Maternal Safety:
Best Practices in Hypertension

Ohio Department of Health | Department of Children & Youth

The Ohio State University Wexner Medical Center

Cleveland Clinic

MetroHealth — Devoted to Hope, Health, and Humanity

Ohio Colleges of Medicine Government Resource Center

AIM Alliance for Innovation on Maternal Health

Ohio Hospital Association

University Hospitals

OPQC Ohio Perinatal Quality Collaborative

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This change package was developed based on content created through the Alliance for Innovation on Maternal Health project and was tailored to Ohio hospitals and providers.

"The Alliance for Innovation on Maternal Health (AIM) is the national, cross-sector commitment designed to lead in the development and implementation of patient safety bundles for the promotion of safe care for every U.S. birth. Founded in 2014 through a cooperative agreement funded by the Health Services Resources Administration (HRSA) and executed by ACOG, the AIM program provides expert technical support and capacity building to multidisciplinary state-based teams, most often perinatal quality collaboratives, leading targeted rapid-cycle quality improvement (QI) via implementation of patient safety bundles."

"An Alliance for Innovation on Maternal Health (AIM) patient safety bundle is a structured way of improving the process of care and patient outcomes: a small, straightforward set of evidence-based practices that, when performed collectively and reliably, have been proven to improve patient outcomes. Patient safety bundles (PBSs) are developed by expert multidisciplinary working groups, supported by the Alliance for Innovation on Maternal Health (AIM) staff at the American College of Obstetricians and Gynecologists (ACOG). Working groups include representatives appointed by professional member organizations, known experts and researchers specializing in the clinical topic, and patients with lived experience. The bundle development process includes design of measure and metrics for implementation and multiple levels of review from engaged stakeholders."

To learn more about AIM and patient safety bundles, please visit https://saferbirth.org/

Table of Contents

Executive Summary

Between 2008 and 2016, Ohio women died from pregnancy-related causes at a rate of 14.7 per 100,000 live births.[1] In addition, severe maternal morbidity (SMM) affects birthing persons at a much higher rate, occurring in 143 per 10,000 deliveries in 2013.[2] The Ohio Department of Health's (ODH) Pregnancy-Associated Mortality Review (PAMR) indicates that 57% of pregnancy-related deaths are preventable (Ohio Department of Health, 2019). Preeclampsia and eclampsia were the leading cause of maternal death in 12% of pregnancy-related deaths during this period, a mortality ratio of 1.7 per 100,000 live births, with preventability for hypertensive disorders of pregnancy determined to be 85%.[1]

Health Disparities

There are significant disparities in severe maternal morbidity and mortality in Ohio. Non-Hispanic Black birthing persons are more than two and a half times more likely to die from a pregnancy-related death than white birthing persons. From 2008 to 2016, the pregnancy related-mortality ratio (PRMR) was 29.5 for Black birthing persons and 11.5 for white birthing persons. Black birthing persons also experience severe maternal morbidity at a higher rate, 210 per 10,000 deliveries, when compared to white birthing persons, 124 per 10,000 deliveries.[1] In addition, mothers covered by Medicaid are over two times more likely to die from a pregnancy-related death than mothers covered by private insurance. From 2008 to 2016, pregnant and postpartum people with Medicaid coverage had a PRMR of 22.2 and mothers with private insurance had a PRMR of 9.4.[1]

About the Ohio Maternal Safety Quality Improvement Project

To address the issues of severe maternal morbidity and mortality due to hypertensive disorders of pregnancy in Ohio and address their contributing factors, the Ohio Department of Health, in collaboration with The Ohio State University Wexner Medical Center, University Hospitals Cleveland Medical Center, Metro Health System, Cleveland Clinic, Ohio Hospital Association (OHA), the Ohio Perinatal Quality Collaborative (OPQC) and the Ohio Colleges of Medicine Government Resource Center (GRC), has initiated the Maternal Safety Quality Improvement Project (QIP), funded by the Health Resources and Services Administration (HRSA).

The project aims to reduce the rate of hypertension-related maternal morbidity and mortality in Ohio for pregnant and postpartum people. The SMART aims for the work are:

1. Increase the percentage of patients who receive anti hypertensive treatment within 60 minutes of a confirmed severe hypertensive event by 20% by September 2024.
2. Increase the percentage of patients who received appropriate anti hypertensive treatment for a confirmed severe hypertensive event by 20% by September 2024.
3. Reduce existing disparities for patients who receive appropriate anti hypertensive treatment by 20% by September 2024.

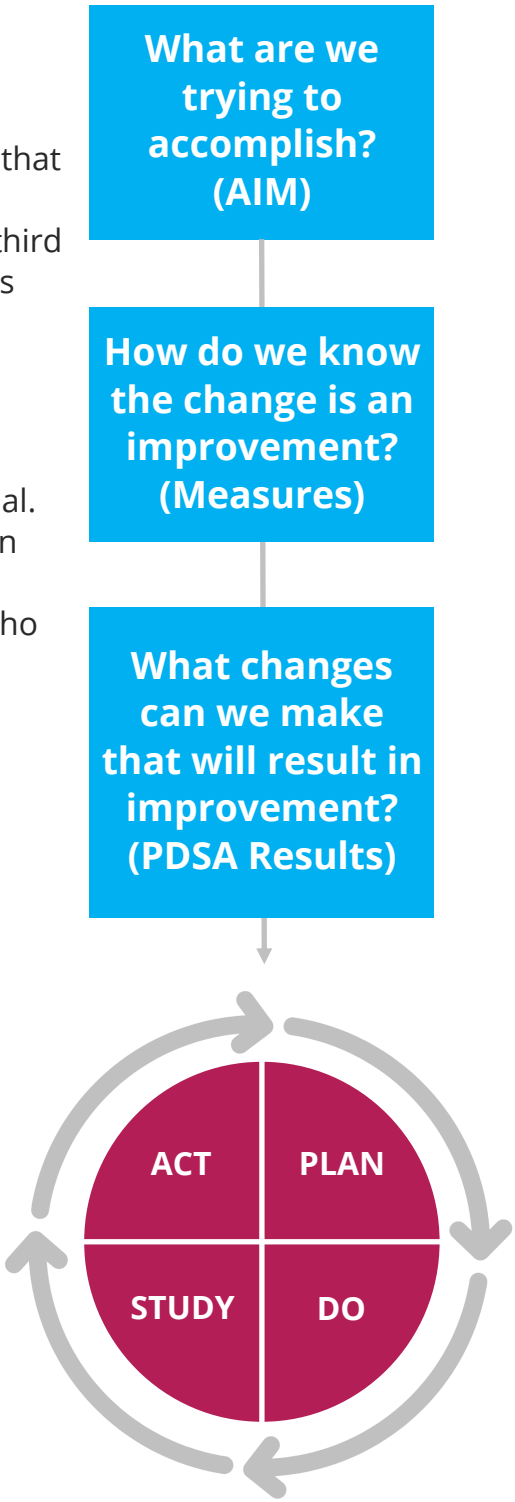
**Includes chronic HTN, gestational HTN, preeclampsia, eclampsia, or preeclampsia superimposed on pre-existing HTN*

The Maternal Safety QIP utilizes quality improvement science to achieve the SMART aims and reduce maternal morbidity and mortality throughout the project implementation period. Utilizing a modified version of the Institute for Healthcare Improvement (IHI) Model for Improvement[3], participating sites will form a project team and develop rapid feedback Plan-Do - Study-Act cycles to test interventions designed to equip providers with best clinical practices to provide care to pregnant and postpartum people.

This toolkit was developed by the project team, based on the Alliance for Innovation on Maternal Health's Severe Hypertension in Pregnancy patient safety bundle, to inform best clinical practices.

Introduction to the Model for Improvement and PDSAs

The Model for Improvement is a powerful tool for accelerating improvement. The model is not meant to replace change models that organizations may already be using, but rather to accelerate improvement. The model has three fundamental questions. The third question relates to the Plan-Do-Study-Act (PDSA) cycle, which tests changes in real work settings. The PDSA cycle guides the test of a change to determine if the change is an improvement.



Step #1: Form a Project Team

Having the right people on a quality improvement team is essential. Teams can vary in size and composition based on the organization and the complexity of the improvement effort. An effective team includes a Project Champion, someone in a leadership position who can get buy-in from staff members required for change to occur. Additional staff members may include:

- RN or Unit Manager
- Front Line Staff Champion
- Quality Improvement Expert

Step #2: Set Aims

What are we trying to accomplish?

For example: The SMART aims for the AIM Hypertension project are to:

1. Increase the percentage of patients who receive anti hypertensive treatment within 60 minutes of a confirmed severe hypertensive event by 20% by September 2024.
2. Increase the percentage of patients who received appropriate anti hypertensive treatment for a confirmed severe hypertensive event by 20% by September 2024.
3. Reduce existing disparities for patients who receive appropriate anti hypertensive treatment by 20% by September 2024.

Once you know your organization's data, these aims can be adapted for your setting.

Step #3: Establish Measures

"How will we know that a change is an improvement?"

Process Measures

- Timely Blood Pressure Treatment
- Appropriate Medical Management
- Discharge Education Materials
- Follow-up Appointment Scheduled
- Follow-up for Patient with Rx

Balancing Measures

- Mean Arterial Pressure (MAP) Decrease
- Fetal Heart Rate (FHR) Deterioration—MAP Decrease
- Fetal Heart Rate (FHR) Deterioration

Outcome Measures

- HTN-related and cardiovascular-related Severe Maternal Morbidity (SMM) (hospital)
- Postpartum Hospital Readmission Rate
- Maternal Mortality
    - Maternal Mortality by Race/ Ethnicity
- SMM (state)
    - SMM (state) by Race/ Ethnicity
- SMM (hospital)
    - SMM (hospital) by Race/ Ethnicity

Step #4: Select Changes

"What changes can we make that will result in improvement?"

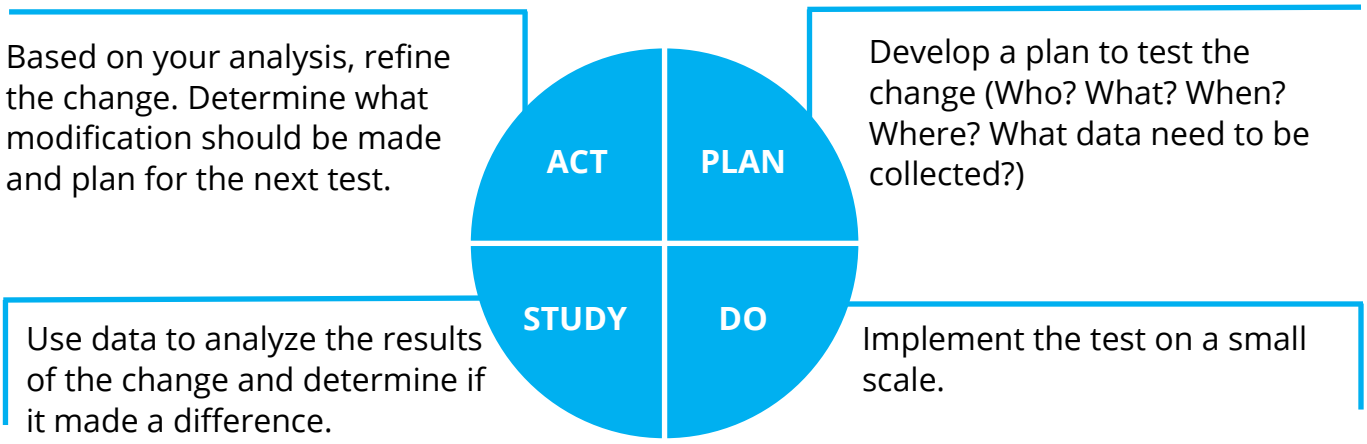
Changes are necessary to make improvements. Rather than completely reconfiguring your current process, develop, test, and implement changes on a small scale. What are the low-hanging fruits? Your team can also use previously gathered observations to determine the changes. Examples:

- Ensure appropriate blood pressure measurement protocol
- Utilize care checklists for care of hypertensive disorders of pregnancy

Step #5: Test Changes

Start testing the selected changes! By testing these strategies on a small scale, you will learn what will work in your setting. Your team can start testing changes in order to figure out what strategies are appropriate for your practice setting.

Follow the Plan-Do-Study-Act (PDSA) cycle:



Step #6: Implement Changes

After several PDSA cycles, your changes can be tested on a broader scale. Implementation is a permanent change to the current process. It may affect documentation, written policies, hiring, training, compensation, and organizational infrastructure. Implementation also requires following the PDSA cycle for continuous testing and monitoring.

Step #7: Spread Changes

After successful tests, your changes can be spread and implemented to other parts of your organization.

Readiness

The Readiness Domain ensures that hospital units are prepared to treat and address hypertensive emergencies. This is accomplished through the implementation of best clinical practices to prevent delays in treatment and to prepare for optimal management of severe hypertension, preeclampsia, and eclampsia. The five key elements of the Readiness domain are[1]:

1. Standards for early warning signs, diagnostic criteria, monitoring and treatment of severe preeclampsia/eclampsia (include order sets and algorithms).
2. Unit education on protocols, unit-based drills (with post-drill debriefs).
3. Process for timely triage and evaluation of pregnant and postpartum women with hypertension including ED and outpatient areas.
4. Rapid access to medications used for severe hypertension/eclampsia: Medications should be stocked and immediately available on labor and delivery and in areas where patients may be treated. Include brief guide for administration and dosage.
5. System plan for escalation, obtaining appropriate consultation, and maternal transport, as needed.

Standards for Early Warning Signs

Units

- Labor & Delivery
- Triage
- Antepartum
- Postpartum
- Emergency Department
- Non-OB inpatient units

Expectation

Treatment with appropriate therapy within 60 minutes of diagnosis of hypertensive emergency system plan for escalation, obtaining appropriate consultation, and maternal transport, as needed.

Table 1. Stages of HTN Emergency	
Stage 1	• Initial treatment and therapy escalation • Protocol activation and bedside care by primary nurse or primary provider
Stage 2	• Continued therapy escalation if needed with alternative agent • Bedside care by primary nurse and additional support nurse or obstetrical provider if available • Notification of charge nurse, anesthesia staff, intensive staff if need for additional assistance

Stage 3	• Continued therapy escalation and transfer to intensive care unit if:
	  • Transfer arrangements have not been made
	  • Patient remains unstable for transport
	• Bedside care with primary nurse and additional support nurse, obstetrical provider, anesthesia staff, intensivist staff
	• Notification of charge nurse, anesthesia staff, intensivist staff
	• If planning to potential emergently deliver, consider notification of pediatrics staff for resuscitation and neonatal care

Consultation Consideration

- Any instances of Stage 1, 2, or 3 HTN
- Other signs, symptoms, findings, or clinical conditions of concern to the primary assessment care team or the items listed below in Table 2

Laboratory

Stat laboratory analysis for:

- Complete blood count (CBC)
- Comprehensive metabolic profile (CMP)
- Lactate dehydrogenase (LDH)
- Coagulation panel (PT/INR, PTT, Fibrinogen)
- Random urine protein to creatinine ratio

Table 2. Clinical Consideration for Consultation—By Service		
Pulmonary	• Pulmonary edema • Fluid overload • Leaky membrane • Low colloid oncotic pressure	• Unresponsiveness to diuretics • Shortness of breath • Unresponsive asthmatic therapy
Cardiac	• Cardiac pump failure (such as peripartum cardiomyopathy) • Arrhythmia • Hypoxia	• Chest trauma • Allergic reaction • Magnesium toxicity
Neurologic	• Seizures (eclampsia) • Seizures unresponsive to typical therapy (magnesium followed by anti-epileptics) • Altered mental status	• New focal neurologic symptom or exam finding • Suspected or confirmed cerebrovascular accident
Hematologic	• Disseminated intravascular coagulation • Thrombocytopenia (platelet < 50,000)	• Coagulopathy • Obstetrical hemorrhage • Anticoagulation use

Pharmacy

Readily available agents and appropriate dosages for initial emergent

Second line agents to be considered in an ICU setting where appropriate (but do not need to be readily available in obstetrical units).

- Nicardipine infusion initially at 5 mg/hr with a maximum dose of 15 mg/hr
- Esmolol infusion
    a. Immediate: 1000 mcg/kg over 30 sec followed by mcg/kg/min
    b. Gradual: 500 mcg/kg over 1 min followed by 50 mcg/kg/min over 4 min with either continuing the 50 mcg/kg/min rate thereafter or titrating up 50 mc/kg/min over 4 min up to a maximum of 300 mcg/kg/min

- IV Labetalol: 20 mg, 40 mg, and 80 mg
- IV Hydralazine: 5 mg and 10 mg
- PO Nifedipine immediate release: 10 mg and 20 mg
- Calcium gluconate: 1g IV in 10%
- Stat portable chest X-ray availability
- Magnesium sulfate
    I. IV – 6 g bolus and 2 g continuous infusion with 10% solution
    II. IM – 5 g injections with 50% solution with two initial injections and one injection

Equipment

- The following should be available to monitor the patient's status:
  - ◊ Maternal pulse oximetry
  - ◊ Supplemental Oxygen
  - ◊ Big-mask ventilation
  - ◊ Suction
  - ◊ Padding for patient's bed
  - ◊ Continuous external fetal monitoring

Unit Education on Protocols, Unit-based Drills

Health Equity Education

It is important to understand the implications of health equity and disparities on outcomes of maternal hypertension, particularly when considering the differences in outcomes for African American mothers, who experience maternal mortality at a rate greater than 2.5 times that of white women.[2] As such, several resources may be utilized to educate an organization's providers and staff on the concepts of health equity.

Table 3. Training Opportunities

ACOG Respectful Care Modules[3]	https://www.acog.org/education-and-events/emodules/respectful-care?utm_source=higher-logic&utm_medium=email&utm_content=nov-18&utm_campaign=acog2022-rounds
Addressing Black Maternal Mortality Rates Starts with Listening to Black Women[4]	https://www.nichq.org/insight/addressing-black-maternal-mortality-rates-starts-listening-black-women

Unit Education

Organizations may utilize the following resources to conduct unit-based drills for their units and staff.

Table 4. Unit-based Drills	
Eclampsia: Simulation Scenario Overview #1[5]	https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-eclampsia-simulation-scenario.pdf
Eclampsia: Clinical Scenario #2[6]	https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-eclampsia-drill-scenario.pdf
Eclampsia: Drill Assessment Tool[7]	https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-eclampsia-drill-assessment.pdf

Process for Timely Triage and Evaluation of Pregnant and Postpartum Women with Hypertension

These checklists may be utilized when evaluating and triaging patients.

Table 5. Triage Resources	
Inpatient Areas: Hypertensive Emergency Checklist ACOG District II[8]	https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-emergency-checklist.pdf
Emergency Department: Postpartum Preeclampsia Checklist ACOG District II[9]	https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-postpartum-preeclampsia-checklist.pdf

Rapid Access to Medications

Medications should be stocked and immediately available on L&D and in other areas where patients may be treated. See Table 6.[10]

FROM THE CMQCC TOOLKIT

Table 2. Sample medication kit: Acute-onset, severe hypertension

Each institution should prepare medication kits specific to local protocols

Medication	Dosage
Labetalol IV 100 mg/20 mL vial	**Initial:** **20 mg (4 mL) IV bolus** followed by **40 mg (8 mL)** IV if not effective within 10 minutes; followed by **80 mg (16 mL)** IV if not effective within 10 minutes
Hydralazine IV 20 mg/mL vial	**Initial:** **5-10 mg (0.25-0.5 mL) IV bolus** followed by **10 mg (0.5 mL)** IV if not effective within 20 minutes
Nifedipine 10 mg immediate release tablets	**10 mg** PO, followed by **20 mg** PO if not effective within 20 minutes; followed by another **20 mg** PO if not effective within 20 minutes
Magnesium 20 g/500 mL bag	**Initial (Loading Dose): 4-6 gm (100 mL–150 mL)** IV over 20 minutes (BMI > 35 requires a 6 gram loading dose and 2 gm per hour maintenance) **Maintenance Dose: 1-2 g/hr (25 mL/hr–50 mL/hr)** continuous IV infusion
	See Appendix E: Acute Treatment Algorithm on page 195 for further detail
Esmolol 100 mg/10 mL vial **(Anesthesiologists or intensivists ONLY)**	**1-2 mg/kg (0.1-0.2 mL/kg)** IV over 1 minute
Propofol 10 mg/mL, 20 mL vial **(Anesthesiologists or intensivists ONLY)**	**30-40 mg (3-4 mL)** IV bolus
Calcium Gluconate 1000 mg/10 mL vial	**1000 mg/10 mL** IV over 2-5 minutes

Adapted and used with written permission from Lucile Packard Children's Hospital, Stanford, Gillian Abir, MBChB, and Shabnam Gaskari, PharmD, BCPPS, 2020

This table was adapted from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds.

**Page number in toolkit/table above are from the CMQCC Toolkit*

Recognition

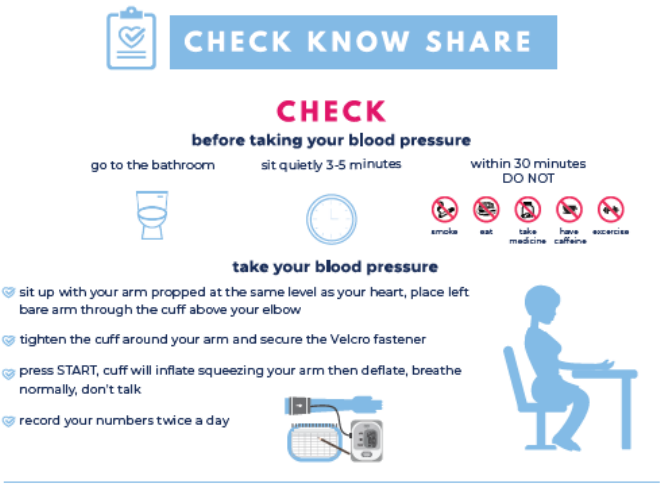
The Hypertension Maternal Safety Bundle Recognition and Prevention Domain is intended to ensure that hospital units are prepared to identify and assess every patient for hypertensive emergency. There are three key elements in the Recognition and Prevention domain.[1]

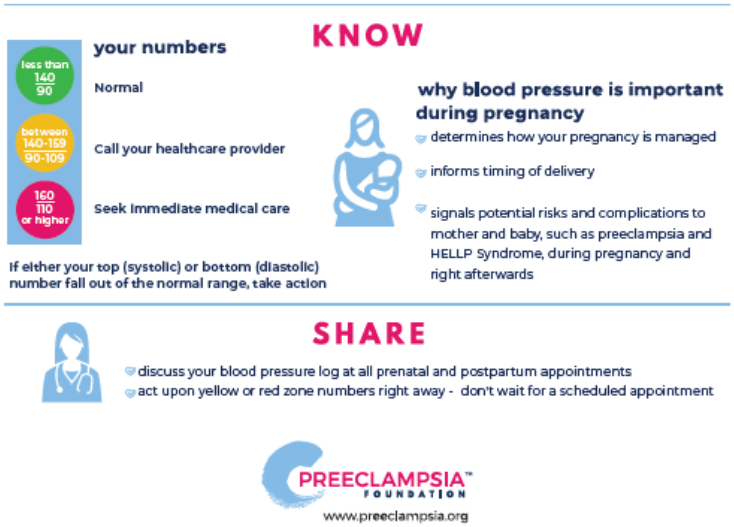
1. Establishing a standard protocol for measurement and assessment of BP and urine protein for all pregnant and postpartum persons.
2. Standard response to maternal early warning signs including listening to and investigating patient symptoms and assessment of key laboratory values.
3. Facility-wide standards for educating prenatal and postpartum persons on signs and symptoms of hypertension and preeclampsia.

Standard Protocol for Measurement and Assessment

Blood Pressure Measurement

The graphic below from the Preeclampsia Foundation[2] may be used as a guide for clinicians and providers regarding appropriate and accurate blood pressure measurement. Additional information regarding blood pressure measurement may be found in Appendix C.





Proteinuria

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Key Principles

1. The level of proteinuria should not be used to classify preeclampsia with or without severe features, and should not be otherwise used to predict severity of disease or guide management.[1] (See Section: Severe Hypertension or Preeclampsia with Severe Features at < 34 Weeks of Gestation on page 111)
2. Urine dipstick is an acceptable initial screen. If positive (1+ or more), further evaluation is warranted through use of a protein/creatine or albumin/creatinine ratio.
3. A urine sample collected after rupture of membranes may result in an elevated protein/creatinine ratio.[2] Obtain a urine sample from a urinary catheter if a value is needed for diagnostic confirmation of the presence of proteinuria.
4. Obtain baseline 24-hour urine protein or validated equivalent from patients with proteinuria noted pre-pregnancy or in early pregnancy. Use heightened surveillance, carefully evaluate for symptoms of preeclampsia with severe features, and monitor for an increase in proteinuria to abnormal levels.
5. Preeclampsia, eclampsia, severe gestational hypertension, and/or HELLP syndrome, may occur without proteinuria.[3,4]
6. Patients with blood pressures, ≥ 140 mm Hg systolic and/or ≥ 90 mm Hg diastolic without proteinuria (gestational hypertension) or with normal blood pressure and development of new-onset proteinuria are at increased risk of development of preeclampsia.

Background

Proteinuria may be identified and quantified by a urine test strip "dip," timed urine collection, protein/creatinine ratio, or albumin/creatinine ratio. The ACOG Practice Bulletin #222 recommends the use of a spot urine protein/creatinine ratio or a 24-hour urine collection to quantify the protein present.[1] The National Institute for Health and Care Excellence (NICE) guidelines, used to inform care in England and Wales, recommend the use of either the spot urine protein/creatinine, or albumin/creatinine ratio, to quantify urine protein for the diagnosis of preeclampsia.[5] The urine protein/creatinine and albumin/creatinine ratios are measurements designed to compensate for the variation in protein and albumin concentration in urine by comparing the amounts of protein to the concentration of creatinine present. (See Boxes 1 and 2 on page 51)

Box 1: Online calculator for urine protein/creatinine ratio

Online Calculator for urine protein/creatinine ratio

Box 2: Online calculator for urine albumin/creatinine ratio

Online Calculator for urine albumin/creatinine ratio

While a urine test strip "dip" has both high false positive and false negative values, it may be used to identify the need for further screening.[1,5] NICE guidelines recommend the use of an automated reagent reading device for testing the urine "dip", and do not recommend the use of a 24-hour urine in screening for preeclampsia collection.[5,6]

The ACOG Practice Bulletin #203 recommends the use of a 24-hour urine collection, if needed, in the setting of chronic hypertension, and if protein/creatinine ratios are borderline or abnormal.[1,7] Timed urine collections at 2 hours, 4 hours, or 12 hours, correlate well with 24-hour urine results, and may be an acceptable alternative when there is not enough time to collect a 24-hour urine.[8-10]

Clinicians need to be aware of testing methods used by the laboratories in their practice settings and the time frame for receiving results. It is important to know the turnaround times for protein/creatinine ratio or a sample for urinalysis assessment of protein. Dipstick testing of urine, while approved as an FDA Clinical Laboratory Improvement Amendments (CLIA) waived test, nevertheless requires considerable resources to meet the College of American Pathologists (CAP) accreditation standards.[2]

A clean catch urine specimen collected after rupture of membranes may result in higher protein values than one obtained from urinary catheterization.[11]

Obtain a baseline 24-hour urine protein or validated equivalent from those patients with proteinuria present in early or pre-pregnancy. Use heightened surveillance, carefully evaluate for symptoms of preeclampsia with severe features, and monitor for an increase in excreted protein in this population. The presence of new-onset proteinuria in the absence of elevated blood pressure requires careful and more frequent patient surveillance (weekly to twice weekly) for the possible development of preeclampsia. Information needs to be given to, and understood by, women and their families so they can recognize and respond appropriately to signs and symptoms of worsening.[12] (See Section: Patient Education on page 65)

Table 1. Proteinuria values in preeclampsia

Dipstick[A]	24-hour urine	Protein/ Creatinine ratio[D]	Albumin: Creatinine ratio
2+ for diagnosis[A] 1+ for further screening[B]	≥ 300 mg/24 hours[C]	≥ 0.3	≥ 8mg/mmol[B]

[A] For diagnosis: Urine dipstick samples should be obtained twice, four hours apart and in absence of infection [1,5,18]

[B] National Institute for Health and Care Excellence (NICE) guidelines; For 1+ dipstick screen with protein: creatinine or albumin: creatinine ratio [5,18]

[C] Society of Obstetricians and Gynaecologists of Canada (SOGC) [19]

[D] See Boxes 1 and 2 on page 51 for how to calculate

This table was adapted from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds.

*Pages number above from the CMQCC Toolkit

Standard Response to Maternal Early Warning Signs

Risk Assessment – Preeclampsia Early Recognition Tool (PERT)

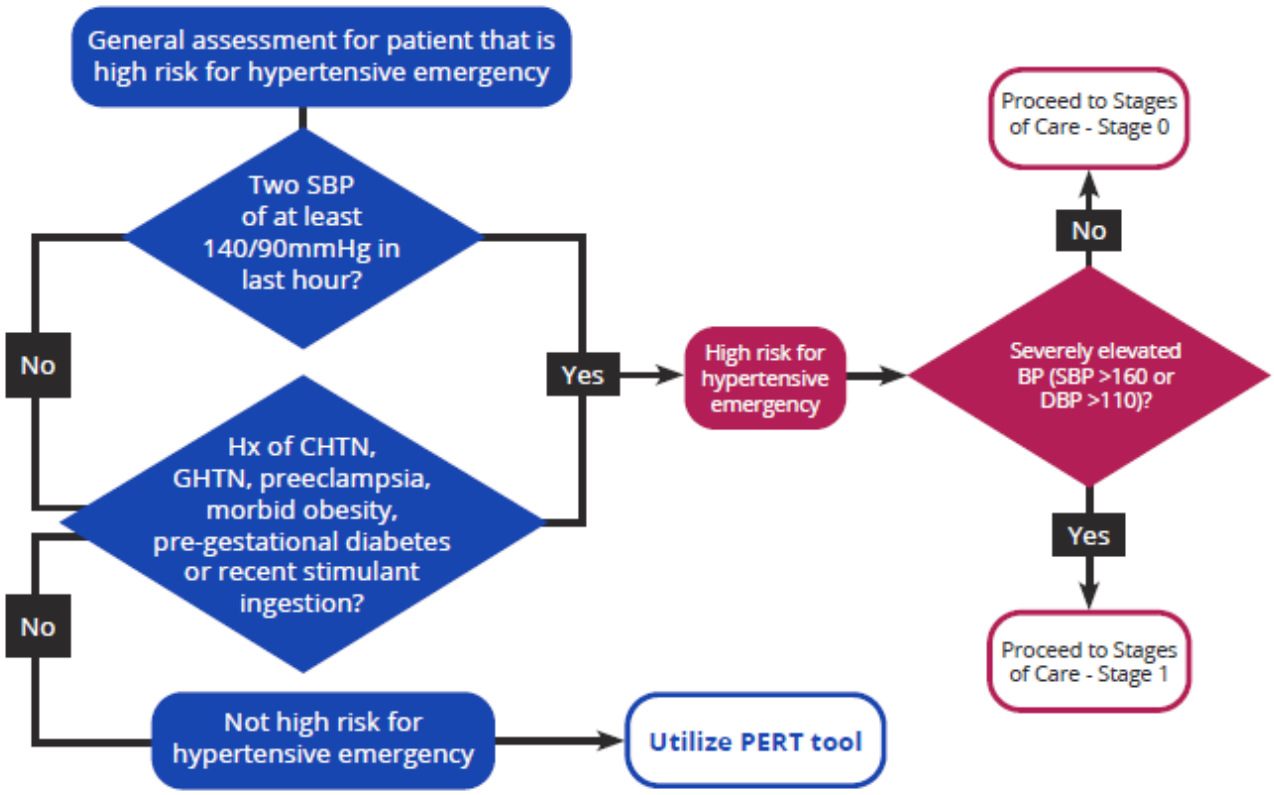
Anytime there is a concern for hypertensive disorders of pregnancy, the components of the tool should be covered and reviewed this includes:

- Initial and on-going assessments in outpatient Obstetrical care settings, OB Triage, Labor and Delivery, Antepartum, Postpartum, Emergency Department, and non-obstetrical inpatient units

Centers should utilize the tool to develop:

- A process for the recognition and appropriate response in the event of a patient's deteriorating condition
- Written criteria describing early warning signs and intervention strategies
    - ◊ When possible, these criteria should be built into the EMR system
- Magnesium sulfate toxicity monitoring and magnesium levels should only be considered if the patient is receiving magnesium sulfate infusion for seizure prophylaxis or treatment of eclampsia

The flowchart below may be used to evaluate a patient's risk level for a hypertensive emergency, and indicates which tool should be referenced.[4]



Use the PERT tool when there is any concern that a patient is experiencing a hypertensive disorder of pregnancy.[5]

B: Preeclampsia Early Recognition Tool (PERT), page 1 of 2

ASSESS	NORMAL (GREEN)	WORRISOME (YELLOW)	SEVERE (RED)
Awareness	Alert/oriented	▸ Agitated/confused ▸ Drowsy ▸ Difficulty speaking	Unresponsive
Headache	None	▸ Mild headache ▸ Nausea, vomiting	Unrelieved headache
Vision	None	Blurred or impaired	Temporary blindness
Systolic BP (mm Hg)	100-139	≥ 155-159	≥ 160
Diastolic BP (mm Hg)	50-89	90-109	≥ 110
HR	61-110	110-120	> 120
Respiration	11-24	< 12 or 25-30	< 10 or > 30
SOB	Absent	Present	Present
O2 Sat (%)	≥ 95	< 95	< 93
Pain: Abdomen or Chest	None	▸ Nausea, vomiting ▸ Chest pain ▸ Abdominal pain	▸ Nausea, vomiting ▸ Chest pain ▸ Abdominal pain
Fetal Signs	▸ Category I ▸ Reactive NS	▸ Category II ▸ IUGR ▸ Non-reactive NST	Category III
Urine Output (ml/hr)	≥50	35-49	≤ 35 (in 2 hrs)
Proteinuria*	Trace	▸ ≥ +1** ▸ ≥ 300mg/24 hours	Protein/Creatinine Ratio (PCR) > 0.3 Dipstick ≥ 2+
Platelets	> 100	50-100	< 50
AST/ALT	< 70	> 70	> 70
Creatinine	≤ 0.8	0.9-1.1	≥ 1.1
Magnesium Sulfate Toxicity	▸ DTR +1 ▸ Respiration 16-20	Depression of patellar reflexes	Respiration < 12

B: Preeclampsia Early Recognition Tool, page 2 of 2

*Level of proteinuria is not an accurate predictor of pregnancy outcome

GREEN=NORMAL: proceed with caution

YELLOW=WORRISOME: Increase assessment frequency

1 Trigger, TO DO:
Notify provider

≥ 2 Triggers, TO DO:

- Notify charge RN
- In-person evaluation
- Order labs/test
- Anesthesia consult
- Consider magnesium sulfate
- Supplemental oxygen

**Provider should be made aware of worsening or new-onset proteinuria

RED=SEVERE: Trigger, 1 of any type listed below

1 of any type:

- Immediate evaluation
- Transfer to higher acuity level
- 1:1 staff ratio

Awareness, Headache, Visual

- Consider Neurology consult
- CT Scan
- R/O SAH/intracranial hemorrhage

BP

- Labetalol/Hydralazine/nifedipine within 30-60 min
- In-person evaluation
- Magnesium sulfate loading or maintenance infusion

Chest Pain

- Consider CT angiogram

Respiration SOB

- O2 at 10L per non-rebreather mask

This figure was adapted from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds.

Facility-wide Standards for Educating Prenatal and Postpartum Persons

For additional educational resources for the healthcare team and patients, see Appendix C.

Table 7. Educational Resources on Signs and Symptoms of Hypertension and Preeclampsia	
Alliance for Innovation on Maternal Health (AIM) eModules: Severe Hypertension (HTN) in Pregnancy[6]	https://vimeo.com/722630251
Alliance for Innovation on Maternal Health (AIM): Urgent Maternal Warning Signs[7]	https://saferbirth.org/aim-resources/aim-cornerstones/urgent-maternal-warning-signs/

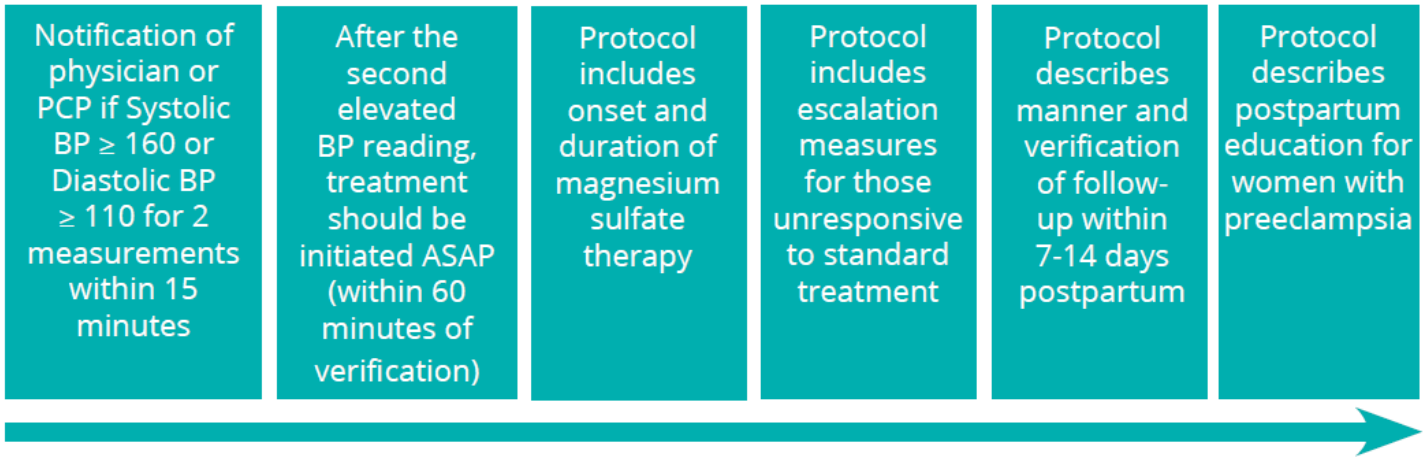
Response

The Hypertension Maternal Safety Bundle Response Domain is intended to ensure that hospital units employ standard and appropriate interventions to treat and address hypertensive emergencies. This is accomplished through the implementation of best clinical practices and protocols to prevent delays in treatment and to encourage standards of practice for the response and treatment of severe hypertension, preeclampsia, and eclampsia. There are three key elements that each organization should utilize to fulfill the requirements of the Response domain.[1]

1. Facility-wide standard protocols with checklists and escalation policies for management and treatment of: severe hypertension, eclampsia, seizure prophylaxis, magnesium over-dosage, and postpartum presentation of severe hypertension/ preeclampsia.
2. Minimum requirements for protocol:
    a. Notification of physician or primary care provider if systolic BP ≥160 or diastolic BP ≥ 110 for two measurements within 15 minutes.
    b. After the second elevated reading, treatment should be initiated ASAP (preferably within 60 minutes of verification).
    c. Includes onset and duration of magnesium sulfate therapy.
    d. Includes escalation measures for those unresponsive to standard treatment.
    e. Describes manner and verification of follow-up within seven to fourteen days postpartum.
    f. Describe postpartum patient education for women with preeclampsia.
3. Support plan for patients, families, and staff for ICU admissions and serious complications of severe hypertension.

Facility-wide Standard Protocols with Checklists and Escalation Policies for Management and Treatment of:

Severe Hypertension	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-emergency-checklist.pdf
Eclampsia, seizure prophylaxis, and magnesium over-dosage	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-eclampsia-checklist.pdf
Postpartum presentation of severe hypertension/ preeclampsia	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-eclampsia-checklist.pdf



Minimum Requirements for Protocol

Stage System for Hypertensive Emergency[5]

1. Primary nurse or Obstetrical provider initiates protocol.

Conditions	Therapy
Suspicion for underlying heart failure, asthma, cocaine, or methamphetamine abuse, bradycardia (HR < 60 bpm)	Recommend hydralazine or immediate-release nifedipine (avoid labetalol)
Predominantly systolic hypertension and pulse pressure > 70	Recommend labetalol
Predominantly diastolic hypertension and pulse pressure < 50	Recommend labetalol
If mixed systolic or diastolic hypertension and pulse pressure	Recommend labetalol
If no IV access	Recommend immediate release nifedipine
Initiate magnesium for seizure prophylaxis	

3. Continue assessments until two consecutive BP readings no sooner than 15 minutes apart are obtained that are < 160 mmHg (systolic) and < 110 mmHg (diastolic) appropriately measured.
4. Once BP thresholds are achieved, repeat BP measurement every 15 min for one hour, then every 30 minutes for one hour, then every hour for four hours.
5. Ensure the patient's family is supported and well-apprised of the situation at each stage.

Stage 1

Definition

Hypertensive Emergency:

- SBP ≥ 160 or
- DPB ≥ 110

Notes:

- Separated by 15 minutes within 1 hour
- Values do not need to be consecutive

Care Team

At Bedside: Level 3

- Primary nurse
- Primary resident
- In-house OB (if available)
- If in ER, primary ER provider (if available)

Notify: Level 3

- Charge nurse
- Chief resident
- In-house OB provider
- Consider telephone MFM consultation if coexisting medical issue is not immediately available

Monitoring

- Continuous external fetal monitoring
- Continuous pulse oximetry
- IV Access: single 18g

LABS:

- Complete blood count
- Comprehensive metabolic panel
- Uric acid
- Coagulation panel
- Lactic Dehydrogenase
- Consider placement of Foley catheter

Continued on next page

Monitoring

Labs:

- Continuous external fetal monitoring
- Continuous pulse oximetry
- IV access: single 18g
- Complete blood count
- Comprehensive metabolic panel
- Uric acid
- Coagulation panel
- Lactic dehydrogenase
- Consider placement of Foley catheter

Therapy– Content and Dose Guidelines (See Appendix D)

Labetalol Protocol

- 20 mg IV over 2 min initially
- Recheck BP in 15 min
- If BP still ≥ 160/110, give 40 mg IV over 2 min
- Recheck BP in 15 min
- If BP still ≥ 160/110, give 80 mg IV over 2 min
- Recheck BP in 15 min and if BP ≥ 160/110 move to stage 2

Hydralazine Protocol

- 5 or 10 mg IV over 2 min initially
- Recheck BP in 15 min
- If BP still ≥ 160/110, give 10 mg IV over 2 min
- Recheck BP in 15 min and if BP ≥ 160/110 move to stage 2

Nifedipine Immediate-Release Protocol (No IV access)

- 10 mg PO initially
- Recheck BP in 15 min
- If BP still ≥ 160/110, give 20 mg PO
- Recheck BP in 15 min
- If BP still ≥ 160/110, give 20 mg PO
- Recheck in 15 min and if BP ≥ 160/110 move to Stage 2

If adequate decrease (SBP ≥ 20 mmHg or a DBP ≥ 10 mmHg) occurs, withhold additional treatment dosages for 10 minutes and repeat BP measurements

If progression to Stage 2 becomes necessary: Contact the charge nurse, attending OB, anesthesia staff, intensivist staff, or maternal-fetal medicine specialist where appropriate;
Bring an additional staff nurse to the patient's room to aid in care;
A "huddle" should be performed at the bedside with the OB provider, bedside and charge nurses, and the anesthesiologist/CRNA

Stage 2

Definition

Hypertensive Emergency:

- SBP ≥ 160 or
- DPB ≥ 110 after giving maximum dose of 1 type of medication from Stage 1

Care Team

At Bedside: Level 3

- Primary nurse
- Charge nurse
- Primary resident
- Chief resident
- In-house OB (if available)
- If in ER, primary ER provider (if available)

Notify: Level 3

- Charge nurse
- Chief resident
- In-house OB provider
- Anesthesia staff
- Consider telephone MFM consultation if coexisting medical issue is not immediately available

Monitoring

- Continuous external fetal monitoring
- Continuous pulse oximetry
- IV Access: single 18g
- Foley catheter with urometer

Therapy - Content and Dose Guidelines (See Appendix D)

Labetalol Protocol

- Consider 80 mg IV over 2 min or switch to Hydralazine 10mg IV over 2 min
- Recheck BP in 15 min if Labetalol given **OR** if hydralazine given
- If BP still ≥ 160/110 move to Stage 3

Hydralazine Protocol

- 5 or 10 mg IV over 2 min initially
- Recheck BP in 15 min
- If BP still ≥ 160/110, give 10 mg IV over 2 min
- Recheck BP in 10 min and if BP ≥ 160/110 move to stage 3
- Hydralazine administered at 30 min

Nifedipine Immediate-Release Protocol (No IV access)

- Switch to Labetalol 20 mg IV over 2 min
- Recheck BP in 10 min and if BP ≥ 160/110 move to stage 3

Magnesium Sulfate Protocol

- 6g IV bolus of 10% solution followed by 2g maintenance **OR**
- 5g IM injection of 50% solution in each buttock (2 injections) with additional 5g injections (1 injection) every 4 hours
    - o May give lidocaine to reduce pain

If adequate decrease (SBP ≥ 20 mmHg or a DBP ≥ 10 mmHg) occurs, withhold additional treatment dosages for 10 minutes and repeat BP measurements

If progression to Stage 2 becomes necessary: Contact the charge nurse, attending OB, anesthesia staff, intensivist staff, or maternal-fetal medicine specialist where appropriate;

Bring an additional staff nurse to the patient's room to aid in care;

A "huddle" should be performed at the bedside with the OB provider, bedside and charge nurses, and the anesthesiologist/ CRNA

Stage 3

Definition

Persistent Hypertensive Emergency:

- SBP ≥ 160 or
- DBP ≥ 110 after giving the maximum dose of medication from Stage 2

Care Team

At Bedside: Level 3

- Primary nurse
- Charge nurse
- Primary resident
- Chief resident
- In-house OB (if available)
- If in ER, primary ER provider (if available)
- Anesthesia staff
- Intensivist staff
- Maternal-Fetal Medicine (if available)

Notify: Level 3

- Charge nurse
- Chief resident
- In-house OB provider
- Anesthesia staff
- Intensivist staff
- Maternal-Fetal Medicine

Monitoring

- Continuous external fetal monitoring
- Continuous pulse oximetry
- IV access: single 18g
- Foley catheter with urometer
- Telemetry
- Consider arterial line
- Consider repeat labs from Stage 1

Therapy - Content and Dose Guidelines (See Appendix D)

Labetalol Protocol

May continue with dosing escalation up to:

- Labetalol 300 mg IV cumulatively (in 20-80 mg dose increments)
- Hydralazine 20 mg IV cumulatively (in 5-10 mg dose increments)
- Nifedipine 180 PO cumulatively (in 10-20 mg dose increments)

Second-Line Suggested Protocols (only to be used in conjunction with Anesthesia or ICU providers)

- Nicardipine infusion initially at 5 mg/hr with a maximum dose of 15 mg/hr
- Esmolol
    - Immediate: 1000 mcg/kg over 30 sec followed by 150 mcg/kg/min infusion with maximum of 300 mcg/kg/min
    - Gradual: 500 mcg/kg over 1 min followed by 50 mcg/kg/min over 4 min with either continuing the 50 mcg/kg/min rate thereafter or titrating up 50 mcg/kg/min over 4 min up to a maximum of 300 mcg/kg/min

Support Plan for Patients, Families, and Staff

For more support and response resources, please see Appendix D.

Support Plan for ICU Admissions and Serious Complications of Severe Hypertension	
ACOG Committee Opinion[6]	https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2021/04/caring-for-patients-who-have-experienced-trauma
Improving the Patient Experience by Implementing an ICU Diary for Those at Risk of Post-intensive Care Syndrome[7]	https://pubmed.ncbi.nlm.nih.gov/28725854/

Reporting

The Hypertension Maternal Safety Bundle Reporting is intended to ensure that hospital units have systems in place to review patient care, risks, and events. This is accomplished through the implementation of practices such as huddles and debriefs, multidisciplinary committee reviews, and monitoring of contribution metrics. There are three key elements in the Reporting domain.[1]

1. Establishing a culture of huddles for high risk patients and post-event debriefs to identify successes and opportunities.
2. Conducting a multidisciplinary review of all severe hypertension/eclampsia cases admitted to ICU for systems issues.
3. Monitoring outcomes and process metrics.

Establish a Culture of Huddles and Post-Event Debriefs

A standardized system of briefs, huddles, and debriefs should be established to coordinate patient care, identify potential risks and events, acknowledge successes and opportunities for growth, and promote team-centered approaches for the treatment and management of severe maternal hypertension. In addition, facilities should develop a system to perform debriefs and case reviews for select cases of severe hypertension in pregnant and postpartum people. For tools and techniques to implement in these systems, please see Appendix E.[2]

Briefs

Meetings to fulfill planning functions such as forming the team, designing roles, and establishing goals. They should engage the entire team in patient planning. Patients should be involved in the plan of care and briefings to promote active involvement and shared decision making.

Huddles

Short ad hoc team meetings that are intended to allow the team to regain situation awareness, discuss critical issues and emerging events, anticipate outcomes and contingencies, assign resources, and express any concerns.

Debriefs

Brief, informal feedback sessions that take place after an event has occurred. They are intended to identify opportunities for improvement in teamwork, skills, and outcomes.

Multidisciplinary Review of All Severe Hypertension/Eclampsia Cases Admitted to ICU for Systems

Multidisciplinary reviews differ from debriefs and huddles in that they are formal meetings that include the staff members involved in the incident, as well as unit and facility leadership and the risk management team. They are intended to identify any systems issues or breakdowns that contributed to the outcome of the event. The reviews should take place as soon as possible after the event occurs.

Reviews should include an in-depth records review, an event timeline, and a root cause analysis. All hospitals should have a process to perform multidisciplinary systems-level reviews on all severe hypertension cases that are admitted to the intensive-care unit. In addition, all severe hypertension cases in which a quality issue or adverse event was identified should also be reviewed. If your site is establishing a framework for a safety and quality committee, please see Appendix E for example documents.

A multidisciplinary Perinatal Quality Committee is a practical method to review cases and track process and outcome measures.

Monitor Outcomes and Process Metrics

Process measures are steps in a process or workflow that contribute to specific outcome metrics. They can have a positive or a negative impact, and are a representation of a system's efforts to apply evidence-based practices or interventions to improvement processes. Process, balancing, and outcomes measures may be found in the executive summary of the toolkit.

Semi-Annual General Assessment

A prospective survey will be administered over the course of the project to determine the availability of the following resources that may help to structure and guide the internal review process:

⇒ Does your organization provide educational resources for Maternal Hypertension?

⇒ Is there a system in place for interdisciplinary huddles for Hypertension care in your Labor and Delivery, Triage, Antepartum, and Postpartum units?

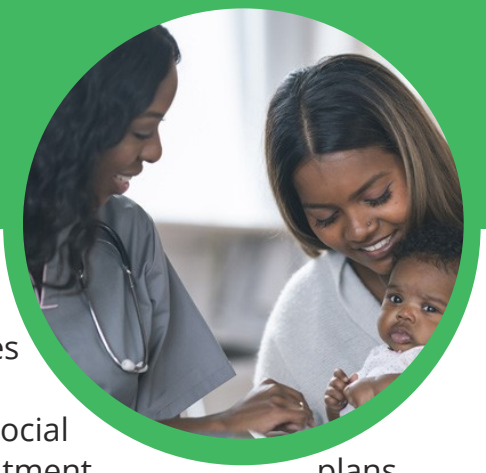
⇒ Is there a system for Quality and Safety Committee Reviews for episodes of severe maternal morbidity?

⇒ Does your team have simulation training directed toward Maternal Hypertension?

⇒ Does your organization offer education and training for disparities in health care and health equity and training for patients of color?

Health equity is a crucial aspect of maternal safety. Hospitals are encouraged to establish a framework to address disparities for mothers in Ohio. This includes resources on implicit bias, racial and ethnic disparities, and shared decision making.

Respectful Care



The Hypertension Maternal Safety Bundle Respectful Care Domain is intended to ensure that hospital units employ standard and appropriate practices to treat and address hypertensive emergencies with mindfulness, sensitivity, and respect for all patients. This is accomplished through screening for and identifying structural and social drivers of health that could impact clinical recommendations or treatment plans, and provide linkage to resources that align with the birthing person's health literacy, cultural needs, and language proficiency. There are three key elements that each organization should utilize to fulfill the requirements of the Respectful Care domain.

1. Utilize a shared decision making approach during the care process.
2. Provide culturally sensitive education for patients and providers.
3. Identify, assess, and address existing barriers to care.

Utilize a shared decision making approach during the care process

Utilizing a shared decision making approach with patients is a vital component in ensuring they are able to identify and consent to the best course of action during their care process. This includes providing patients with all the information they will need to make an informed decision regarding their care. This process should be documented in the electronic medical record. More information regarding shared decision making may be found in the following sources:

Shared Decision Making Resources	
Informed Consent and Shared Decision Making in Obstetrics and Gynecology[1]	https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2021/02/informed-consent-and-shared-decision-making-in-obstetrics-and-gynecology
Importance of Social Determinants of Health and Cultural Awareness in the Delivery of Reproductive Health Care[2]	https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2018/01/importance-of-social-determinants-of-health-and-cultural-awareness-in-the-delivery-of-reproductive-health-care
Effective Patient-Physician Communication[3]	https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2014/02/effective-patient-physician-communication

Provide culturally sensitive education for patients and providers

Given the existing disparities in maternal health outcomes, it is important to provide education regarding these disparities to both health care providers and patients. In addition, it is vital that health care providers develop a level of comfort and competency in discussing these issues with their patients when care is provided. Health care team members may seek to further their knowledge and training on topics such as implicit bias, anti-racism, and shared decision making through the following resources:

Provider Training	Cost	
ACOG Respectful Care Module[4]	Free	https://www.acog.org/education-and-events/emodules/respectful-care?utm_source=higher-logic&utm_medium=email&utm_content=nov-18&utm_campaign=acog2022-rounds
March of Dimes Training[5]	Varies	https://modprofessionaled.learnuponus.com/store/502-awareness-to-action-dismantling-bias-in-maternal-and-infant-healthcare

Identify, assess, and address existing barriers to care

There are significant disparities in severe maternal morbidity (SMM) and maternal mortality in Ohio. From 2008-2016, the pregnancy related-mortality ratio (PRMR) was 29.5 for non-Hispanic Black women and 11.5 for non-Hispanic white women. Black women also experienced SMM at a higher rate, 210 per 10,000 deliveries, when compared to white women, 124 per 10,000 deliveries.

In order to address these disparate outcomes for different patient populations, it is important for hospitals to engage in activities aimed at eliminating racial disparities in obstetric outcomes. Several avenues that may be explored are addressed in this toolkit, including utilizing a shared decision making approach with patients, as well as providing education to patient and clinical providers.

Additional resources regarding disparities in maternal health outcomes, barriers to care, and health outcomes may be found below:

Resource	
Reducing Disparities in Severe Maternal Morbidity and Mortality[6]	https://journals.lww.com/clinicalobgyn/Abstract/2018/06000/Reducing_Disparities_in_Severe_Maternal_Morbidity.22.aspx?WT.mc_id=HPxADx20100319xMP
Racial Disparity in Postpartum Readmission Due to Hypertension among Women with Pregnancy-Associated Hypertension[7]	https://www.thieme-connect.com/products/ejournals/pdf/10.1055/s-0040-1712530.pdf

Racial Disparities in Cardiovascular Complications With Pregnancy-Induced Hypertension in the United States[8]	https://www.ahajournals.org/doi/full/10.1161/HYPERTENSIONAHA.121.17104
Does Race or Ethnicity Play a Role in the Origin, Pathophysiology, and outcomes of Preeclampsia? An Expert Review of the Literature[9]	https://www.ajog.org/article/S0002-9378(20)30769-9/fulltext
Clinical Course, Associated Factors, and Blood Pressure Profile of Delayed-Onset Postpartum Preeclampsia[10]	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6922052/
Racial and Ethnic Disparities in Reproductive Health Services and Outcomes, 2020[11]	https://journals.lww.com/greenjournal/Fulltext/2021/02000/Racial_and_Ethnic_Disparities_in_Reproductive.5.aspx

Additionally, community resources for social and health care services may be found at the Ohio Colleges of Medicine Government Resource Center website.[13]

Appendix

Appendix A – Executive Summary
References

1. Ohio Department of Health. (2019). *A Report on Pregnancy-Associated Deaths in Ohio 2008-2016.* Columbus, OH: Ohio Department of Health.

2. Ohio Department of Health. (2017). Severe Maternal Morbidity (SMM). *Maternal and Child Health Women and Infants Health*. Retrieved from https://odh.ohio.gov/wps/wcm/connect/gov/db0ab299-4e0d-411e-a107-2db1f555106a/SMM-Factsheet.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-db0ab299-4e0d-411e-a107-2db1f555106a-mMBwu6k

3. Institute for Healthcare Improvement. (n.d.). Model for Improvement.

Appendix B- Section 1 Readiness
References

1. Council on Patient Safety in Women's Health Care. (2015). Severe Hypertension Bundle. Retrieved from https://saferbirth.org/psbs/severe-hypertension-in-pregnancy/

2. Ohio Department of Health. (2019). *A Report on Pregnancy-Associated Deaths in Ohio 2008-2016.* Columbus, OH: Ohio Department of Health.

3. ACOG Respectful Care eModules
Retrieved from https://www.acog.org/education-and-events/emodules/respectful-care?utm_source=higher-logic&utm_medium=email&utm_content=nov-18&utm_campaign=acog2022-rounds

4. National Institute for Children's Health Quality. (2020). *Addressing Black Maternal Mortality Rates Starts with Listening to Black Women.* Retrieved from https://www.nichq.org/insight/addressing-black-maternal-mortality-rates-starts-listening-black-women

5. The American College of Obstetricians and Gynecologists District II. (2014). Eclampsia Simulation Scenario Overview. Retrieved from https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-eclampsia-simulation-scenario.pdf

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9. The American College of Obstetricians and Gynecologists District II. (2014). Postpartum Preeclampsia Checklist. Retrieved from https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-hypertension-bundle-postpartum-preeclampsia-checklist.pdf

10. Druzin M, Shields L, Peterson N, Sakowski C, Cape V, Morton C. Improving Health Care Response to Hypertensive Disorders of Pregnancy, a California Maternal Quality Care Collaborative Quality Improvement Toolkit, 2021.

11. Gibson, K.S., McLean, D. (2020). A Maternal Transport Briefing Form and Checklist.

Resources: Tools and Tables

[Patient Sticker Here] or Enter:
Name:_____
DOB:_____

Receiving Hospital (Name, Logo)
Transport Center: (phone #)
Labor & Delivery: (phone #)
Fax Documents: (phone #)

Date: _____
Initial Call (time):_____
Transport Accepted: _____
Pt Left Sending Hosp: _____

Maternal Transport Summary & Checklist

This form is an example and should be modified to fit each receiving facility's unique requirements

G_ P_ _ _ _ EDC_____ Gest Age___wk __d {or Date Delivered:_____} Pt Weight_____

Indication(s) for transfer: □ Maternal_____ □ Fetal_____
Primary Diagnosis:_____
Secondary Diagnoses:_____
Pertinent PMH, PSH: _____
Other services needed on transfer: □ NICU □ ICU □ Cardiac □ Other_____
Referring Hospital:_____ Level of Care: Maternal___ Neo___
Referring Physician:_____ Phone:_____

Primary Obstetrician:_____ Phone:_____

Receiving Hospital:_____ Level of Care: Maternal___ Neo___
Accepting Physician:_____ Phone: _____

Vitals: Current Time:_____ BP____/_____ P_____ R_____ O2 sat:____ T____
On transfer Time:_____ BP____/_____ P_____ R_____ O2 sat:____ T____
Vaginal exam: _____ / _____ / _____ date/time _____
Vaginal exam: _____ / _____ / _____ date/time _____
Membranes: □ Intact □ Ruptured □ Bulging
Bleeding: □ Yes (EBL: _____ml) □ No
Ultrasound: Presentation □ Cephalic □ Breech □ Transverse □ Unknown
Previa □ Yes □ No □ Unknown
EFW: _____g

EFM: Baseline: _____ Variability: _____ Accels: _____ Decels: _____
Category □ I (normal) □ II (indeterminate) □ III (Abnormal)
Contractions ≥4/hr? □ Yes □ No

Medications: □ Antenatal steroids (1st dose date and time_____)
□ Magnesium Sulfate: Bolus (time)_____, then Drip at_____gm/hr
□ Terbutaline (time _____) □ Antibiotics: _____
□ Other: _____

Blood Products: Units Given (___PRBC ___ Cryoprecipitate ____FFP ____Platelets)

Transportation: □ Ambulance □ Air □ Private car Responsible for arranging:_____
Monitoring on transport □ Continuous EFM □ Tele □ Medications _____
□ Physician-to-Physician communication done □ Nurse-to-Nurse communication done

Document Checklist: Documents sent how: □ with patient □ fax to receiving hospital
□ Prenatal record □ Prenatal labs □ Ultrasound reports □ Current labs □ H&P □Discharge Summary
□ Current admission other relevant notes □ EFM strips if relevant findings
□ Admission face sheet □ Patient consent for transfer □ Copy of this completed form
Notes_____
_____

Version 4-25-2020

Appendix C- Section 2 Recognition

References

1. Council on Patient Safety in Women's Health Care. (2015). Severe Hypertension Bundle. Retrieved from https://saferbirth.org/psbs/severe-hypertension-in-pregnancy/

2. Preeclampsia Foundation. (n.d.). Your Blood Pressure: Check-Know-Share.

3. Druzin M, Shields L, Peterson N, Sakowski C, Cape V, Morton C. Improving Health Care Response to Hypertensive Disorders of Pregnancy, a California Maternal Quality Care Collaborative Quality Improvement Toolkit, 2021.4. TriHealth. (n.d.). Hypertensive Emergency Protocol.

4. Trihealth. (n.d.). Hypertensive Emergency Protocol.

5. Maurice L. Druzin, MD; Laurence E. Shields, MD; Nancy L. Peterson, RNC, PNNP, MSN; Valerie Cape, BSBA. Preeclampsia Toolkit: Improving Health Care Response to Preeclampsia (California Maternal Quality Care Collaborative Toolkit to Transform Maternity Care) Developed under contract #11-10006 with the California Department of Public Health; Maternal, Child and Adolescent Health Division; Published by the California Maternal Quality Care Collaborative, November 2013. The California Department of Public Health holds the copyright for this toolkit.

6. Alliance for Innovation of Maternal Health. (2022). Implementation Webinar.

7. Alliance for Innovation of Maternal Health. (2022). Urgent Maternal Warning Signs.

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Appendix C: Simulation Scenarios

Mark Meyer MD, Kaiser Permanente, San Diego
Amy Judy MD, Stanford University School of Medicine

NOTE: The HDP Task Force does not endorse any particular simulation system and the references to trade names in this section are included as reference only. This is a SAMPLE developed by a particular facility as an example to work from. You may need to adjust based on the individual circumstances of your facility.

Preeclampsia with Severe Features and Eclampsia in Postpartum Unit

Part 1: General directions for use

General

1. This scenario is written using Laerdal LLEAP software and can be used with either SimMan3G or SimMan Essentials. It is designed to operate the simulator and the patient monitor display in a standardized fashion with minimal input from the operator.
2. This scenario can be varied depending on several factors and can be used with little or no dedicated simulation equipment. This could be as simple as using cue cards with a staff member acting as the patient.

Possible Variants:

1. Clinical area: this scenario is written for use in the postpartum unit but could easily be adapted for use in LDR, ED, etc.
2. Patient simulator options:
    a. Other Laerdal simulators including SimMom
    b. Other high fidelity simulator manufacturers
    c. Use of a confederate to act as the patient
        i. this can be highly effective to better simulate seizure-like activity
        ii. It is critical that participants do not attempt to do procedures on the "patient" e.g. IV start, intubation, etc.
3. Pre-programmed content vs. "on the fly" – Using the parameters in the scenario algorithm, the operator could run the case manually instead of using the pre-programmed case file.
4. Providing vital signs during the case
    a. Use of other patient monitor simulators
    b. Use of vital sign generator apps that work on phones, tablets, etc.
    c. Use PowerPoint slides on a tablet, or even cardboard "cue cards" to indicate changes in vital signs and patient status.
    d. Cue cards to provide vital signs
5. Patient care materials: can be run with or without patient care materials like IV, medications, etc.
6. Video for debriefing: the use of video for debriefing can be a powerful when done appropriately but is not necessary for effective debriefing. There are several AV capture options if desired.

Part 2: Scenario overview

Scenario Program File	Preeclampsia/Eclampsia/PP Unit 3G v1.0 (SimMan3G) or Preeclampsia/Eclampsia/PP Unit Ess v1.0 (SimMan Essentials)
Scenario Time	15-20 minutes
Debriefing Time	20-45 minutes – will vary depending on how the team manages preeclampsia/eclampsia and hypertension as well as what TeamSTEPPS concepts will be covered.
Target Group	Postpartum nurses, OB physicians, Anesthesiologists, & CRNAs
Case Summary	This is a case of a patient in the postpartum unit with postpartum preeclampsia with severe features that progresses to eclampsia. The patient requires antihypertensive treatment as well as magnesium sulfate to control seizures. Despite an initial magnesium bolus and drip, the patient continues to seize and will require an additional magnesium bolus to control her seizures. Varying airway compromise can be added if desired. This case is designed to ensure staff are following ACOG & CMQCC guidelines for treatment of preeclampsia and eclampsia. Therefore, there is a great emphasis on appropriate medication dosing and timing per these guidelines. There are two very important operational conditions to make this scenario work effectively. 1. The appropriate dosing interval between antihypertensives requires the operator to "artificially speed up time" during the case in order to complete the case in 15-20 minutes. 2. It is critical that the participants recognize the patient is seizing. Options: a. Use of a "seizure mattress" works well to create seizures. b. SimMan3G has a seizure feature but the effectiveness of this feature is limited, so a confederate may need to point out seizure if the team does not recognize one is occurring. c. If using a confederate for the patient, that person should simulate a generalized tonic-clonic seizure and post-ictal state.

Teaching Personnel **Recommend 4 Instructors: Must include at least 1 MD and 1 RN**	Instructor Roles: 1. GUI operator/Voice of patient: can be operated by sim technician if available 2. AV capture operator: collect data for debriefing and data collection purposes. 3. Lead debriefer: may be AV capture operator or another instructor who works alongside to insure all relevant information for debrief & data collection is collected accurately. 4. Confederates to act as family member. They should be holding the new infant and can point out the seizure if not apparent to the team.
Participants	1. Physicians (minimum 1 OB/emergency medicine physician, may include anesthesia, trainees, etc. if desired) 2. Nurses (4-5) to include no more than 1 LVN. (May use 3-4 RNs with 1 Tech/MA)
Learning Objectives	1. Demonstrate superior teamwork and communication skills using the TeamSTEPPS model with a focus on shared mental model and role clarity throughout the case. 2. Recognize and treat preeclampsia with severe features, and eclampsia with hypertension, by treating with: a. Antihypertensives per ACOG/CMQCC guidelines b. Magnesium sulfate for seizures 3. Maintain airway and oxygenation in seizing and post-ictal patient
References	1. ACOG. Gestational hypertension and preeclampsia. Practice Bulletin No. 222 of the American College of Obstetricians and Gynecologists. Obstetrics and Gynecology 135, 1492-1495, doi:10.1097/AOG.0000000000003892 (2020). 2. Bernstein PS, Martin JN Jr, Barton JR, et al. National Partnership for Maternal Safety: Consensus Bundle on Severe Hypertension During Pregnancy and the Postpartum Period. Obstetrics and Gynecology 2017; 130:347.

Improving Health Care Response to Hypertensive Disorders of Pregnancy, a CMQCC Quality Improvement Toolkit, 2021.

Part 3: Detailed objectives

Medical Management	1. Identify the patient with postpartum preeclampsia with severe features that progresses to eclampsia a. Identify possible signs and symptoms of postpartum preeclampsia i. Neuro: Headache, Visual Complaints, Altered Mental Status, CVA, Seizure ii. Abdominal pain – especially RUQ or epigastric pain iii. Shortness of breath – pulmonary edema b. Identify the hypertensive emergency that is part of preeclampsia with severe features in this case, i.e., SBP ≥ 160 mm Hg OR DBP ≥ 110 mm Hg 2. Manage the patient with postpartum preeclampsia with severe features that progresses to eclampsia a. Treat hypertension per ACOG and CMQCC guidelines i. Target BP = 130-150/80-100 mm Hg ii. Labetalol IV - escalating doses 20mg, 40mg, 80mg, q10 min prn iii. Hydralazine IV - escalating doses 5-10mg, 10 mg, q 20 min prn iv. Nifedipine PO (immediate release) - escalating doses 10 mg, 20 mg, q20 min prn b. Treat refractory eclampsia with magnesium sulfate. i. Initial magnesium sulfate load and drip ii. Additional magnesium sulfate bolus for recurrent seizures. Can include other medications including benzodiazepines if desired 3. Maintain airway and oxygenation – basic airway positioning, optional intubation
Psychomotor Skills	1. Prepare, and administer critical medications 2. Seizure precautions – positioning, padding of rails, etc. 3. Provide airway support with basic airway positioning, optional intubation

Teamwork & Communication Skills (TeamSTEPPS)	1. Communication: a. SBAR to team responding to call for help b. Call outs before meds are given and after medications have been given – timing of antihypertensive dosing is critical for this scenario. c. Check backs (i.e. closed loop communication) i. Team leader to team members re: role clarity ii. RN call backs to confirm dosages d. Importance of team recorder to keep team on track with times of meds/interventions 2. Leadership – joint duty of primary nurse and primary physician a. Role clarity for team members – primary nurse b. Shared mental model – physician – briefs team after initial assessment on patient condition and plan of care. 3. Situation Monitoring a. Situational Awareness b. Maintains shared mental model – briefing during case to keep up to date and address challenges in treatment. c. Cross-monitoring – "watching each other's back" 4. Mutual Support a. Task assistance – help with medications, seizure precautions, airway etc. as needed b. Assertion for important information i. Speak up in firm and respectful manner – offer explanation of concern and proposed solution ii. CUS – I'm Concerned! I am Uncomfortable! This is a Safety issue! 5. Demonstrate successful strategies to deal with concerned family members who may become an obstruction to patient care

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Part 4: Patient background information

Patient Information	Background OPTION #1
Age	25
Weight	197 lb.
HPI	25 y/o G1P1 who is post-op day 2 from a primary c/s for fetal macrosomia. Prenatal course uncomplicated and c/s uneventful. QBL 800ml. Post-op course to date has been uneventful. The patient has been doing well until approx. 24 hours ago when she delivered and had a worsening headache and dizziness. In the last 6-8 hours, she has developed some RUQ abdominal pain with nausea. She is not vomiting but is having a difficult time taking adequate po due to pain and nausea.
PMHx	None
Medications	Prenatal Vitamins, Ibuprofen 800mg tid
Allergies	None
Social Hx	Married, works as cashier at grocery store. No EtOH, Drugs, Tobacco.
Presentation	Patient calls the nurse after developing a worsening headache and dizziness. The nurse should evaluate the patient's VS and note that she is now markedly hypertensive. If the RN does not check VS, the patient should complain about worsening symptoms including RUQ pain and nausea.
Vital Signs	T 98.3, HR 93 BP 170/109, RR 16, SpO2 99% on RA.
Labs	WBC 13, Hgb 10.7, Hct: 32, Plt: 220, ALT 42, AST 27, BUN 10, Cr. 0.7, Uric Acid: 5.6

Patient Information	Background OPTION #2
Age	42
Weight	221 lb.
HPI	42 y/o G1P1 is 8 hours s/p vaginal delivery at 38 weeks. Prenatal course was complicated by some mild-range hypertension that did not require antihypertensive medication. QBL 250ml and she has been doing well otherwise
PMHx	HTN – not on medications

Patient Information	Background OPTION #2
Medications	Prenatal Vitamins, Ibuprofen 800mg tid
Allergies	None
Social Hx	Married, works as a corporate attorney. No EtOH, Drugs, Tobacco.
Presentation	Patient calls the nurse after developing a worsening headache and dizziness. The nurse should evaluate the patient's VS and note that she is now markedly hypertensive. If the RN does not check VS, the patient should complain about worsening symptoms including RUQ pain and nausea.
Vital Signs	T 98.3, HR 93 BP 170/109, RR 16, SpO2 99% on RA.
Labs	WBC 13, Hgb 10.7, Hct: 32, Plt: 220, ALT 42, AST 27, BUN 10, Cr. 0.7, Uric Acid: 5.6

Improving Health Care Response to Hypertensive Disorders of Pregnancy, a CMQCC Quality Improvement Toolkit, 2021.

Simulation scenarios for preeclampsia with severe features and eclampsia in postpartum unit

Part 5: Equipment/materials list

Simulation Equipment:

- ☐ Option #1 – SimMan 3G – Instructor PC & Patient Monitor PC – Seizures produced using "Tonic-Clonic" seizure on GUI
- ☐ Option #2 – SimMan Essential or 3G – Instructor PC & Patient Monitor PC with "Seizure Mattress" – Seizures produced from seizure mattress independent of GUI.
- ☐ Option #3 – SimMom
- ☐ Option #4 – Standardized patient with Instructor PC & Patient Monitor PC.
- ☐ Option #5 – Standardized patient with low fidelity cue cards for VS OR use of VS apps on phone/iPads
- ☐ Microphone for GUI operator to simulate patient's voice
- ☐ Video Capture: can use Laerdal software or other AV capture software e.g. Vosaic Connect for video debriefing and data collection. Alternatively, can use combo of laptop with iPad or GoPro for video capture.
- ☐ Debrief using laptop and video projector.
- ☐ Low fidelity option includes note taker rather than video capture, with review of notes for

debrief. Video is preferable if equipment and expert debriefer available.

- ☐ Low fidelity infant simulator/doll for family member to hold at bedside

Patient Care Equipment:

- ☐ ID band on patient (simulator or standardized patient)
- ☐ IV in place
- ☐ Normal saline and IV pole
- ☐ Crash cart – should be outside room if planning on more advanced airway issues
- ☐ 100% O2 Non-Rebreather Mask
- ☐ Adult ambu bag and oxygen tubing
- ☐ Suction module, canister, tubing, yankauer tip
- ☐ Optional - Medication pump to administer magnesium sulfate

Medication:
Unless otherwise specified, nursing should draw up meds or mix medication drips

- ☐ Magnesium 6g
- ☐ Magnesium 4g
- ☐ Magnesium 2g x 2 – one for drip and another for additional bolus
- ☐ Labetalol 10mg, 20mg, 40mg and 80mg
- ☐ Hydralazine 5 and 10mg – multiple doses
- ☐ Nifedipine immediate release 10 mg tabs – multiple doses
- ☐ Optional - Benzodiazepines – Ativan, Versed, or Valium

Moulage:

None

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Part 6: Program algorithm and operator notes

Case Summary and Key Points

This is a case of a patient with postpartum preeclampsia with severe features that progresses to eclampsia. The patient develops severe signs and symptoms of preeclampsia that progress to eclampsia and requires anti-hypertensive treatment as well as magnesium sulfate to control seizures. Despite an initial magnesium sulfate bolus and drip, the patient continues to seize and will require an additional magnesium sulfate bolus to control her seizures. Varying airway compromise can be added if desired. This case is designed to ensure staff are following ACOG & CMQCC guidelines for treatment of preeclampsia and eclampsia. Therefore, there is a great emphasis on appropriate medication dosing and timing per these guidelines.

There are also important operational conditions to make this scenario work effectively

1. The appropriate dosing interval is 10 min for IV labetalol, 20 min for IV hydralazine, and 20 min for PO nifedipine (immediate release tabs). This requires the operator to "artificially speed up time" during the case in order to complete the case in a timely fashion. There are cues built into the scenario that prompt a call out that 10 min have passed approx. 90-120 seconds into the frame. This cue should be discussed in the pre-scenario briefing so that participants won't be surprised during the scenario.
2. It is critical that the participants recognize the patient is seizing. Use of a "seizure mattress" is ideal to create seizures, but if not available, SimMan3G does have a seizure feature. Unfortunately, the effectiveness of this seizure feature is limited, so a confederate may be required to point out the seizure if the team does not recognize that a seizure is occurring.

The scenario flows as noted in the diagram below

1. Scenario advances when anti-HTN meds are ordered, given, or "Advance Next Frame" is clicked. Note the events that connect frames in diagram below.
2. The event menu contains antihypertensive meds, critical scenarios controls and magnesium doses. Note the Magnesium tab that must be clicked to see the magnesium bolus doses and magnesium drip. (Figure 1 on page 189)
3. The resources menu shows the ED Monitor setup as well as the GUI setup for this case (Fig. 2).
4. Seizure control will be up to the instructor, but there are instructor messages to cue seizures at the recommended time. It is recommended to have the patient seize for the first time after the primary nurse completes their initial assessment and is ready to call for help. This will insure that the whole team responds. If you want the team to treat refractory seizures, have the patient seize again approx. 20 min into the case because the first mag bolus should be complete at that time.
5. The case ends after the BP is under control and the patient is no longer seizing.

Example of simulation models:

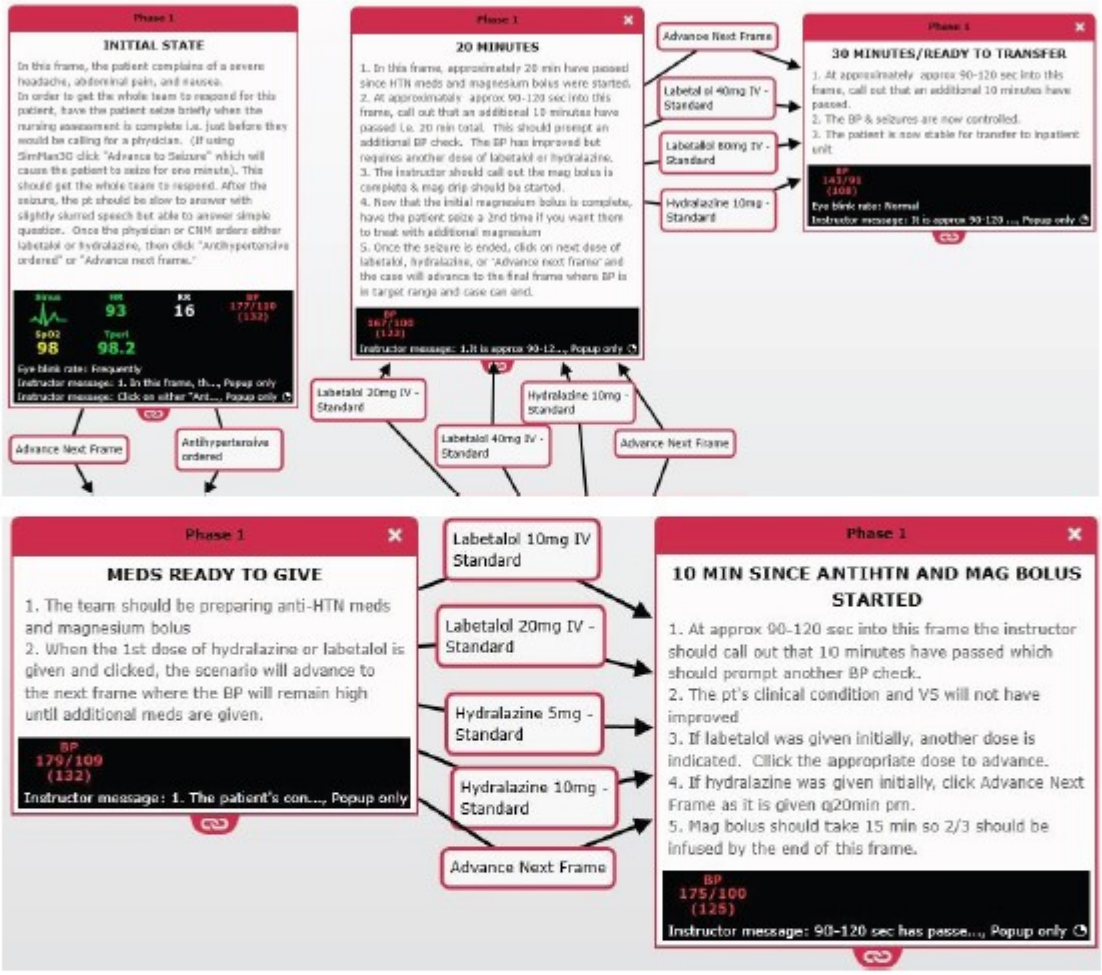

Figure 1. Event Menu

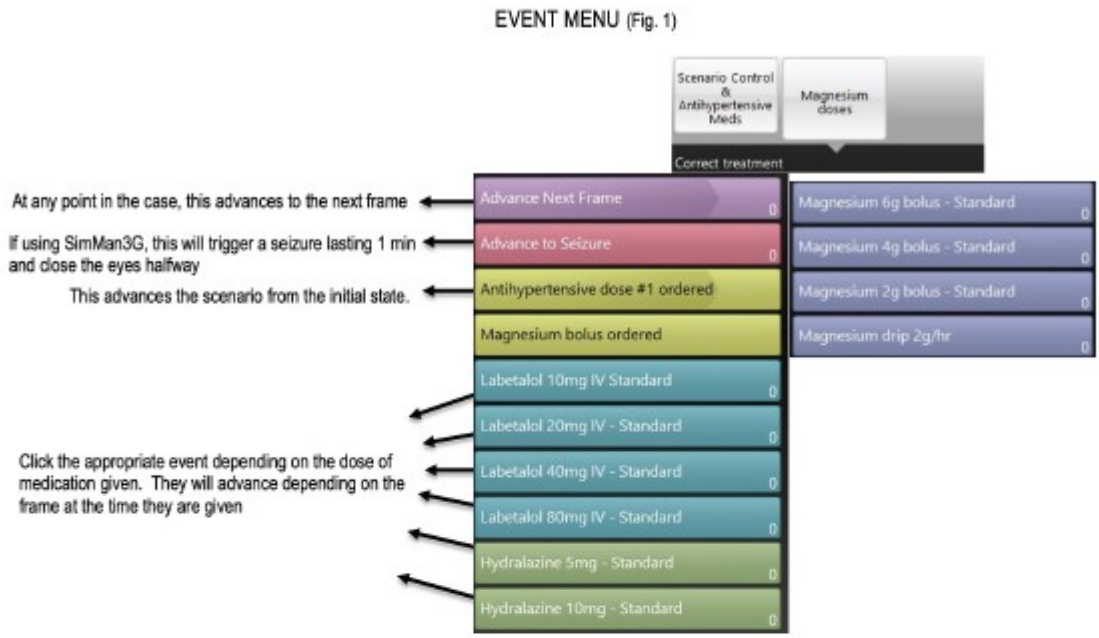

Figure 2. Event Menu (Resource Menu)

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Part 7: Debriefing objectives

Estimated Debriefing Time	20-45 minutes – will vary significantly depending on the detail of the discussion regarding medical management as well as considering what TeamSTEPPS concepts will be covered.
Debriefing Objectives	Recommend 2-3 TeamSTEPPS skills and 1-2 medical management issues for a maximum of 4-5 objectives
Teamwork & Communication Skills	
TeamSTEPPS	There are several TeamSTEPPS tools that the team will need to employ to successfully manage this case. There are a few that are especially applicable.
(TeamSTEPPS) 1. Initial SBAR to team	1. Establishing a shared mental model at the outset of the case: Initial SBAR from RN to responding team a. Did the critical information get relayed to the team? b. Did entire team and/or latecomers "receive" report? i.e. did they actually stop and listen or immediately jump into doing tasks?
(TeamSTEPPS) 2. Role Clarity – leaders, checklist reader	2. Role Clarity a. Was there clearly a lead physician and a lead nurse? b. Were there clearly understood roles/task clarity for other critical tasks? (including closed loop communication during assignment) c. Was there a designated checklist reader?
(TeamSTEPPS) 3. Call outs with QBL/VS and when tasks are complete	3. Other important communication: a. Call outs before meds are given and after medications have been given to reduce delays and potential errors b. Check backs (i.e. closed loop communication) e.g. RN call backs to confirm dosages

(TeamSTEPPS) 4. Situation monitoring and communication to maintain shared mental model	4. Situation Monitoring a. Situational Awareness b. Maintains shared mental model – briefing during case to keep up to date, assess response to treatment, and address challenges in treatment.
Medical Management	
(Medical Management) 1. Manage HTN using alternative medication regimens.	1. Identify the patient with postpartum preeclampsia with severe features with hypertensive emergency that progresses to eclampsia (i.e. SBP ≥ 160 OR DBP ≥ 105)
(Medical Management) 2. Manage refractory seizures with magnesium	2. Manage the patient with postpartum preeclampsia with severe features that progresses to eclampsia a. Treat hypertension per ACOG guidelines using alternative regimens that do NOT utilize labetalol. Since the patient seizes and is post-ictal, PO medications are not recommended. The team should treat BP with IV hydralazine + IV metoprolol b. Treat preeclampsia/eclampsia with magnesium. May require additional mag bolus for refractory seizures. c. Maintain airway and oxygenation – basic airway positioning, optional intubation

Improving Health Care Response to Hypertensive Disorders of Pregnancy, a CMQCC Quality Improvement Toolkit, 2021.

Outpatient Management of Preeclampsia Without Severe Features

Martha Rode, MD, Stanford University School of Medicine

Key Principles

1. Outpatient management of preeclampsia should only be considered for patients without severe features, with stable disease and reassuring fetal assessment, and who are able to follow the recommended outpatient management plan.
2. Hospital admission is necessary for any patient who develops preeclampsia with severe features.
3. Women with preeclampsia without severe features should be admitted and delivered at 37 weeks of gestation.

Background

Once providers diagnose preeclampsia based on new-onset systolic BP ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg, and new-onset proteinuria, or signs and symptoms of preeclampsia, they must decide if the woman has preeclampsia with or without severe features. The criteria for preeclampsia with severe features are listed in Appendix B: Suspected Preeclampsia Algorithm on page 178. Outpatient treatment should only be considered for women who have preeclampsia without severe features, who are less than 37 weeks of gestation, and only after providers confirm fetal wellbeing and maternal stability.[1-3]

A complete initial evaluation is required in order to document the severity of preeclampsia. This evaluation should include the following: serial BP values, proteinuria assessment (protein/creatinine ratio or 24-hour urine for protein), complete blood count (CBC) with platelet count, aspartate aminotransferase (AST), alanine aminotransferase (ALT), Creatinine (Cr) and lactate dehydrogenase (LDH).[1-2] The patient should be questioned thoroughly regarding possible associated symptoms of epigastric or right upper quadrant abdominal pain, headache, and significant visual disturbances. Fetal assessment should include non-stress test (NST) or biophysical profile (BPP), ultrasound assessment of fetal growth and amniotic fluid volume.

There are currently no national guidelines on the length of observation period necessary to determine whether a woman can be managed on an outpatient basis. The consensus among the CMQCC Task Force on Hypertensive Disorders of Pregnancy was for a minimum of 4-6 hours observation, and many felt that up to 24 hours observation may be needed. After observation, providers must determine whether a patient has a diagnosis of preeclampsia without severe features, and is therefore a candidate for outpatient management. During this time, providers should obtain several BP values, and review laboratory results, perform fetal assessment (NST/ultrasound), question the patient, and monitor for possible associated symptoms. If concerning results are obtained, this period of observation may be extended. This extended observation would allow time to administer betamethasone and collect a formal 24-hour urine protein (if clinically

appropriate) while continuing to monitor BP values, symptoms and laboratory values.

As noted in the section on gestational hypertension in this Toolkit, ACOG recently recognized the diagnosis of white coat hypertension.[4] Defined as elevated blood pressure primarily during medical appointments, white coat hypertension may represent approximately 15% of patients with hypertension noted during an office visit. Importantly, patients with white coat hypertension should be followed closely, as 8% will progress to preeclampsia and 40% will develop gestational hypertension. For women with suspected white coat hypertension, ambulatory, or at-home, blood pressure monitoring is suggested to help in the diagnosis and management of these conditions. [5,6] (See Section: Accurate Blood Pressure Measurement on page 45)

Outpatient management

The goal of outpatient management for women who have preeclampsia without severe features is to ensure early identification of severe features. Should preeclampsia with severe features develop, we recommend maternal hospitalization, and timely delivery before significant maternal or fetal morbidity occurs.

If any abnormalities in either maternal or fetal assessments are consistent with severe features of preeclampsia, further management should occur in the hospital. If the patient is > 34 weeks of gestation and has preeclampsia with severe features, delivery is always indicated. In cases where gestational age is < 34 weeks of gestation, **inpatient** observation may be considered. (See Section: Severe Hypertension or Preeclampsia with Severe Features at < 34 Weeks of Gestation on page 111)

If preeclampsia without severe features is diagnosed and the patient is considered to be a candidate for outpatient management, the following criteria must be met:

- ☐ A clearly documented follow-up plan that is understood and agreed to by the woman and the partner/family. They should be able to articulate the signs and symptoms that would be consistent with severe features and understand that if these signs are present, the woman needs to return to the hospital immediately--regardless of the day of the week or time of the day.
- ☐ The follow-up plan should include twice-weekly maternal and fetal assessment with BP checks, a review for new signs and symptoms of preeclampsia, NST and amniotic fluid index (AFI) or BPP, and repeat labs at least weekly (Of note, the amount of proteinuria over the diagnostic threshold is no longer a criterion for diagnosis of preeclampsia with severe features, so this test does not need to be repeated). Continue performing growth ultrasounds every 3 weeks.
- ☐ Patients demonstrating borderline severe BP of 155/105 mm Hg range should be observed in the hospital for a minimum of 24-48 hours for evaluation of severity of disease.
- ☐ The seriousness of a diagnosis of preeclampsia and the possibility of long-term maternal or fetal morbidities or mortality should be described in terms the patient and family can understand. Signs and symptoms which should prompt urgent in-hospital evaluation or a 911 call for emergency assistance should be reviewed in detail. Again, the family should be aware of these and provided with an information sheet. (See Appendix H: Patient Clinical Summary: Severe Maternal Event on page 200) It is helpful to have the patient/family member verbally repeat these details back to the care provider to ensure understanding. (See Section: Patient Education on page 65)

- ☐ Confirm that the woman's living situation, distance from hospital and available transportation methods allow for frequent trips for evaluation or urgent transport to the hospital. Confirm that she will not have additional responsibilities, such as primary care of children or the expectation to continue working, etc. Specific questions such as "Who will care for your small children during the day if you need to come in for an evaluation? How will you come in for appointments and will you be able to have someone with you?" may better clarify constraints to timely assessment when indicated. (See Section: Patient Education on page 65)
- ☐ It is important the woman agrees and consents to outpatient management as this approach may be associated with a higher risk for adverse outcomes compared to inpatient management.
- ☐ There is no evidence that strict bedrest, sometimes ordered as "bedrest with bathroom privileges", is beneficial in HDP. In fact, this level of immobilization has been demonstrated to increase the risk of VTE after as little as 48 hours. In addition, deconditioning and loss of muscle mass is another harmful effect of this approach. Patients should be encouraged to engage in normal daily activities, without strenuous exercise. Home BP monitoring should be encouraged.

The goal of outpatient management for women who have preeclampsia without severe features is to ensure early identification of severe features if and when they occur. (See Preeclampsia with severe features at < 34 weeks on page 111) If a woman develops any sign of preeclampsia with severe features she should be admitted to the hospital and the plan of care modified appropriately:

At < 34 weeks of gestation, a woman diagnosed with preeclampsia with severe features should be managed at a facility with capability to manage both maternal and neonatal care.

At > 34 weeks, a woman diagnosed with preeclampsia with severe features should be admitted to the hospital and delivery should be expedited.[3]

If the patient's diagnosis continues to be preeclampsia without severe features, delivery should be scheduled at 37 weeks.

EVIDENCE GRADING
LEVEL OF EVIDENCE: B

References

1. ACOG. Gestational hypertension and preeclampsia: Practice Bulletin No. 222 of the American College of Obstetricians and Gynecologists. Obstetrics and Gynecology 135, 1492-1495, doi:10.1097/AOG.0000000000003892 (2020).
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3. Sibai, B. M. Evaluation and management of severe preeclampsia before 34 weeks of gestation. American Journal of Obstetrics and Gynecology 205, 191-198, doi:10.1016/j.ajog.2011.07.017 (2011).
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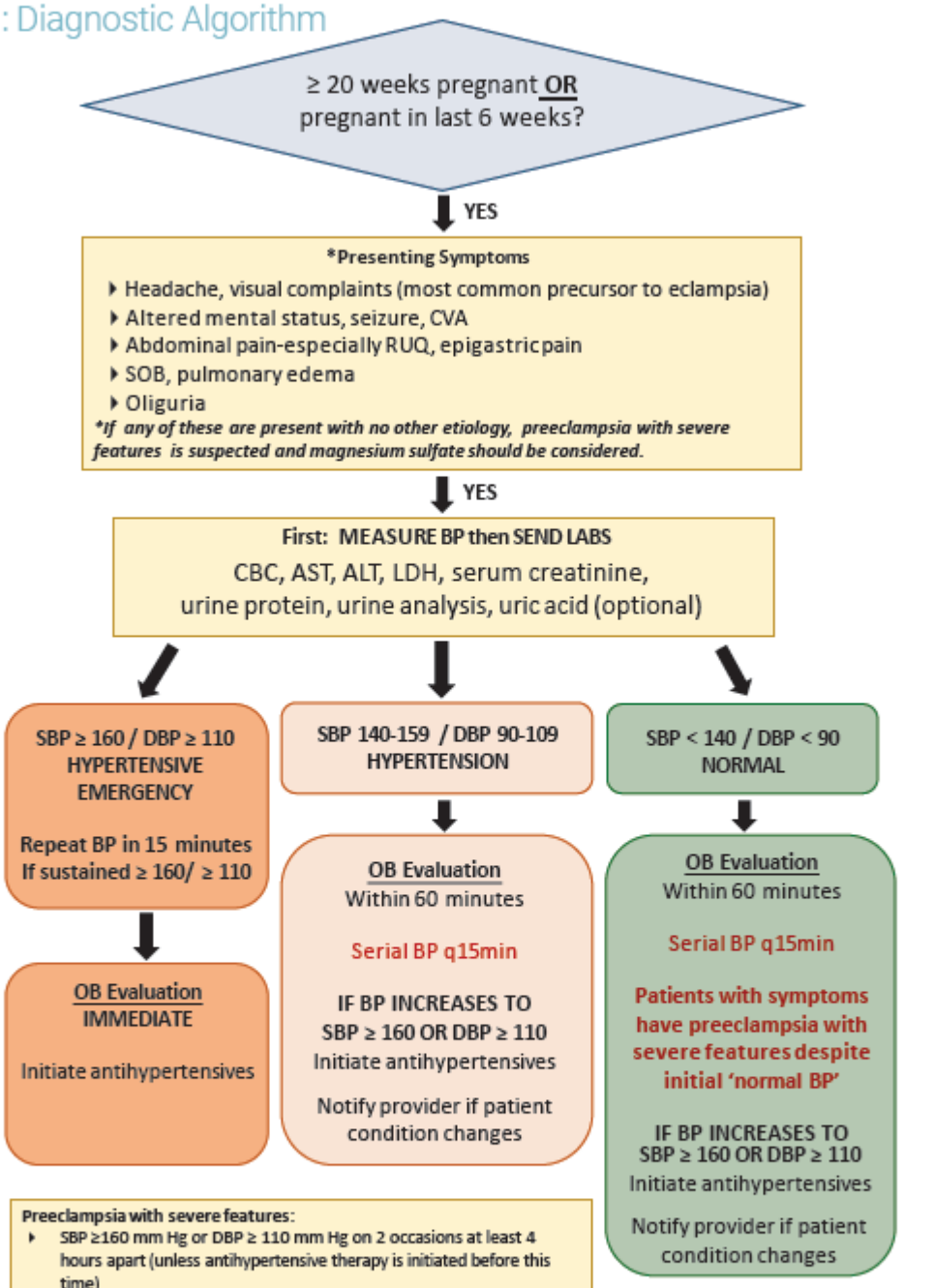
6. Johnson, S., Liu, B., Kalafat, E., Thilaganathan, B. & Khalil, A. Maternal and perinatal outcomes of white coat hypertension during pregnancy: A systematic review and meta-analysis. Hypertension 76, 157-166, doi:10.1161/ HYPERTENSIONAHA.119.(2020).

Appendix E: Acute Treatment Algorithm

Part 1: Diagnostic Algorithm



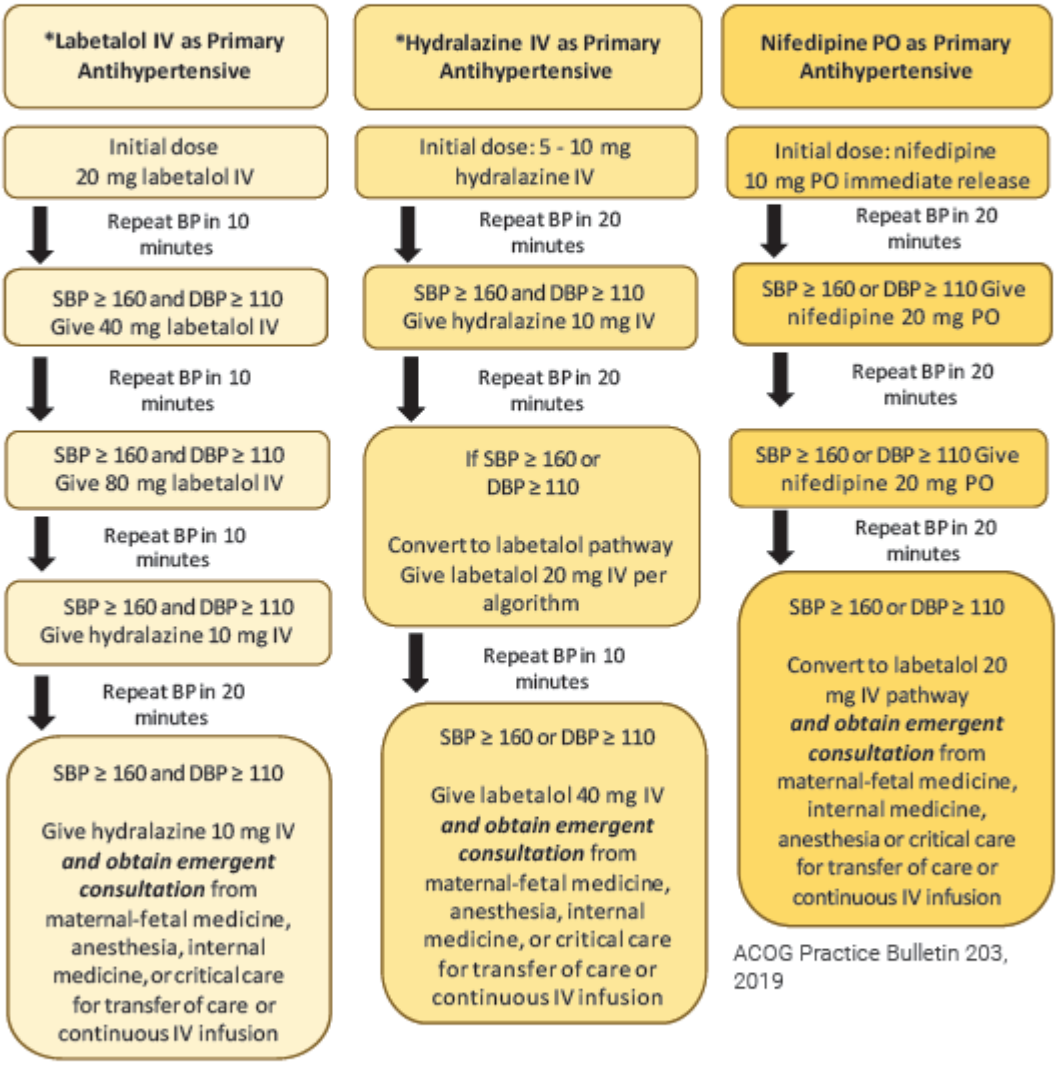
ACOG Practice Bulletin 222, 2020

This figure was adapted from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds.

Part 2: Antihypertensive Treatment Algorithm for Hypertensive Emergencies

Treatment Recommendations for Sustained Systolic BP ≥ 160 mm Hg or Diastolic BP ≥ 110 mm Hg

*Antihypertensive treatment and magnesium sulfate should be administered simultaneously. If concurrent administration is not possible, antihypertensive treatment should be 1st priority.



ACOG Practice Bulletin 203, 2019

Target BP: 130-150/80-100 mm Hg

Once BP threshold is achieved:
- Q10 min for 1 hr
- Q15 min for 1 hr
- Q30 min for 1 hr
- Q1hr for 4 hrs

*Intravenous hydralazine or labetalol should be given over 2 minutes. In the presence of sinus bradycardia or a history of asthma, hydralazine or nifedipine are preferred as initial agents. If maternal HR > 110, labetalol is preferred.

This figure was adapted from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds.

Part 3: Magnesium Dosing and Treatment Algorithm for Refractory Seizures

Magnesium: Initial Treatment

1. Loading Dose: 4-6 gm over 20-30 minutes (6 gm for BMI > 35)
2. Maintenance Dose: 1-2 gm per hour
3. Close observation for signs of toxicity
   - Disappearance of deep tendon reflexes
   - Decreased RR, shallow respirations, shortness of breath
   - Heart block, chest pain
   - Pulmonary edema
4. Calcium gluconate or calcium chloride should be readily available for treatment of toxicity

For recurrent seizures while on magnesium

1. Secure airway and maintain oxygenation
2. Give 2nd loading dose of 2-4 gm Magnesium over 5 minutes
3. If patient still seizing 20 minutes after 2nd magnesium bolus, consider one of the following:
   - Midazolam 1-2 mg IV; may repeat in 5-10 min
     OR
   - Diazepam 5-10 mg IV slowly; may repeat q15 min to max of 30 mg
     OR
   - Phenytoin 1,250 mg IV at a rate of 50 mg/min
   - Other medications have been used with the assistance of anesthesia providers such as:
     - Sodium thiopental
     - Sodium amobarbital
     - Propofol
4. Notify anesthesia
5. Notify neurology and consider head imaging

Seizures Resolve

1. Maintain airway and oxygenation
2. Monitor vital signs, cardiac rhythm/EKG for signs of medication toxicity
3. Consider brain imaging for:
   - Head trauma
   - Focal seizure
   - Focal neurologic findings
   - Other suspected neurologic diagnosis
4. Reassure patient with information, support
5. Debrief with team before shift end

This figure was adapted from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds.

Diagnosis and Classification

Maurice L. Druzin, MD, Stanford University School of Medicine
Laurence E. Shields, MD, Marian Regional Medical Center, CommonSpirit Health

Key Principles

1. The current accepted terminology of preeclampsia (with and without severe features) replaces the prior definitions of "mild" and "severe" preeclampsia.[1]
2. If the patient has been diagnosed with gestational hypertension or preeclampsia, and meets the BLOOD PRESSURE diagnostic criteria for severe hypertension (≥ 160/110 mm Hg confirmed) she immediately meets the criteria for preeclampsia with severe features. **Do not wait to treat the hypertensive emergency!**
3. As many as one quarter of women with gestational hypertension will develop preeclampsia.

The current diagnosis and classification of hypertensive disorders of pregnancy is primarily based on ACOG Practice Bulletin No. 222, Gestational Hypertension and Preeclampsia, June 2020.[1] The current accepted terminology of preeclampsia (with and without severe features) replaces the prior definitions of "mild" and "severe" preeclampsia. In addition, the ACOG Practice Bulletin No. 203, Chronic Hypertension in Pregnancy, published January 2019, defined chronic hypertension as hypertension diagnosed or present before pregnancy or before 20 weeks of gestation; or hypertension that is diagnosed for the first time during pregnancy and that does not resolve in the postpartum period. Chronic hypertension with superimposed preeclampsia is defined as preeclampsia in a woman with a history of hypertension before pregnancy or before 20 weeks of gestation.[2]

The expanded list of risk factors for preeclampsia as noted in Box 1 of ACOG Practice Bulletin #222 (See right) is important to heighten clinician awareness about the patients who are at greatest risk for developing preeclampsia. Greater clinical awareness should aid in the earlier detection of this condition, allowing for earlier implementation of appropriate management.

Box 1: Risk Factors for Preeclampsia

- Nulliparity
- Multifetal gestations
- Preeclampsia in a previous pregnancy
- Chronic hypertension
- Pregestational diabetes
- Gestational diabetes
- Thrombophilia
- Systemic lupus erythematosus
- Pre-pregnancy body mass index greater than 30
- Antiphospholipid antibody syndrome
- Maternal age 35 years or older
- Kidney disease
- Assisted reproductive technology
- Obstructive sleep apnea

Gestational hypertension and preeclampsia. ACOG Practice Bulletin No. 222. American College of Obstetricians and Gynecologists. Obstetrics and Gynecology 2020;135:e237–60. Reprinted with permission from the American College of Obstetricians and Gynecologists.

Appendix D- Section 3 Response

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Resources: Tools and Tables

L&D Severe Preeclampsia & Eclampsia Box – Content and Dose Guideline page from CMQCC Toolkit

Resources: Additional Sources

Onset and Duration of magnesium sulfate therapy	CMQCC "Preventing and Managing Eclamptic seizures" page 126
Postpartum patient education	Urgent Maternal Warning Signs
Labetalol	ACOG Labetalol Algorithm
Hydralazine	ACOG Hydralazine Algorithm
Oral Nifedipine	ACOG Immediate-Release Oral Nifedipine Algorithm

Appendix E- Section 4 Reporting

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Box 1: SBAR-R-R communication technique

Prepare for an SBAR-R-R by:

1. Assessing the patient
2. Reviewing recent notes and laboratory results
3. Having the medical record available during the conversation

Situation: Always identify yourself, where you are calling from, the name of the woman you are calling about. Quickly state the main reason and the level of urgency for the call.

Background: Give brief pertinent background information including medical history, complaints, vital signs, and interventions that have already occurred.

Assessment: Say what you think is going on.

Recommendation: Say what you think should happen or ask for specific orders.

Reasoning: If the response is not what you expect and requested, state why what you think should happen is important. What could happen if we don't do this?

Ratification: Close the loop by confirming actions to be taken. Assure mutual agreement on the plan.

This box is original content from the Improving Health Care Response to Preeclampsia: A California Quality Improvement Toolkit, funded by the California Department of Public Health, 2014; supported by Title V funds. © 2014 California Department of Public Health.

Table 2: Sample SBAR-R-R scenarios applied to preeclampsia

Scenarios	Ambulatory Care or Emergency Department	Inpatient Antepartum or Intrapartum	Postpartum
Situation	I am calling about Ms. ___, who ❑ is pregnant ❑ recently had a baby and is here in the ED with stomach pain. I am concerned about: ▸ High BP ▸ Headache ▸ Visual disturbances ▸ Decreased fetal movement ▸ Nausea and vomiting	I am calling about Ms. ___, who is an antepartum patient being monitored for preeclampsia. I am concerned about: ▸ New-onset headache ▸ Increasing BP ▸ Headache that has not resolved ▸ Visual disturbances ▸ Abdominal pain ▸ Abnormal or indeterminate fetal status ▸ Altered or worsening lab values	I'm calling about Ms. ___ who had her second baby yesterday at 3 pm. I am concerned about: ▸ New-onset headache ▸ Increasing BP ▸ Headache that has not resolved ▸ Visual disturbances ▸ Stomach pain ▸ Altered/worsening lab values
Background	▸ G_P_ @__weeks or G_P_ #days post birth ▸ Significant OB and medical history ▸ Current problems ▸ Patient complaints ▸ Vital signs ▸ Interventions and response	▸ G_P_ @__weeks ▸ Significant OB and medical history ▸ Current problems ▸ Patient complaints ▸ Vital signs ▸ Fetal heart rate (FHR) tracing baseline, variability, accelerations, decelerations ▸ Uterine activity ▸ Interventions already completed	▸ G__P__ ▸ Mode of birth (vaginal/cesarean) ▸ Significant OB and medical history ▸ Current problems ▸ Patient complaints ▸ Vital signs ▸ Interventions already completed

Scenarios	Ambulatory Care or Emergency Department	Inpatient Antepartum or Intrapartum	Postpartum
Assessment	▸ I'm thinking she may have preeclampsia and needs an OB evaluation before we can clear her ▸ I'm concerned she may have preeclampsia with severe features and needs medication to control her blood pressure now	▸ Her preeclampsia seems to be progressing and her BP values indicate hypertension or preeclampsia with severe features ▸ The FHR tracing is indeterminate and the decelerations do not resolve with position change	I'm thinking that her increasing BP values and new-onset headache may represent preeclampsia and that she would benefit from an initial preeclampsia workup
Recommendation	▸ Could you please come and evaluate her within___? • Now • Within 30 min • Before___, etc. ▸ Could I have orders for:___ • CBC, liver function, kidney function • Antihypertensive ▸ Magnesium sulfate	▸ I need you to come and evaluate her now. ▸ May I please have an order for antihypertensive medication? ▸ Are there any labs we need to repeat? ▸ When can I expect you?	▸ May I have an order for a preeclampsia lab panel? ▸ When can I expect you in to evaluate Ms. ___?
Reasoning	▸ I don't think it is safe to send her home without evaluating the possibility of preeclampsia ▸ If we don't lower her BP to a safer range, she could have a stroke	▸ It is really important to control her BP while we make preparations to proceed to delivery ▸ If we don't lower her BP to a safer range, she could have a stroke	It's important for us to get baseline data before considering discharge in the morning

Scenarios	Ambulatory Care or Emergency Department	Inpatient Antepartum or Intrapartum	Postpartum
Ratification	Ok, I'll do___, and you'll evaluate her in ___ or call ___ for ___	Ok, I'll do___, and you'll be here to evaluate her in ___	OK, I'll do ___ and you'll be in to evaluate her in ___

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Building collaborative culture and problem-solving skills

Nurse-led multidisciplinary obstetric patient summaries (MOPS) are one strategy for improving communications around patient care.[36] As a regular practice, every patient should be discussed by the multidisciplinary team each shift. This might occur at board rounds with the entire labor and delivery team, or might be a two-person process, involving the attending physician or midwife and bedside nurse, with additional consultation from anesthesia, maternal-fetal-medicine, charge nurse, or others as needed for patient complexity. The exact make-up and logistics for each team will depend on local conditions and needs.

All care providers are encouraged to consider elements of concern or potential risks by pondering questions such as:

- What potential risks exist for this patient? (e.g., risk of stroke, eclampsia, hemorrhage, or fetal injury)
- Are there trends that indicate concern? (e.g., vital signs, fetal trends, lab trends, headache, malaise, nausea, abdominal pain, or scotomata)
- Is there any information or task that I don't understand or know how to perform?
- What is the plan of care based on the given information?
- Do I feel uncomfortable or I am concerned about the plan of care?
- Do I feel qualified or do I feel inexperienced in caring for a patient like this?
- Are there concerns I would like to have addressed?

EVIDENCE GRADING
LEVEL OF EVIDENCE: B

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Appendix F- Section 5 Respectful Care

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