and the emergence of eclampsia in patients with severe preeclampsia.[5] Parenteral magnesium sulfate is the drug of choice for this purpose. While magnesium sulfate has also been administered to women with mild preeclampsia and gestational hypertension,[19,20] the Working Group considers that its benefits in these groups are uncertain. Intrapartum antihypertensive therapy *(Table 6)*[5] is indicated when sustained blood pressure elevations of 160 mm Hg systolic and/or at least 105 mm Hg diastolic are documented. The goal of blood pressure reduction in emergency situations should be a gradual reduction of blood pressure to the normal range.

#### POSTPARTUM COUNSELING AND FOLLOW-UP

Hypertension and other signs of preeclampsia should remit by six to 12 weeks' postpartum.[5] Women should be informed of the risk of recurrent preeclampsia and its consequences in future pregnancies. Risk factors for recurrence include onset before 30 weeks' gestation (up to 40 percent recurrence), black descent, having a different father from the previous gestation and previous preeclampsia as a multipara. Women with clear-cut, isolated preeclampsia-eclampsia do not appear to have an increased risk of future hypertension or cardiovascular disease, but women with transient hypertension or chronic hypertension do.

## Final Comment

Hypertension is a common complication of pregnancy that may have serious consequences to the mother and fetus. When hypertension predates pregnancy, efforts should be directed toward early recognition of intrauterine growth restriction or superimposed preeclampsia, both of which are the most impor-

TABLE 6
**Treatment of Acute Severe Hypertension in Preeclampsia**

| |
|---|
| Blood pressure ≥ 160 mm Hg systolic and/or ≥ 105 mm Hg diastolic if sustained |
| Hydralazine (Apresazide): Start with 5 mg IV or 10 mg IM; if blood pressure is not controlled,* repeat at 20-minute intervals (with 5 to 10 mg, depending on response). Once blood pressure control is achieved, repeat as needed (usually about every three hours). If no success by 20 mg IV or 30 mg IM total, consider another drug. |
| Labetalol (Normodyne): Start with 20 mg IV bolus; if effect is suboptimal, give 40 mg 10 minutes later and 80 mg every 10 minutes for two additional doses. Use a maximum of 220 mg. If desired blood pressure levels* are not achieved, switch to another drug. Avoid using labetalol in women with asthma or congestive heart failure. |
| Nifedipine (Procardia)*: Start with 10 mg orally and repeat in 30 minutes if necessary. (Short-acting nifedipine is not approved by the FDA for management of hypertension.) |
| Nitroprusside (Nipride) is rarely needed for treatment of hypertension not responding to the drugs listed above or if there are clinical findings of hypertensive encephalopathy. Start at a rate of 0.25 mg per kg per minute to a maximal dose of 5 mg per kg per minute. Fetal cyanide poisoning may occur if used for more than four hours. |

*IV = intravenously; IM = intramuscularly; FDA = U.S. Food and Drug Administration.*

**—Sudden and severe hypotension can result from the administration of any of these agents, especially short-acting oral nifedipine (see an extensive cautionary section on this issue in the Working Group's full report). The goal of blood pressure reduction in emergency situations should be a gradual reduction of blood pressure to the normal range.*

NOTE: *In managing hypertensive emergencies, the IV route is safer than oral or IM administration because it is easier to combat inadvertent hypotension by stopping an IV injection or infusion than it is to stop intestinal or IM absorption of an orally or IM-administered drug.*

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tant contributors to adverse outcomes in this group of women. When hypertension develops in the latter half of pregnancy, efforts should focus on distinguishing between probable transient hypertension of pregnancy, by definition a benign and retrospectively diagnosed condition, and preeclampsia-eclampsia. Laboratory studies and close follow-up play the most important role in this distinction. The timing of delivery is the most important management decision, and the physician should carefully weigh maternal and fetal risks.

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