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Committee on Obstetric Practice

This Committee Opinion was developed by the American College of Obstetricians and Gynecologists' Committee on Obstetric Practice in collaboration with committee members Yasser Y. El-Sayed, MD, and Ann E. Borders, MD, MSc, MPH.

This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period

ABSTRACT: Acute-onset, severe systolic hypertension; severe diastolic hypertension; or both can occur during the prenatal, intrapartum, or postpartum periods. Pregnant women or women in the postpartum period with acute-onset, severe systolic hypertension; severe diastolic hypertension; or both require urgent antihypertensive therapy. Introducing standardized, evidence-based clinical guidelines for the management of patients with preeclampsia and eclampsia has been demonstrated to reduce the incidence of adverse maternal outcomes. Individuals and institutions should have mechanisms in place to initiate the prompt administration of medication when a patient presents with a hypertensive emergency. Treatment with first-line agents should be expeditious and occur as soon as possible within 30–60 minutes of confirmed severe hypertension to reduce the risk of maternal stroke. Intravenous labetalol and hydralazine have long been considered first-line medications for the management of acute-onset, severe hypertension in pregnant women and women in the postpartum period. Although relatively less information currently exists for the use of calcium channel blockers for this clinical indication, the available evidence suggests that immediate release oral nifedipine also may be considered as a first-line therapy, particularly when intravenous access is not available. In the rare circumstance that intravenous bolus labetalol, hydralazine, or immediate release oral nifedipine fails to relieve acute-onset, severe hypertension and is given in successive appropriate doses, emergent consultation with an anesthesiologist, maternal–fetal medicine subspecialist, or critical care subspecialist to discuss second-line intervention is recommended.

Recommendations and Conclusions

The American College of Obstetricians and Gynecologists makes the following recommendations and conclusions:

- Introducing standardized, evidence-based clinical guidelines for the management of patients with preeclampsia and eclampsia has been demonstrated to reduce the incidence of adverse maternal outcomes.
- Pregnant women or women in the postpartum period with acute-onset, severe systolic hypertension; severe diastolic hypertension; or both require urgent antihypertensive therapy.
- Close maternal and fetal monitoring by a physician and nursing staff are advised during the treatment of acute-onset, severe hypertension.
- After initial stabilization, the team should monitor blood pressure closely and institute maintenance therapy as needed.
- Intravenous (IV) labetalol and hydralazine have long been considered first-line medications for the management of acute-onset, severe hypertension in pregnant women and women in the postpartum period.
- Immediate release oral nifedipine also may be considered as a first-line therapy, particularly when IV access is not available.
- The use of IV labetalol, IV hydralazine, or immediate release oral nifedipine for the treatment of acute-onset, severe hypertension for pregnant or postpartum patients does not require cardiac monitoring.

- In the rare circumstance that IV bolus labetalol, hydralazine, or immediate release oral nifedipine fails to relieve acute-onset, severe hypertension and is given in successive appropriate doses, emergent consultation with an anesthesiologist, maternal-fetal medicine subspecialist, or critical care subspecialist to discuss second-line intervention is recommended.

Risk reduction and successful, safe clinical outcomes for women with preeclampsia or eclampsia require appropriate and prompt management of severe systolic and severe diastolic hypertension (1). Integrating standardized order sets into everyday safe practice in the United States is a challenge. Increasing evidence indicates that standardization of care improves patient outcomes (2). Introducing standardized, evidence-based clinical guidelines for the management of patients with preeclampsia and eclampsia has been demonstrated to reduce the incidence of adverse maternal outcomes (3, 4). With the advent of pregnancy hypertension guidelines in the United Kingdom, care of maternity patients with preeclampsia or eclampsia improved significantly, and maternal mortality rates decreased because of a reduction in cerebral and respiratory complications (5, 6). Individuals and institutions should have mechanisms in place to initiate the prompt administration of medication when a patient presents with a hypertensive emergency. Treatment with first-line agents should be expeditious and occur as soon as possible within 30–60 minutes of confirmed severe hypertension (blood pressure greater than 160/110 mm Hg and persistent for 15 minutes) to reduce the risk of maternal stroke (7–9). The use of checklists may be a useful tool to facilitate this process. This document revises Committee Opinion Number 623, *Emergent Therapy for Acute-Onset, Severe Hypertension with Preeclampsia or Eclampsia*, primarily to clarify the terminology around immediate release oral nifedipine and to clarify monitoring expectations during and after treatment of acute-onset, severe hypertension.

Acute-onset, severe systolic (greater than or equal to 160 mm Hg) hypertension; severe diastolic (greater than or equal to 110 mm Hg) hypertension; or both can occur during the prenatal, intrapartum, or postpartum periods. These conditions can occur in the second half of gestation in women not known to have chronic hypertension who develop sudden, severe hypertension (ie, with preeclampsia; gestational hypertension; or hemolysis, elevated liver enzymes, and low platelet count [HELLP] syndrome), but they also can occur among patients with chronic hypertension who are developing superimposed preeclampsia or a hypertensive exacerbation with acutely worsening, difficult to control, severe hypertension.

Acute-onset, severe hypertension that is accurately measured using standard techniques and is persistent for 15 minutes or more is considered a hypertensive emergency. It is well known that severe hypertension can cause central nervous system injury. As

stated in the Confidential Enquiries report from the United Kingdom, two thirds of the maternal deaths during 2003–2005 resulted from cerebral hemorrhage or infarction (5). The degree of systolic hypertension (as opposed to the level of diastolic hypertension or relative increase or rate of increase of mean arterial pressure from baseline levels) may be the most important predictor of cerebral injury and infarction. In a case series of 28 women with preeclampsia with severe features and stroke, all but one woman had severe systolic hypertension just before a hemorrhagic stroke, and 54% died, whereas only 13% had severe diastolic hypertension in the hours preceding a stroke (10). A similar relationship between severe systolic hypertension and risk of hemorrhagic stroke has been observed in nonpregnant adults (11). Thus, systolic blood pressure (BP) of 160 mm Hg or greater should be included as part of the definition of severe hypertension in pregnant women or women in the postpartum period (12).

Accurate measurement of blood pressure is necessary to optimally manage hypertension in pregnancy. Standardized protocols to measure BP in pregnant patients facilitate accuracy and ensure that appropriate steps are followed across all units regardless of patient arm size or shape. Mercury sphygmomanometer is the gold standard; however, validated equivalent automated equipment also can be used. It is necessary to obtain the correct cuff size (a range of cuff sizes with directions to determine appropriate cuff size based on arm shape should be available) and patients should be positioned in a sitting or semireclining position with the back supported. Patients should not be repositioned to reclining or be on their sides in order to obtain a lower BP because it will provide a false reading (see the California Maternal Quality Care Collaborative Toolkit for standardized protocol for a BP measurement example) (13).

Pregnant women or women in the postpartum period with acute-onset, severe systolic hypertension; severe diastolic hypertension; or both require urgent antihypertensive therapy. The goal is not to normalize BP, but to achieve a range of 140–150/90–100 mm Hg in order to prevent repeated, prolonged exposure to severe systolic hypertension, with subsequent loss of cerebral vasculature autoregulation. In the event of a hypertensive crisis, with prolonged uncontrolled hypertension, maternal stabilization should occur before delivery, even in urgent circumstances (14). When acute-onset, severe hypertension is diagnosed in the office setting, the patient should be expeditiously sent to the hospital for treatment. Also, if transfer to a tertiary center is likely (eg, for preterm preeclampsia with severe features), BP should be stabilized and other measures initiated as appropriate, such as magnesium sulfate before transfer.

Endotracheal intubation is another risk of severe hypertension and is well known to increase BP sometimes to severe levels that require emergent therapeutic intervention (14). Induction of general anesthesia and

intubation should never be undertaken without first taking steps to eliminate or minimize the hypertensive response to intubation. Close maternal and fetal monitoring by a physician and nursing staff are advised during the treatment of acute-onset, severe hypertension, and judicious fluid administration is recommended even in the case of oliguria. After initial stabilization, the team should monitor BP closely and institute maintenance therapy as needed.

First-line Therapy

Intravenous labetalol and hydralazine have long been considered first-line medications for the management of acute-onset, severe hypertension in pregnant women and women in the postpartum period. Although relatively less information currently exists for the use of calcium channel blockers for this clinical indication, the available evidence suggests that immediate release oral nifedipine

also may be considered as a first-line therapy (15–18), particularly when IV access is not available. Some studies have shown that women who received immediate release oral nifedipine had their BP lowered more quickly than with either IV labetalol or hydralazine and had a significant increase in urine output (15, 19). Concern for neuromuscular blockade and severe hypotension with the contemporaneous use of nifedipine and magnesium sulfate were not substantiated in a large retrospective review (20). However, because both drugs are calcium antagonists, facilities should be prepared to monitor maternal vital signs (see Box 1), with attention to normal heart rate and blood pressure. Immediate release oral nifedipine capsules should be administered orally and not punctured or otherwise administered sublingually.

Patients may respond to one drug and not another. Magnesium sulfate is not recommended as an anti-hypertensive agent, but magnesium sulfate remains the

Box 1. Sample Order Set for Severe Intrapartum or Postpartum Hypertension Initial First-line Management With Immediate-Release Oral Nifedipine*† ↵

- Notify physician if systolic blood pressure (BP) is greater than or equal to 160 mm Hg or if diastolic BP is greater than or equal to 110 mm Hg.
- Institute fetal surveillance if undelivered and fetus is viable.
- If severe BP elevations persist for 15 minutes or more, administer nifedipine‡ (10 mg orally).
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer nifedipine capsules (20 mg orally). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer nifedipine capsule (20 mg orally). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (40 mg intravenously over 2 minutes) and obtain emergency consultation from maternal–fetal medicine, internal medicine, anesthesia, or critical care subspecialists.
- Give additional antihypertensive medication per specific order.
- Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.
- Institute additional BP timing per specific order.

*Please note there may be adverse effects and contraindications.

†When used with magnesium sulfate, facilities should monitor maternal vital signs as described above in reference to blood pressure, with attention to normal heart rate and blood pressure.

‡Capsules should be administered orally and not punctured or otherwise administered sublingually.

Data from National Heart, Lung, and Blood Institute. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. NIH Publication No. 04-5230. Bethesda (MD): NHLBI; 2004. Available at: <https://www.nhlbi.nih.gov/files/docs/guidelines/jnc7full.pdf>. Retrieved December 5, 2016; Vermillion ST, Scardo JA, Newman RB, Chauhan SP. A randomized, double-blind trial of oral nifedipine and intravenous labetalol in hypertensive emergencies of pregnancy. *Am J Obstet Gynecol* 1999;181:858–61; Raheem IA, Saaid R, Omar SZ, Tan PC. Oral nifedipine versus intravenous labetalol for acute blood pressure control in hypertensive emergencies of pregnancy: a randomised trial. *BJOG* 2012;119:78–85; Shekhar S, Sharma C, Thakur S, Verma S. Oral nifedipine or intravenous labetalol for hypertensive emergency in pregnancy: a randomized controlled trial. *Obstet Gynecol* 2013;122:1057–63; and Duley L, Meher S, Jones L. Drugs for treatment of very high blood pressure during pregnancy. *Cochrane Database of Systematic Reviews* 2013, Issue 7. Art. No.: CD001449. DOI: 10.1002/14651858.CD001449.pub3.

Box 2. Sample Order Set for Severe Intrapartum or Postpartum Hypertension Initial First-line Management With Hydralazine* ↩

- Notify physician if systolic blood pressure (BP) is greater than or equal to 160 mm Hg or if diastolic BP is greater than or equal to 110 mm Hg.
- Institute fetal surveillance if undelivered and fetus is viable.
- If severe BP elevations persist for 15 minutes or more, administer hydralazine (5 mg or 10 mg intravenously [IV] for more than 2 minutes).
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer hydralazine (10 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (20 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (40 mg IV for more than 2 minutes) and obtain emergency consultation from maternal–fetal medicine, internal medicine, anesthesia, or critical care subspecialists.
- Give additional antihypertensive medication per specific order.
- Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.
- Institute additional BP timing per specific order.

*Please note there may be adverse effects and contraindications. Data from National Heart, Lung, and Blood Institute. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. NIH Publication No. 04-5230. Bethesda (MD): NHLBI; 2004. Available at: <https://www.nhlbi.nih.gov/files/docs/guidelines/jnc7full.pdf>. Retrieved December 5, 2016.

Box 3. Sample Order Set for Severe Intrapartum or Postpartum Hypertension, Initial First-line Management With Labetalol* ↩

- Notify physician if systolic blood pressure (BP) measurement is greater than or equal to 160 mm Hg or if diastolic BP measurement is greater than or equal to 110 mm Hg.
- Institute fetal surveillance if undelivered and fetus is viable.
- If severe BP elevations persist for 15 minutes or more, administer labetalol (20 mg intravenously [IV] for more than 2 minutes).
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (40 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer labetalol (80 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 10 minutes and record results.
- If either BP threshold is still exceeded, administer hydralazine (10 mg IV for more than 2 minutes). If BP is below threshold, continue to monitor BP closely.
- Repeat BP measurement in 20 minutes and record results.
- If either BP threshold is still exceeded, obtain emergency consultation from maternal–fetal medicine, internal medicine, anesthesia, or critical care subspecialists.
- Give additional antihypertensive medication per specific order.
- Once the aforementioned BP thresholds are achieved, repeat BP measurement every 10 minutes for 1 hour, then every 15 minutes for 1 hour, then every 30 minutes for 1 hour, and then every hour for 4 hours.
- Institute additional BP timing per specific order.

*Please note there may be adverse effects and contraindications. Data from National Heart, Lung, and Blood Institute. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. NIH Publication No. 04-5230. Bethesda (MD): NHLBI; 2004. Available at: <https://www.nhlbi.nih.gov/files/docs/guidelines/jnc7full.pdf>. Retrieved December 5, 2016.

drug of choice for seizure prophylaxis in preeclampsia with severe features and for controlling seizures in eclampsia. Box 1, Box 2, and Box 3 outline standardized sample order sets for the use of IV labetalol, IV hydralazine, and immediate release oral nifedipine for the initial management of acute-onset, severe hypertension in women who are pregnant or in the postpartum period (15–17, 19, 21).

It is important to note differences in recommended dosage intervals between these options, which reflect differences in their pharmacokinetics. Although all three

medications are appropriately used for the treatment of hypertensive emergencies in pregnancy, each agent can be associated with adverse effects. Parenteral hydralazine may increase the risk of maternal hypotension (systolic BP, 90 mm Hg or less) (22). Parenteral labetalol may

cause neonatal bradycardia and should be avoided in women with asthma, heart disease, or congestive heart failure (23, 24). Nifedipine has been associated with an increase in maternal heart rate, and with overshoot hypotension (15). No significant changes in umbilical blood flow have been observed with the use of either labetalol or hydralazine (25), and maternal and perinatal outcomes are similar for both drugs (18). Likewise, no significant changes in the uteroplacental blood flow or the fetal heart have been noted with the use of immediate release oral nifedipine for treatment of severe pregnancy-induced hypertension (26–28). Immediate release oral nifedipine should not be given sublingually because of risk of hypotension.

The use of IV labetalol, IV hydralazine, or immediate release oral nifedipine for the treatment of acute-onset, severe hypertension for pregnant or postpartum patients does not require cardiac monitoring or other special monitoring beyond that which is outlined in the order sets in this document (see Box 1, Box 2, Box 3), which describe time intervals for repeat vital sign assessment and escalation of therapy. In addition, personnel in all hospital settings, including labor and delivery, antepartum, postpartum, and emergency department units, should be able to provide these initial medications without transferring patients to another unit. Protocols that include additional requirements in order to provide urgent IV hypertension therapy lead to unnecessary delays in reducing time to treatment for severe hypertension for pregnant and postpartum patients. Hospital protocols should be updated in order to reflect current recommended order sets (see Box 1, Box 2, Box 3) and, therefore, optimize time to appropriate therapy for all pregnant and postpartum patients with acute-onset, severe hypertension.

When treatment for acute-onset, severe hypertension is needed and IV access has not yet been initiated, a 200-mg dose of labetalol can be administered orally if immediate release oral nifedipine is not available. This labetalol dose may be repeated in 30 minutes if appropriate improvement is not observed (6). The immediate release oral nifedipine algorithm should be first-line therapy in this setting when IV access is not available or not yet obtained.

Treatment of Resistant Hypertension

In the rare circumstance that IV bolus labetalol, hydralazine, or immediate release oral nifedipine fails to relieve acute-onset, severe hypertension and is given in successive appropriate doses, such as those outlined in the order sets (see Box 1, Box 2, and Box 3), emergent consultation with an anesthesiologist, maternal–fetal medicine subspecialist, or critical care subspecialist to discuss second-line intervention is recommended. Second-line alternatives to consider include nicardipine or esmolol by infusion pump (29–31).

Sodium nitroprusside should be reserved for extreme emergencies and used for the shortest amount of time possible because of concerns about cyanide and thiocyanate toxicity in the woman and fetus or newborn, and increased intracranial pressure with potential worsening of cerebral edema in the woman (21). Once the hypertensive emergency is treated, a complete and detailed evaluation of maternal and fetal well-being is needed with consideration of, among many issues, the need for subsequent pharmacotherapy and the appropriate timing of delivery.

For More Information

The American College of Obstetricians and Gynecologists has identified additional resources on topics related to this document that may be helpful for ob-gyns, other health care providers, and patients. You may view these resources at www.acog.org/More-Info/HypertensionInPregnancy.

These resources are for information only and are not meant to be comprehensive. Referral to these resources does not imply the American College of Obstetricians and Gynecologists' endorsement of the organization, the organization's website, or the content of the resource. The resources may change without notice.

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The American College of Obstetricians and Gynecologists
409 12th Street, SW, PO Box 96920, Washington, DC 20090-6920

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