Development and Evaluation of a Protocol: Caring for Patients with Preeclampsia in a Community Hospital

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Development and Evaluation of a Protocol: Caring for Patients with Preeclampsia in a Community Hospital

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Abstract

Problem: The United States has some of the worst maternal mortality and morbidity rates for a developed nation and these rates are on the rise, which has profound implications for the well-being of mothers, their children, and the communities in which they reside. With the incidence of preeclampsia of three to five percent, one recommendation for improvement in maternal morbidity and mortality is with the standardization of care by providers and bedside nurses when caring for patients. With the standardization of care and use of evidence-based protocols, maternal health can be improved.

Aim: The aim of this quality improvement project was to create a protocol for obstetric care providers and nurses to use that will improve outcomes for patients diagnosed with preeclampsia in a community hospital setting. The evidence-based practice protocol is designed to enhance the care for women in pregnancy and the immediate postpartum period.

Method: Following a thorough review of the literature, an evidence-based practice protocol was developed for a community hospital in Southern Johnson County, Kansas. This protocol was evaluated by both providers and bedside nurses with at least 5 years of obstetric experience using a validated and reliable tool for protocol evaluation. There was an opportunity for participants to offer comments and concerns, which was considered for inclusion in a revised protocol.

Results: After the evaluation of the protocol, comments as well as evaluation ratings were considered. A revised protocol was created and presented to practice committees for use at the community hospital.

Keywords: hypertension, preeclampsia, pregnancy, quality improvement, protocol

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1: Introduction

Maternal mortality and morbidity are a worldwide concern. In 2000, the United Nations presented the Millennium Development Goals (MDG) which were intended as a health blueprint for all countries. Of the eight goals, one was to decrease worldwide maternal mortality and morbidity by 75% by 2015 (Jacobsen, 2019). From 2000 to 2014, maternal mortality and morbidity trended the opposite direction in the continental United States, while being reduced 44% worldwide (MacDorman et al., 2016; Jacobsen, 2019). "The well-being of mothers, infants, and children determines the health of the next generation and can help predict future public health challenges for families, communities, and the medical care system" (Office of Disease Prevention and Health Promotion, 2018, para 1).

The maternal mortality and morbidity rate in the United States is staggering. According to the Central Intelligence Agency, the United States ranks 49th out of 184 countries for maternal mortality, higher than any other developed country, and it is still on the rise (Central Intelligence Agency, 2018). This concerning fact has caught the attention of many influential practice leaders in women's health including the American Congress of Obstetrics and Gynecologists (ACOG), American College of Nurse-Midwives (ACNM), Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN), and the California Maternal Quality Care Collaborative (CMQCC).

The use of protocols, triggers, bundles, and checklists have led to improved outcomes for women when implemented to address practice concerns (Arora et al., 2016). The goal of implementing an evidenced-based protocol is to improve the outcomes for women, improve the readiness of the unit to care for patients at risk for or diagnosed with a complication, and to

enable the providers to better recognize the women that are at risk for complications in order to make a timely and accurate diagnosis (Bernstein et al., 2016).

2: Problem and Significance

Maternal mortality and morbidity are concepts that are often used in conjunction with one another and are therefore often combined in the literature and in discussion. Independently, maternal mortality is a complicated concept with different terminology used to describe this phenomenon. First, there is pregnancy-related death. Pregnancy-related death is universally defined as the death of any woman, from any cause, while pregnant or within one calendar year of termination of pregnancy (Center for Disease Control [CDC], 2018). In contrast maternal death is defined as the death of a woman while pregnant and within 42 days of termination of pregnancy (CDC, 2018). The differing definitions that fall under the category of maternal mortality may lead to challenges interpreting the rates of mortality.

Maternal morbidity is more difficult to define because of the lack of a unified reporting system and inconsistent terminology (Koblinsky et al., 2012). Maternal morbidity, which refers to "any physical or mental illness or disability directly related to pregnancy and/or childbirth" (Koblinsky et al., 2012, p. 125), may not be life-threatening but can significantly impact quality of life. Maternal morbidity is classified as severe maternal morbidity (SMM) or non-severe maternal morbidity, but the literature is not always consistent with these phrases. Despite inconsistencies in reporting, there is an increase in severe maternal morbidity by 106% in the last decade (Gibson, Rohan & Gillespie, 2017). Morbidities, or obstetric or maternal complications, related to preeclampsia include, but are not limited to, increased risk of diabetes and hypertension recurrence, increased risk of preeclampsia in future pregnancies, early delivery of infant, admission to Intensive Care Unit, renal failure, stroke, respiratory failure, eclampsia,

HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome, organ failure, disseminated intravascular coagulation, and death (ACOG, 2013; August & Sibai, 2018; Supplee, Bingham, & Kleppel, 2017; Sutton, Harper, & Tita, 2018).

Hypertensive disorders of pregnancy encompass several diagnoses. More than 10% of pregnancies are affected by a hypertensive disorder (Sutton, Harper, & Tita, 2018). Classically, hypertension is defined as a systolic blood pressure of greater than or equal to 140 mm Hg and/or a diastolic blood pressure of greater than or equal to 90 mm Hg (ACOG, 2013). But, hypertension may develop during the pregnancy and may lead to maternal morbidity and/or mortality. Hypertensive disorders of pregnancy include preeclampsia, eclampsia, gestational hypertension, chronic hypertension with superimposed preeclampsia, and HELLP Syndrome. For this project, there will be a focus on differentiating gestational hypertension from preeclampsia. See Figure 1 for diagnostic criteria for those hypertensive disorders reviewed below.

Chronic Hypertension	• BP of ≥ 140 mm Hg systolic or ≥ 90 mm Hg prior to conception • Identified prior to 20 weeks gestation • Continues after 12 weeks gestation • Use of antihypertensive medications prior to pregnancy
Preeclampsia	• BP of ≥ 140 mm Hg systolic or ≥ 90 mm Hg or higher on 2 occasions greater than 4 hours apart • Occurring after 20 weeks gestation • Proteinuria
Severe Features of Preeclampsia	One or more of the following: • BP of ≥ 160 mm Hg systolic or ≥ 110 mm Hg • Thrombocytopenia • Renal insufficiency • Impaired liver function • Pulmonary edema • Cerebral or visual symptoms
Chronic Hypertension with Superimposed Preeclampsia	• BP of ≥ 140 mm Hg systolic or ≥ 90 mm Hg • Sudden increase or new-onset of proteinuria • Worsening of hypertension • Any of the severe features of preeclampsia
Gestational Hypertension	• BP of ≥ 140 mm Hg systolic or ≥ 90 mm Hg after 20 weeks gestation • No proteinuria or other signs of preeclampsia • Resolves by 12 weeks postpartum

Figure 1. Hypertensive disorders of pregnancy diagnostic criteria table. Adapted from ACOG, 2017. BP= Blood pressure, measured in mmHg.

Preeclampsia is one of the hypertensive disorders of pregnancy and is a common cause of maternal morbidity, and occasionally mortality (ACOG, 2013). Preeclampsia is categorized as either preeclampsia without severe features or preeclampsia with severe features. Preeclampsia is defined as a blood pressure of greater than or equal to 140 mm Hg systolic and/or 90 mm Hg diastolic on 2 occasions at least 4 hours apart in a patient in a previously normotensive patient that is greater than 20 weeks gestation and proteinuria of greater than or equal to 300 mg per 24-hour urine collection or protein/creatinine ratio of greater than 0.3 mg/dL. In the absence of proteinuria, preeclampsia can also be diagnosed by the patient having thrombocytopenia with platelet count of less than 100,000/microliter, serum creatinine concentrations of greater than 1.1 mg/dL in the absence of other renal disease, elevated blood concentrations of liver transaminases to twice normal concentration, pulmonary edema, and/or cerebral or visual symptoms. Preeclampsia with severe features is when any of the following criteria are met: (a) blood pressure of 160 mm Hg systolic or higher or 110 mm Hg diastolic or higher on two occasions at least 4 hours apart while the patient is on bedrest; (b) oliguria with urine output of less than 500 mL in 24 hours; (c) persistent headache unrelieved by analgesics or with visual disturbances; (d) pulmonary edema; (e) epigastric or right upper quadrant pain; (f) impaired liver functions greater to or equal to twice the upper limits of normal; (g) thrombocytopenia; or (h) renal insufficiency (ACOG, 2013; August & Sibai, 2018; Sutton, Harper, & Tita, 2018).

Gestational hypertension is defined as hypertension, in the absence of proteinuria, beginning after 20 weeks gestation in a pregnant woman. Chronic hypertension is elevated blood pressures diagnosed prior to 20 weeks gestation, although this is more accurately diagnosed when a patient is not pregnant. Additionally, women that are prescribed, and taking,

antihypertensive medications prior to pregnancy are considered to have chronic hypertension. Hypertension that continues beyond 12 weeks postpartum is classified as chronic hypertension.

The final hypertensive disorder of pregnancy is chronic hypertension with superimposed preeclampsia. This is diagnosed when a patient with preexisting chronic hypertension develops preeclampsia (ACOG, 2013). This is suspected when the woman has a sudden increase in blood pressure in a woman with a previously well-controlled blood pressure regardless of use of anti-hypertensive medication or new onset of proteinuria. This diagnosis has the highest risk of adverse outcomes (Sutton et al., 2018).

Epidemiologic Data

The leading causes of maternal mortality and morbidity in the United States are cardiovascular diseases (15.2%), non-cardiovascular diseases (14.7%), infection or sepsis (12.8%), hemorrhage (11.5%), cardiomyopathy (10.3%), thrombotic pulmonary embolism (9.1%), cerebrovascular accidents (7.4%), hypertensive disorders of pregnancy (6.8%), amniotic fluid embolism (5.5%), anesthesia complications (0.3%) (CDC, 2018). Preeclampsia and hypertensive disorders of pregnancy combined complicate five to eight percent of all pregnancies (Preeclampsia.org, 2010). The prevalence of preeclampsia is about 3.4% in the United States; however, it is 1.5 to 2 times higher in primigravida women (August & Sibai, 2018). Morbidity rates are more difficult to discern, but women that experience maternal morbidity are about 20 to 30 times more likely to die, which is known as maternal mortality (Firoz et al., 2013).

About half of these causes of maternal mortality and morbidity are preventable, and just over half of the maternal deaths occur in the postpartum period (Bingham et al., 2018). Among these causes, hypertensive disorders of pregnancy are a preventable cause of maternal mortality (Bernstein et al., 2017). Some of the complications that arise from preeclampsia in pregnancy

include risk of pre-term birth, cerebral complications, and long-term cardiovascular disease in women (Sutton et al., 2018). With the use of an evidenced-based protocol, facilities have been able to reduce blood pressures in a timely fashion leading to a decrease in cerebral complications (Bernstein et al., 2017). Women that have been diagnosed with preeclampsia are at a greater risk, a relative risk of 7.6 times, to have preeclampsia in subsequent pregnancies (Dhariwal & Lynde, 2018).

Standardized Policies

The California Maternal Quality Care Collaborative (CMQCC) is comprised of key stakeholders from a variety of healthcare disciplines with one purpose in mind, improve the maternal mortality and morbidity in California (CMQCC, 2018). CMQCC has published toolkits for healthcare professionals to adopt for use in their own facilities. CMQCC has standardized care for patients and has provided the information in resources, print and online. This willingness to share resources and knowledge is important because the use of standardized policies is essential to ensure that mothers are getting proper and timely care (Arora et al., 2016). Complications in pregnancy, those situations that lead to maternal mortality and morbidity, may occur without any warning. Using evidenced-based protocols can ensure that the women that experience a complication are cared for in a manner that improves outcomes (Arora et al., 2016). Protocols are very helpful to clinicians because it is a reminder of the baseline expectation for providers and of the actions that are expected (Arora et al., 2016).

Patient Education after Diagnosis

Nurses are often unprepared to offer self-care education to postpartum mothers upon discharge from the hospital (Suplee, Bingham & Kleppel, 2017). Patients may not be receiving evidenced-based information and education throughout their stay and at discharge, including the

precautions, signs and symptoms of emerging or worsening conditions, and appropriate follow-up (Suplee, Bingham, & Kleppel, 2017). Since nurses provide a majority of postpartum discharge instructions to patients, it is important that nurses are able to give high-quality and succinct information to patients that covers any and all key points to reduce maternal mortality and morbidity (Suplee, Kleppel, Santa-Donato, & Bingham, 2016). Standardizing the discharge teaching for postpartum women has been effective in reducing readmissions and postpartum mortality (Bingham, Suplee, Morris, & McBride, 2018).

3: Project Details

Design

The aim of this Doctor of Nursing Practice project was to develop an evidence-based, standardized policy and protocol for the care of women with hypertensive disorders of pregnancy during intrapartum and postpartum hospital care in a community hospital, including written discharge instructions for women diagnosed with hypertensive disorders of pregnancy. This protocol will help not only the providers, but also the frontline nurses, in providing timely care to patients that present with hypertension in pregnancy.

Theoretical Framework

The theoretical framework used for this project was the Iowa model, a framework used for implementation of evidenced-based practice that was first introduced in 1994 and has been revised since (Titler et al., 2001). The Iowa model starts with the premise that a change is necessary and a priority for the organization (see Figure 2). This model uses triggers, either problem- or knowledge-focused, to engage nurses in thinking about ways to improve efficiency or effectiveness of care. The model uses a team approach and will be modified slightly for this quality improvement project. The first step in the process is to determine a priority topic. A

thorough literature review should then be completed to assemble relevant research and related literature. Critiquing the research is completed as the project passes through practice committee. After the evidenced was critiqued and determined to be sufficient, the protocol was formed, a pilot change was implemented and then the protocol is adopted into practice.

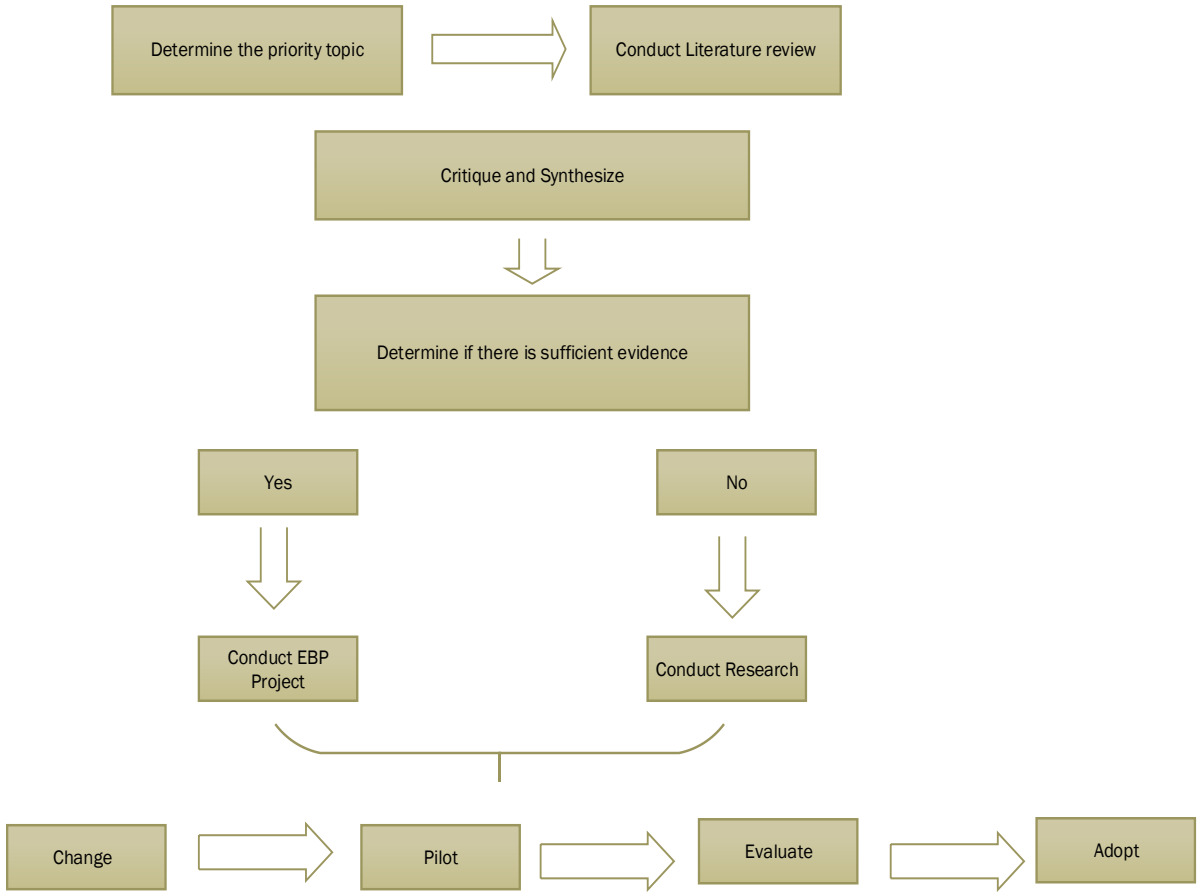

Figure 2. Modified IOWA Framework for evidenced based practice. Adapted from Titler et al., 2001.

Setting

The setting for this project was a community hospital in the Southern Johnson County area of Kansas that provides intrapartum and postpartum care for women. This hospital has approximately 1,400 deliveries per year. The providers that care for these women are a mix of obstetricians and family practice physicians. This facility has a Level II NICU that provides care for neonates (also called newborns) that are 32 weeks gestation and greater, not requiring a long-

term ventilator for breathing support. Many women choose the facility they deliver in based on the anticipated care for their newborn (March of Dimes, 2015). The implication is that pregnant women with moderate risk are seen at this facility. There was no standardized protocol for the care of women diagnosed with hypertensive disorders, including preeclampsia, at this facility. The care of these women is dependent on nursing knowledge and physician orders. Physician preference drives the type of diagnostic evaluation or work-up, use of antihypertensive medication, and even how often blood pressure readings were obtained.

Methodology

This project is a quality improvement project for evidenced based practice which is defined as a formal and systematic method to improve the processes of a healthcare system (Batalden & Davidoff, 2007). The project begins with a matrix review of the literature to determine what research pertains to the phenomenon of preeclampsia and medications used in the hospital setting. A thorough review of the literature, development of a protocol and evaluation of the protocol by an interprofessional team are discussed here.

Quality Improvement Determination. A determination of quality improvement was requested, and approved, for this project from the KUMC Human Subjects Committee/Institutional Review Board. The project qualified due to the project evaluating or improving the local implementation of widely-accepted clinical or educational standards that have been proven effective at other locations.

Review of Literature. An initial search using CINAHL, PubMed, MEDline, and Google Scholar was performed. The search terms were “maternal mortality and morbidity”, “preeclampsia”, “preeclampsia protocol”, “preeclampsia management”, “preeclampsia AND protocol”, “preeclampsia AND management”, “clinical practice guidelines”, and “preeclampsia

AND clinical practice guidelines". Inclusion criteria for review included: (a) full-text resources, (b) English language, (c) publication within 5 years, and (d) research that focused on protocols and guidelines for patients with preeclampsia. Greater attention was given to literature focusing on the maternal mortality and morbidity in the United States related to hypertensive disorders in pregnancy. A matrix review was created and included as part of the appendices (see Appendix A).

Research reviewed focuses on several aspects of the preeclamptic patient. In the area of medication, there are three medications routinely used for hypertensive emergencies: intravenous labetalol, intravenous hydralazine, and oral nifedipine (ACOG, 2013). These medications are often studied in research to determine the most efficacious. When reducing blood pressure in a pregnant patient, it is important to not reduce too quickly and lead to uteroplacental insufficiency (Gavit, Sharma, & Dixit, 2018). Research is split about the most effective medication to reduce blood pressure in women with a hypertensive emergency, but all research agrees that the difference is minimal. In studies comparing oral nifedipine and intravenous labetalol, oral nifedipine was found to be most effective in two studies by lowering the blood pressure the quickest (Gavit et al., 2018; Shekar et al., 2013). In contrast, comparing the two, labetalol has been effective with quicker results and less side effects in two studies (Dey et al., 2017; Padmaja & Sravanthi, 2017). Two studies found no difference in the efficacy of oral nifedipine and intravenous labetalol (Das et al., 2015; Kumari & Srilaxmi, 2016). Oral nifedipine and intravenous hydralazine have also been studied together. Sabir, et al, (2016) found intravenous hydralazine to be more effective and Sharma, et al, (2017) found no difference in the efficacy two medications.

The evidence explains why there are three choices of medication that reduce maternal blood pressure in a hypertensive emergency in pregnancy as the efficacy is very similar in all medications at reducing the critical blood pressures in pregnant women. Most importantly, early intervention, meaning treatment within one hour of confirmed high blood pressure, in the reduction of blood pressure is key to reducing maternal morbidity (Shields et al., 2017; Cleary et al., 2018). Some of the limitations of the studies include three of the studies were comparative studies (Das et al., 2015; Padmaja & Sravanthi, 2017; Sabir et al., 2016), while one was a retrospective cohort study (Cleary et al., 2018), and another was an observational study (Gavit et al., 2018). Four of the studies were randomized control trials, highly regarded in research (Dey et al., 2017; Kumari et al., 2016; Sharma et al., 2017; Shekhar et al., 2013). Inadvertently, research shows that using magnesium sulfate with antihypertensive medications is more effective than magnesium sulfate alone with a need to treat of 29 to prevent each case of eclampsia (Shields et al., 2017).

Development of Protocol. A thorough review of the literature related to preeclampsia was used to develop an evidenced-based protocol. This protocol was developed with the guidance of the toolkit provided by CMQCC (2014) and the recommendations from ACOG (2013). These published toolkits are designed for easy modification to fit different facilities while keeping patients at the forefront. The maternal early warning signs (MEWS) published by National Partnership for Maternal Safety was also used for input for this project (Mhyre et al., 2014). The MEWS is a tool that has been designed to facilitate initiation of prompt care for women who have symptoms related to emergent conditions, including impending decompensation or status change.

The evidenced-based preeclampsia protocol (see Appendix B) encompasses the care of women diagnosed with preeclampsia from initial evaluation through discharge of both pregnant and postpartum women. The protocol includes the care of postpartum women readmitted with hypertension or preeclampsia. The preeclampsia protocol also includes the recommended discharge instructions, along with teaching, for the women that have been diagnosed with preeclampsia during their pregnancy.

Evaluation of Protocol. After development, the protocol was presented and AGREE II instrument, designed by the Appraisal of Guidelines for Research and Evaluation, was shared with an interprofessional group of experts, via REDCap. Study data were collected and managed using REDCap electronic data capture tools hosted at The University of Kansas.

The evaluation form consisted of 23 Likert-type statements of agreement (see Appendix C) with an area for comments and suggestions with each evaluation statement. The AGREE II instrument is both valid and reliable. The AGREE II instrument has been used in protocol evaluations for clinical guidelines in postpartum women and infants in primary care (Haran et al., 2014), World Health Organization (WHO) guidelines in maternal health (Polus et al., 2012), and clinical practice guidelines for postpartum hemorrhage (Novo et al., 2016).

The participants included in the REDCap survey were seven OB/GYNs, eight Family Practice physicians that have delivery privileges at the hospital, six day shift Registered nurses with more than five years of labor and delivery experience, six night shift Registered nurses with more than five years labor and delivery experience and the nurse manager of the labor and delivery unit.

Analysis of Protocol. For the analysis, the Likert-type questions were reviewed to determine common levels of agreement amongst participants. The data was analyzed using the REDcap system, with descriptive statistics, including mean and range.

4: Results

Survey Results

There were 27 total invitations sent with 15 completed for a 55.6% completion rate. Of those invited to the survey, three OB/GYNs, three family medicine physicians and nine Registered nurses responded to the survey (see Figure 3).

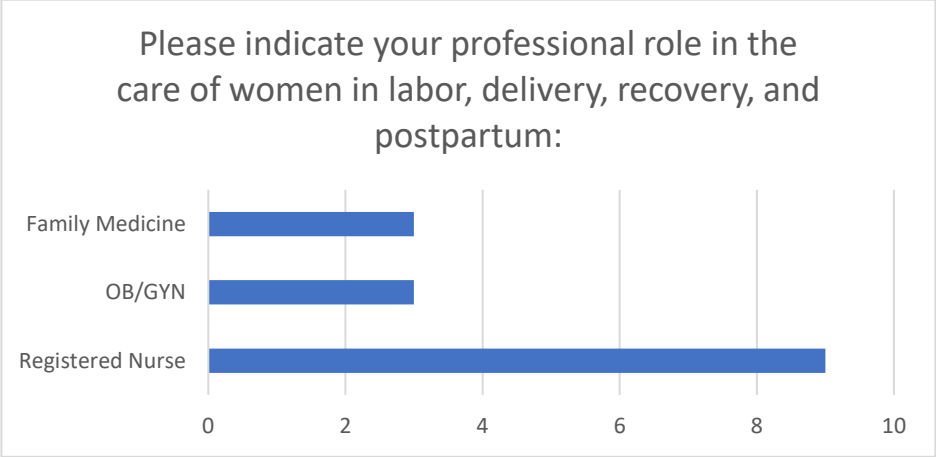

Figure 3. Breakdown of interprofessional participants, by role, in the preeclampsia protocol survey. Adapted from REDCap.

The AGREE II tool is divided into six domains. The first domain focuses on scope and purpose. All respondents to the survey answered positively to the overall objective being specifically described and the health questions in the guideline being specifically described in the protocol. The population to whom the guideline is meant to specifically describe statement yielded 86.7% partially agree or strongly agree answers.

The second domain of the AGREE II tool asks respondents to rate level of agreement with statements relating to stakeholder involvement. Of all respondents, 87% either agree or

strongly agree the protocol includes individuals from all relevant professional groups. The views and preferences of the target population being sought was either agreed or strongly agreed by 80%. Rounding out the second domain, 80% either agreed or strongly agreed that the target users of protocol were clearly defined.

The bulk of the AGREE II tool is in the third domain, which covers statements relating to the rigor of development. This domain questions methods, benefits, and updating the protocol. Even though 86.7% either agree of strongly agree that systematic methods were used to search for evidence only 66.7% either agree or strongly agree that the criteria for selecting the evidence was clearly defined and 26.7% of respondents disagree. Of the respondents, 80% either agreed or strongly agreed that the strengths and limitations of the body of evidenced were clearly described as well as the recommendations were clearly described; however, the other 20% either disagreed or were neutral. For the health benefits, side effects, and risks being considered in formulating recommendations, 86% either agreed or strongly agreed. The remaining participants were neutral. None of the respondents disagreed in any form to a link between the recommendation and the supporting evidence and 80% either agreed or strongly agreed to the link. There were 40% of the participants neutral and 60% that either agreed or strongly agreed that the guideline had been externally reviewed by experts prior to its publication. Even though 40% of participants strongly agreed that there is a procedure for updating the protocol, 26.7% disagree.

The clarity of presentation was the focus of the fourth domain with only three statements. All respondents at least partially agreed that the recommendations are specific or unambiguous and that the key recommendations are easily identifiable. There was 6.7% of the respondents that partially disagreed that the different options for management of the condition or health issue were clearly presented but 87% either agreed or strongly agreed to the statement.

In the fifth domain, applicability of the protocol was the focus. This domain started with a statement about the protocol describing facilitators and barriers to its applications and 20% of the respondents either disagreed or partially disagreed, 20% were neutral, and 60% either agreed or strongly agreed to the statement. All respondents were either neutral or agreed in some format, and over 50% strongly agreed, that the protocol provides advice and/or tools on how the recommendations can be put into practice. The potential resource implications of applying recommendation have been considered was either agreed or strongly agreed by 80% of the respondents. Two respondents disagreed that the protocol presents monitoring and/or auditing criteria, while over 73% either agree or strongly agree that the criteria is present in the protocol.

The final domain had two statements about the editorial independence. Of the responses, 86.7% either agree or strongly agree that the views of the funding body have not influenced the content of the guideline while the other responses were neutral. The final question of the tool asked respondents to rate the competing interests of the guideline being recorded and addressed and over half of the respondents were neutral and the others either agreed or strongly agreed.

Respondents were then asked to rate the overall quality of the guideline with a scale ranging from one to seven where the “1” is the lowest quality and the “7” is the highest quality, 26.7% selected a five, 40% selected a six, and 33.3% selected a seven (see Figure 4).

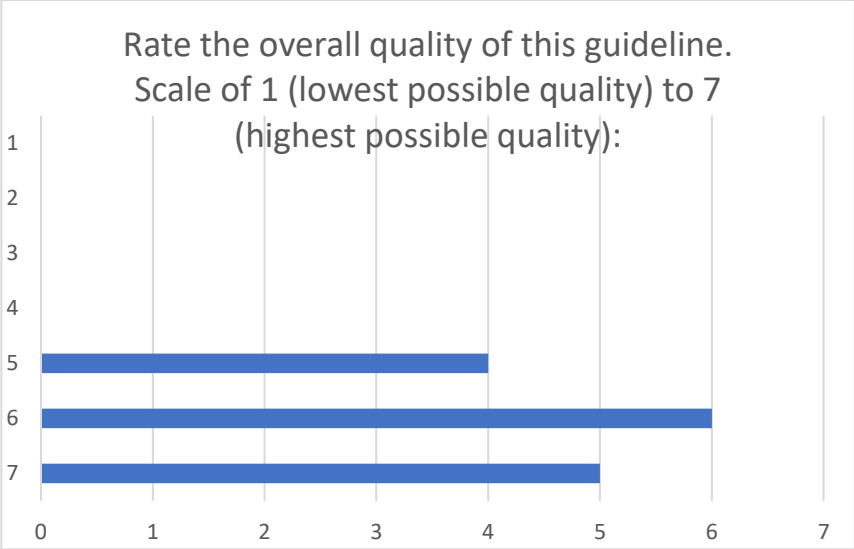

Figure 4. Participant rankings of overall quality of the preeclampsia protocol. Adapted from REDCap.

When asked if the participants believe the protocol should be put into use, all respondents replied "yes" or "yes with edits" (see Figure 5).

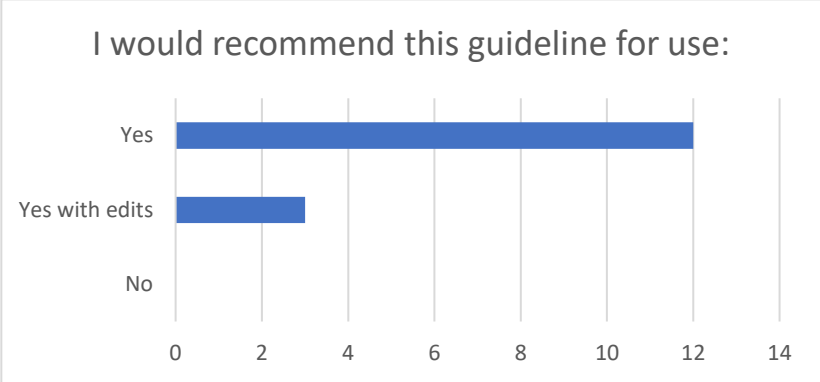

Figure 5. Bar graph of participants response about recommendation for use of the guideline. Adapted from REDCap.

All participants had an opportunity for comments, including the following prompts: changes they would like to see, what they liked about the protocol, and perceived barriers to implementation. Comments regarding suggested improvements to the protocol include one from a participant that found an error in the hydralazine algorithm and clarification about who is to follow the protocol, physicians or nurses. Other comments include "great improvement to

hospital if approved", "clear and concise", "I like the protocol spells out the frequency of the assessments needed during the treatment whether IVP, PO or Magnesium. That's always a source of discrepancy from nurse to nurse", and "I love having the algorithms".

Revised Protocol

After the protocol was created, ACOG released two updated practice bulletins, "Gestational Hypertension and Preeclampsia" and "Chronic Hypertension in Pregnancy" (ACOG, 2019). The changes that affect this protocol are the definition of hypertension. The updated definition of hypertension is classified into four categories. These are normal blood pressure which is a systolic blood pressure of 120 mmHg or below and a diastolic blood pressure of 80 mmHg or below (ACOG, 2019). The second category is elevated blood pressure defined as systolic blood pressure of 120-129 mmHg and diastolic blood pressure of less than 80 mmHg (ACOG, 2019). The third category is stage 1 hypertension which is systolic blood pressure of 130-139 mmHg or diastolic blood pressure of 80-89 mmHg (ACOG, 2019). The final category is stage 2 hypertension, the definition of systolic blood pressure greater than or equal to 140 mmHg or diastolic blood pressure of greater than or equal to 90 mmHg (ACOG, 2019). The change in the definition does not change the management in the protocol, but the definition needed to be updated in the protocol to remain current. ACOG also describes that the care for patients with preeclampsia without severe feature and patients with gestational hypertension are the same so there may not be a need for a delineation in the diagnosis given to patient (ACOG, 2019).

The responses to the survey and the updated information from ACOG were reviewed, and necessary changes were made to the protocol after thorough evaluation. The revised protocol (see Appendix E) has been forwarded to the OB/PEDS committee and the Nursing Practice Council at the community hospital to gain approval for implementation into practice.

If approved, the evidence-based protocol would then be forwarded to all physicians by the medical staff services department with instructions that the protocol is currently in place. For nursing, the protocol and necessary education would be disseminated during mandatory staff meetings and an opportunity for nurses to ask questions and gain clarification.

Implications for practice

With the addition of this protocol, care for patients with gestational hypertension and preeclampsia will be streamlined. The patients will receive higher quality care because the confusion level, and possible errors, will be decreased by nursing staff. The physicians will have a streamlined, evidence-based way to care for patients to ensure that all labs and medications are ordered as appropriate for patient condition. For dissemination of this protocol to other facilities it would be necessary that it becomes personalized for each facility. It is recommended that physicians, providers, and nurses collaborate to ensure that the facilities needs are met with the protocol and changes made if needed.

5: Conclusion

Early standardized treatment is the necessary change for women with preeclampsia that could lessen maternal morbidity and mortality and can positively affect the care given (Shields et al., 2017). The developed protocol is research-driven and evidence-based. Providers at this community hospital facility will no longer need to be creative in decision-making as they have a standardized and evaluated protocol. The protocol will help the providers develop a plan of care, as well as helping the nursing staff with necessary education for patients that have been diagnosed with preeclampsia, as there is a lifetime vascular risk in these women (Goynumer et al., 2013). The education component will provide information to women that have been affected with preeclampsia about necessary care for a healthier lifetime.

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Appendix A

Matrix Review Table

Author, Title, Journal	Year publication	Purpose	Methodological (study design)
Young et al., "Physicians' knowledge of future vascular disease in women with preeclampsia" *Hypertension In Pregnancy*	2012	Determine the knowledge of OB/GYNs and internists about future cardiovascular disease in women that have had preeclampsia	Anonymous survey
Goynumer et al., "Vascular risk in women with a history of severe preeclmapsia" *Journal of Clinical Ultrasound*	2013	Assess markers of vascular dysfunction and risk in postpartum women with a history of severe preeclampsia	Cross-sectional study
Luo and Ma, "Risk factor for preeclampsia: a case control study" *Hypertension in Pregnancy*	2013	Explore the risk factors of preeclampsia and provide prevention information	Case-control study
Gulec et al., "Comparison of clinical and laboratory findings in early- and late-onset preeclampsia" *The Journal of Maternal-Fetal & Neonatal Medicine*	2013	Comparing the clinical findings and laboratory results of women with onset preeclampsia prior to 34 weeks gestation to those with preeclampsia onset after 34 weeks gestation	Prospective longitudinal study
Brown et al., "Women's perception of future risk following pregnancies complicated by preeclampsia" *Hypertension in Pregnancy*	2013	Determine what women affected by preeclampsia understand to be their future risk of cardiovascular disease	Descriptive study

Koual et al., "Short term outcome of patients with preeclampsia" *Vascular Health and Risk Management*	2013	Evaluate short term outcome of women affected by preeclampsia and determine future risk of cardiovascular disease	Prospective study
Shekhar et al., "Oral nifedipine or intravenous labetalol for hypertensive emergency in pregnancy: A randomized controlled trial" *Obstetrics & Gynecology*	2013	Compare the effectiveness of the medications given in hypertensive emergencies in pregnancy to determine the best medication	Double-blind randomized controlled trial
Pare et al., "Clinical risk factors for preeclampsia in the 21st century" *Obstetrics & Gynecology*	2014	Validation of previously notated clinical risk factors for preeclampsia	Chart Review
Lisonkova et al., "Maternal morbidity associated with early-onset and late-onset preeclampsia" *Obstetrics & Gynecology*	2014	Examine trends in maternal morbidity dependent on timing of onset of preeclampsia	Chart Review
Das et al., "Comparative study of intravenous labetalol and oral nifedipine for control of blood pressure in severe preeclampsia" *Journal of Dental and Medical Sciences*	2015	Determine the best medication to control blood pressure in severe preeclampsia	Randomized controlled trial
Harris et al., "Emergency room utilization after medically complicated pregnancies: A Medicaid claims	2015	Determine how many women use the emergency room after pregnancies that have had medical complications and interventions that	Retrospective population based cohort study

analysis" *Journal of Women's Health*		may decrease this number	
Yamada et al., "Isolated gestational proteinuria preceding the diagnosis of preeclampsia- an observational study" *Acta Obstetricia et Gynecologica Scandanavica*	2015	Determine if isolated proteinuria precedes the diagnosis of preeclampsia	Observational Study
Lange et al., "Readability, content, and quality of online patient education materials on preeclampsia" *Hypertension in Pregnancy*	2015	Evaluation of materials about preeclampsia found online for patient education	Assessment of reading materials
Kilpatrick et al., "Severe maternal morbidity in a large cohort of women with acute sever intrapartum hypertension" *American Journal of Obstetrics and Gynecology*	2016	To determine best first line treatment based on efficacy; and determine the morbidity and mortality of those with intrapartum severe hypertension based on current management compared to those without severe hypertension intrapartum.	Retrospective cohort study
Sabir et al., "Comparison of oral nifedipine with intravenous hydralazine for acute hypertensive emergencies of pregnancy" *Journal of Postgraduate Medical Institute*	2016	Compare the efficacy two of the leading medications used to treat hypertensive emergencies of pregnancy	Comparative study
Kumari et al., "Oral nifedipine versus intravenous labetalol	2016	Compare the efficacy of the two medications approved	Randomized trial

for control of blood pressure in severe preeclampsia" *Journal of Evolution of Medical and Dental Sciences*		to treat severe hypertension in patients with severe preeclampsia.	
Shields et al., "Early standardized treatment of critical blood pressure elevations is associated with a reduction in eclampsia and severe maternal morbidity" *American Journal of Obstetrics and Gynecology*	2017	Determine if mortality and morbidity is improved using a standardized treatment for severe hypertension during pregnancy.	Prospective cohort study
Sharma et al., "Hydralazine vs. nifedipine for acute hypertensive emergency in pregnancy: A randomized controlled trial", *American Journal of Obstetrics and Gynecology*	2017	Compare the efficacy of the two medications approved to treat severe hypertension in pregnancy.	Double-blind randomized, controlled trial
Dey et al., "Intravenous labetalol versus oral nifedipine for acute blood pressure control in severe pregnancy-induced hypertension- a randomized trial" *Journal of Evolution of Medical and Dental Sciences*	2017	Compare the efficacy of the two medications approved to lower high blood pressure in severe pregnancy induced hypertension.	Prospective, Interventional, Randomized control trial
Padmaja and Sravanthi, "A study of oral nifedipine and intravenous labetalol	2017	Compare the efficacy of the two medications approved to treat severe	Randomized trial

in severe hypertension in pregnancy at teaching hospital" *International Archives of Integrative Medicine*		hypertension in pregnancy.	
Asgharnia et al., "Maternal serum uric acid level and maternal and neonatal complications in preeclamptic women: A cross-sectional study" *International Journal of Reproductive Biomedicine*	2017	Determine the association between the level of uric acid in the mother with maternal and neonatal complications in women with preeclampsia.	Cross-sectional study
Amorim et al., "Profile of pregnant women with preeclampsia" *Journal of Nursing UFPE online*	2017	Describe the clinical and socioeconomic aspects of women with preeclampsia.	Descriptive and Retrospective study
Gavit et al., "A comparative study of oral nifedipine and intravenous labetalol in control of acute hypertension in sever preeclampsia and eclampsia" *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*	2018	Compare the efficacy of the two medications approved to treat severe hypertension in patients with severe preeclampsia and eclampsia.	Comparative study
Cleary et al., "Use of antihypertensive medications during delivery hospitalizations complicated by preeclampsia"	2018	Determine the amount of use of anti-hypertensive medications used during delivery hospitalizations for preeclampsia.	Retrospective cohort study

Obstetrics & Gynecology			
Mariano et al., "Women with hypertensive syndromes" *Journal of Nursing UFPE online*	2018	Describe the obstetric profile of women with hypertensive syndrome.	Quantitative, exploratory, descriptive, retrospective, and documental study

Appendix B

Protocol: Hypertensive Disorders in Pregnancy

Purpose of this guideline:

1. Standardize care of patients with gestational hypertension/preeclampsia
2. Treatment of critically elevated blood pressure within 1 hour of verification
3. Use of magnesium sulfate in the presence of critically elevated blood pressures, for seizure prophylaxis, regardless if other criteria for preeclampsia are present
4. Early postpartum follow-up assessment

Types of Hypertension

Chronic Hypertension	○ SBP ≥ 140 **or** DBP ≥ 90 ○ Pre-pregnancy or < 20 weeks gestation
Gestational Hypertension	○ SBP ≥ 140 **or** DBP ≥ 90 ○ > 20 weeks gestation ○ Absence of proteinuria or systemic signs/symptoms
Preeclampsia	○ SBP ≥ 140 **or** DBP ≥ 90 -WITH- ○ Proteinuria, or Protein/Creatinine ration of >0.3 mg/dL with or without signs/symptoms -OR- ○ Presentation of signs/symptoms/lab abnormalities but no proteinuria
Chronic Hypertension + Superimposed Preeclampsia	
Preeclampsia with severe features	-ANY of the following ○ Two severe BP values (SBP ≥ 160 **or** DBP ≥ 110) obtained 15-60 minutes apart ○ Persistent oliguria <500 ml/24 hours ○ Progressive renal insufficiency ○ Unremitting headache/visual disturbances ○ Pulmonary edema ○ Epigastric/RUQ pain ○ LFTs > 2x normal ○ Platelets < 100,000 ○ HELLP syndrome ○ Serum Creatinine > 1.1mg/dL

Adapted from ACOG 2017

Definitions

Severe Hypertension

- Systolic Blood Pressure ≥ 160 **or**
- Diastolic Blood Pressure ≥ 110

Hypertensive Emergency

- Persistent, severe hypertension that can occur antepartum, intrapartum, or postpartum
    - Defined as: Two severe values (≥ 160/110) taken 15-60 minutes apart, severe values do not need to be consecutive

If a patient experiences a new onset BP of SBP ≥ 140 or DBP ≥ 90 on two occasions <u>at least</u> 4 hours apart (review prenatal record):

1. Notify provider
2. Obtain labs
    a. CBC
    b. CMP
    c. UA (consider straight catheterization for postpartum)
    d. Protein/Creatinine ratio
    e. LDH
    f. Uric acid
3. Assess for severe features of preeclampsia
    a. Headache not relieved by acetaminophen or ibuprofen
    b. Visual disturbances
    c. Altered mental status
    d. Epigastric pain
    e. Pulmonary edema
    f. Shortness of breath
    g. Increased respiratory rate
    h. Deep tendon reflexes
4. Pad bed rails
5. Continue BP assessment at least hourly intrapartum and at least every 4 hours postpartum

Any Two severe BP values (SBP ≥ 160 or DBP ≥ 110) obtained 15-60 minutes apart:

1. Notify provider
2. Obtain labs, if not done previously
    a. CBC
    b. CMP
    c. UA (consider straight catheterization for postpartum)
    d. Protein/Creatinine ratio
    e. LDH
    f. Uric acid
3. Assess for severe features of preeclampsia
    a. Headache not relieved by acetaminophen or ibuprofen
    b. Visual disturbances
    c. Altered mental status
    d. Epigastric pain
    e. Pulmonary edema
    f. Shortness of breath
    g. Increased respiratory rate
    h. Deep tendon reflexes
4. Obtain order for antihypertensive medication
    a. IV Labetalol
        i. Onset 2-5 minutes, peak 5 minutes
    b. IV Hydralazine
        i. Onset 5-20 minutes, peak15-30 minutes
    c. PO Nifedipine

        i. Onset 5-20 minutes, peak 30-60 minutes
5. Once BP in controlled (<160/110), measure:
    a. Every 10 minutes for 1 hour
    b. Every 15 minutes for next hour
    c. Every 30 minutes for next hour
    d. Every hour for 4 hours
6. Pad bed rails
7. Consider magnesium sulfate for seizure prophylaxis, continue for 24 hours post delivery
8. Continue BP assessment at least hourly intrapartum and at least every 4 hours postpartum

Nursing Assessment:

Preeclampsia without Severe Features			
	Antepartum*	Intrapartum*	Postpartum*
BP, Pulse, Respiration, SaO2	Every 4 hours	Every 60 min	Every 4 hours
Lung Sounds	Every 4 hours	Every 4 hours	Every 4 hours
Deep Consciousness Edema Assessment for headache, visual disturbances, epigastric pain	Every 8 hours	Every 8 hours	Every 8 hours
Fetal status	Every shift	Continuous	N/A
Intake and Output	Every 1 hour with totals every shift and every 24 hours		

*minimum frequency for the patient NOT on magnesium sulfate

Preeclampsia Intrapartum and Postpartum for Women on Magnesium Sulfate	

BP, Pulse, Respiration, SaO2	• Every 5 minutes during loading dose and every 30 minutes during maintenance of magnesium sulfate solution
	• Can change to every 60 minutes if any one or more of the following criteria are met:
	  ○ Preeclampsia without severe features
	  ○ BP stable without increases for a minimum of 2 hours
	  ○ No antihypertensives within last 6 hours
	  ○ Antepartum patient
	  ○ Latent phase of labor
	• Continuous SaO2 during magnesium infusion for intrapartum. For postpartum patient, check with vital signs

Lung Sounds	Every 2 hours
Deep tendon reflexes & clonus Edema Level of consciousness Assessment for headache, visual disturbances, epigastric pain	Every 4 hours
Temperature	Per protocol
Intake and Output	Intake: • IV solutions and medication drips should all be on a pump • Total hourly intake should be ≤ 125 mL/hr • NPO with ice chips or as permitted by practitioner Output: • Insert foley with urometer Calculate hourly, end of shift, and 24-hour totals
Fetal status and uterine activity	Continuous fetal monitoring

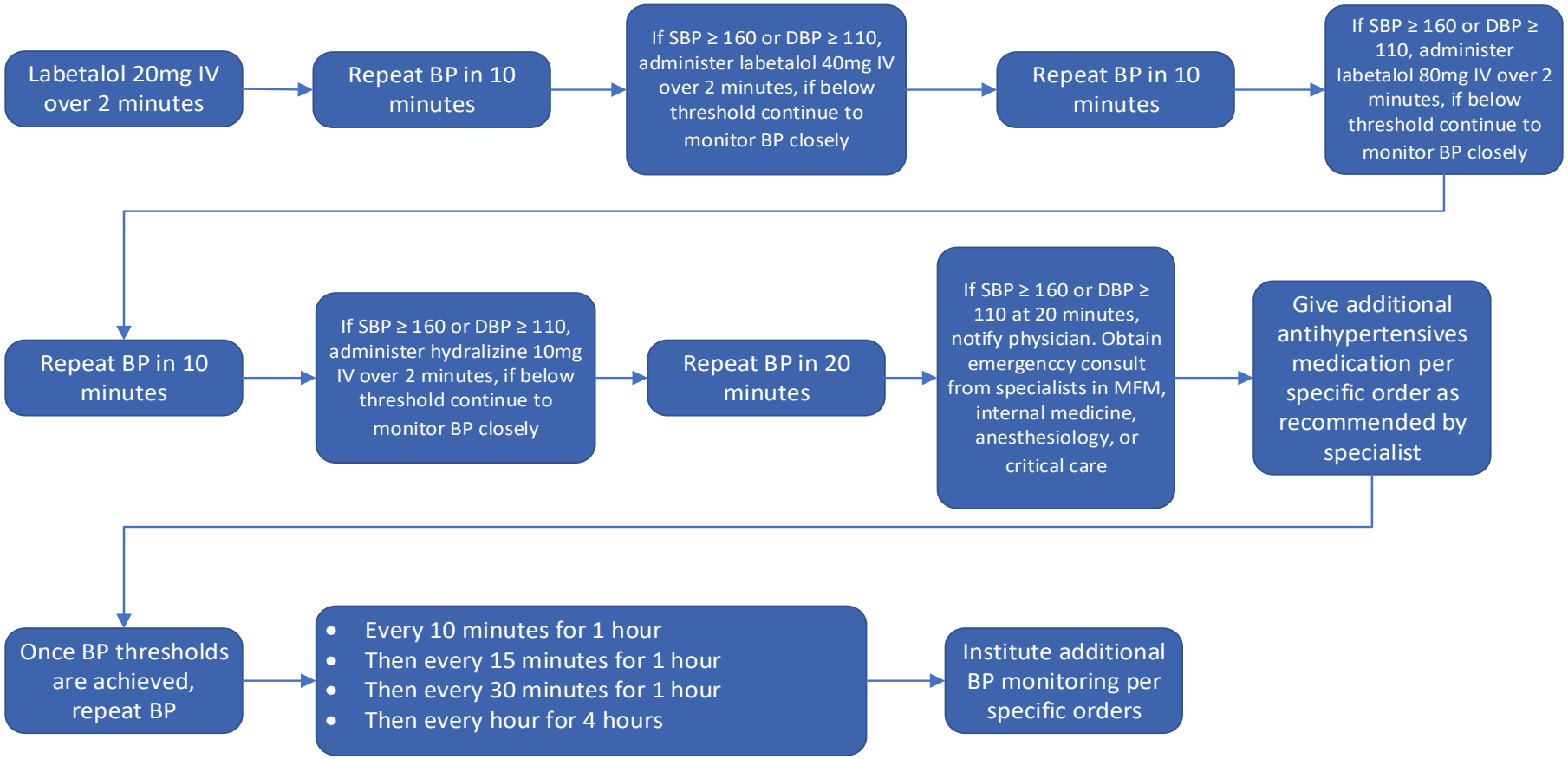
Adapted from CMQCC

Recommend Discharge Instructions for patients with preeclampsia:

1. Take BP daily at home
2. Home Health visit 3-5 days after discharge
3. Follow-up with provider 7-10 post discharge
4. Follow-up with General Practitioner within 6-12 months to ensure BP has normalized
5. Yearly physical including BP, lipid profile, fasting glucose, and BMI

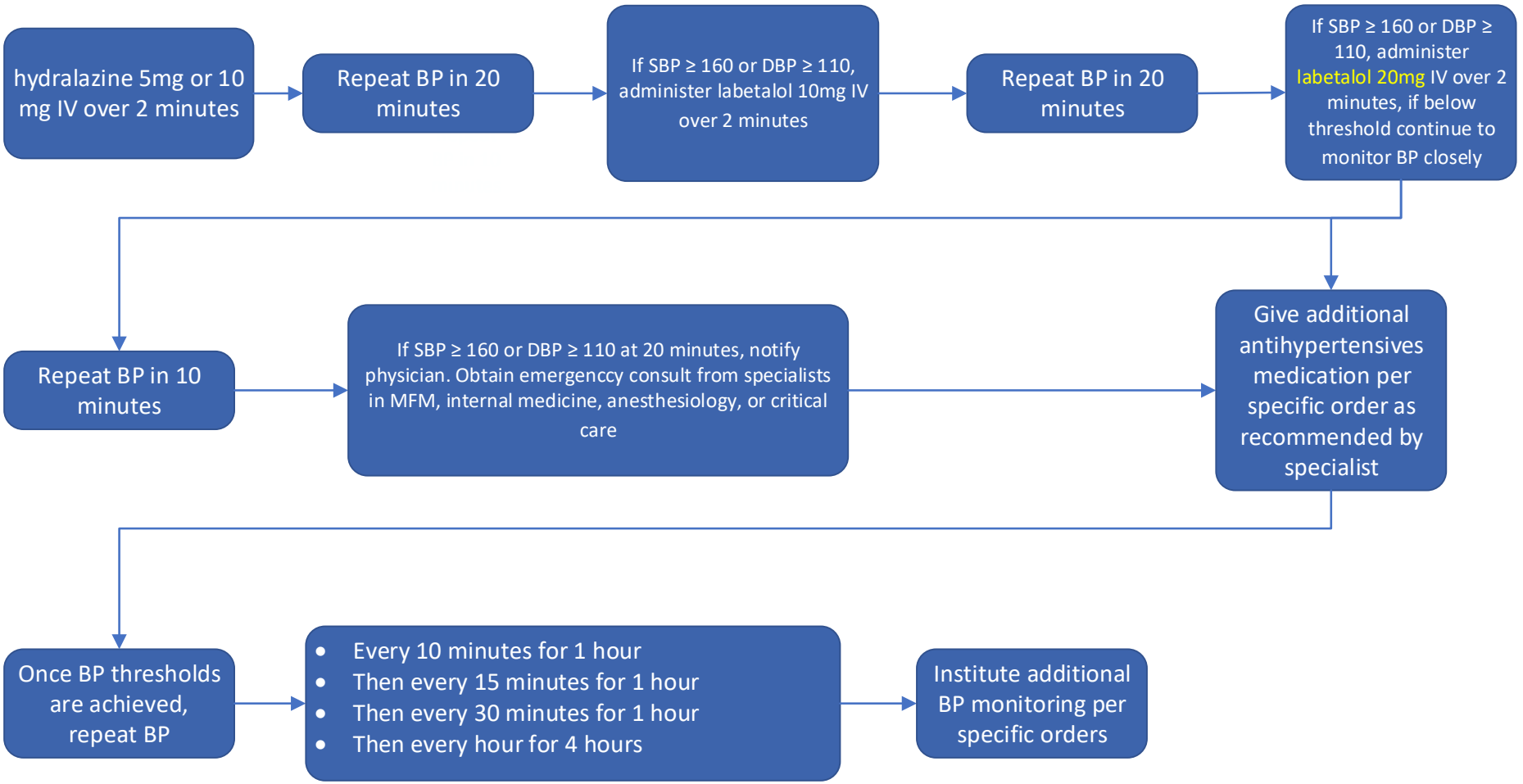
Call your provider immediately if you experience any of the following symptoms:
A blood pressure reading that is greater than: Systolic 160 or Diastolic 110
Headaches, not relieved by medication
Changes in your vision (blurred vision, flashes of light, or spots)
Upper abdominal pain or tenderness
Increase in swelling, especially of face
Change in level of consciousness
Call 911 if you experience any seizures

Labetalol Algorithm

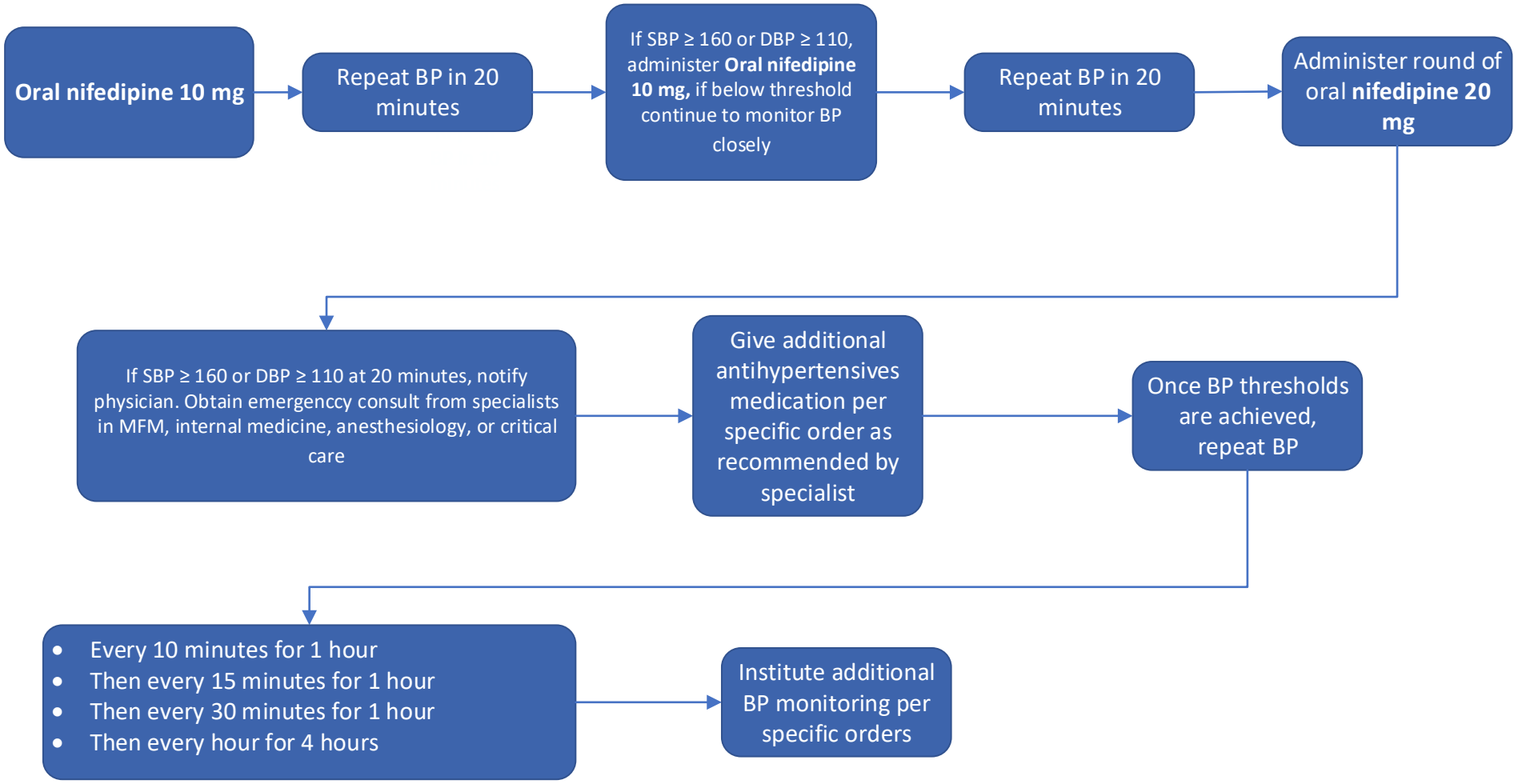


- Hold IV labetalol for maternal pulse under 60 bpm
- Maximum cumulative dose of labetalol should not exceed 220mg in 24 hours
- There may be adverse effects and contraindications. Clinical judgement should prevail
- **Avoid IV labetalol with active asthma, heart disease, or congestive heart failure, use with caution with history of asthma, may cause neonatal bradycardia**
- Active asthma is symptoms at least once per week, use of inhaler or corticosteroids for asthma during the pregnancy, or any history of intubation or hospitalization for asthma

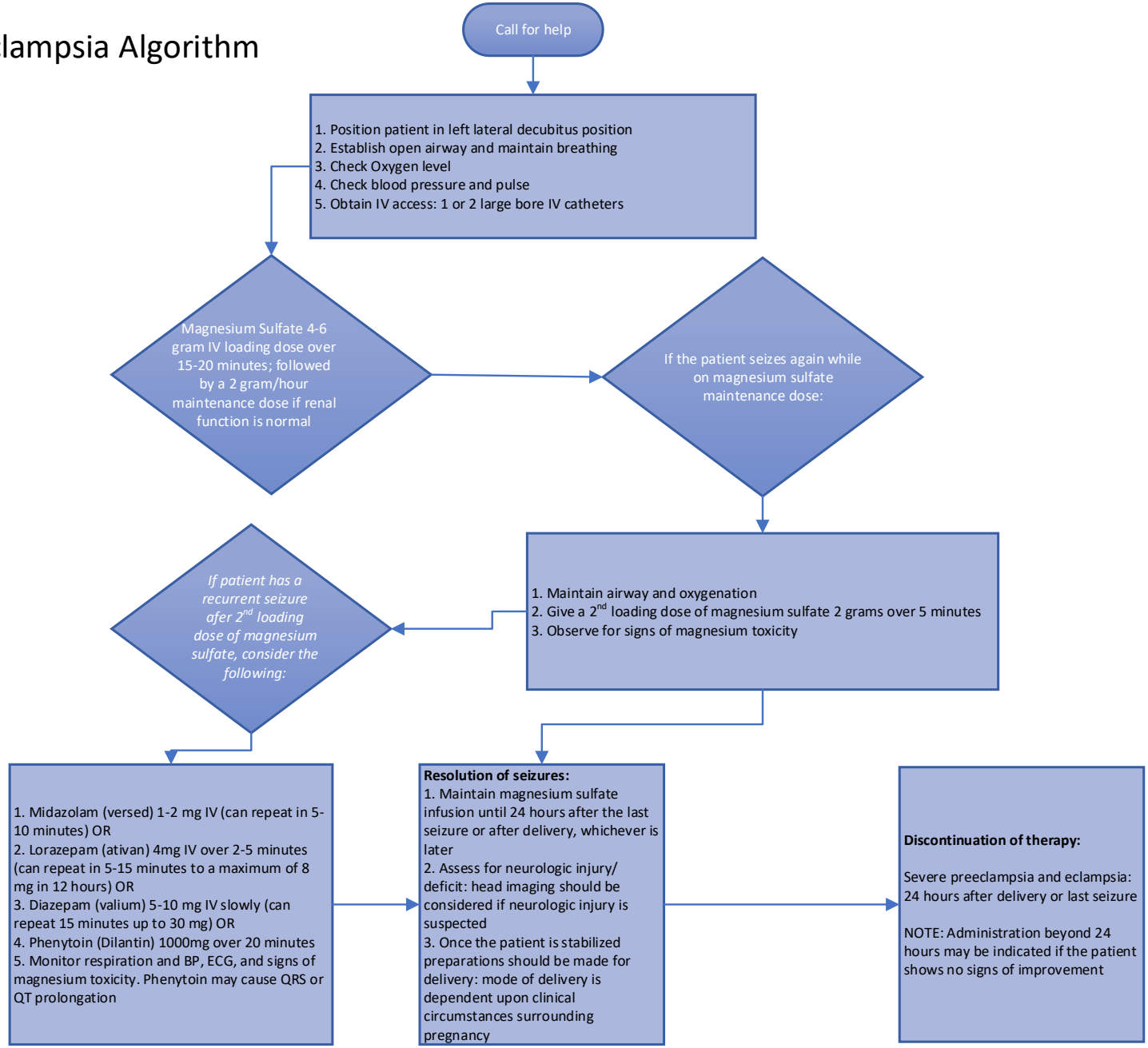
Hydralazine Algorithm



Oral Nifedipine Algorithm



Eclampsia Algorithm



Adapted from CMQCC, 2013

Appendix C

AGREE II Form

DOMAIN 1. SCOPE AND PURPOSE

1. The overall objective(s) of the guideline is (are) specifically described.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

2. The health question(s) covered by the guideline is (are) specifically described.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

DOMAIN 2. STAKEHOLDER INVOLVEMENT

4. The guideline development group includes individuals from all relevant professional groups.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

5. The views and preferences of the target population (patients, public, etc.) have been sought.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

6. The target users of the guideline are clearly defined.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

DOMAIN 3. RIGOUR OF DEVELOPMENT

7. Systematic methods were used to search for evidence.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

8. The criteria for selecting the evidence are clearly described.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

9. The strength and limitations of the body of evidence are clearly described.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

10. The methods for formulating the recommendations are clearly described.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

11. The health benefits, side effects, and risks have been considered in formulating the recommendations.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

12. There is an explicit link between the recommendations and the supporting evidence.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

13. The guideline has been externally reviewed by experts prior to its publication.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

14. A procedure for updating the guideline is provided.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

DOMAIN 4. CLARITY OF PRESENTATION

15. The recommendations are specific and unambiguous.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

16. The different options for management of the condition or health issue are clearly presented.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

17. Key recommendations are easily identifiable.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

DOMAIN 5. APPLICABILITY

18. The guideline describes facilitators and barriers to its application.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

19. The guideline provides advice and/or tools on how the recommendations can be put into practice.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

20. The potential resource implications of applying the recommendations have been considered.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

21. The guideline presents monitoring and/or auditing criteria.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

DOMAIN 6. EDITORIAL INDEPENDENCE

22. The views of the funding body have not influenced the content of the guideline.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

23. Competing interests of guideline development group members have been recorded and addressed.

1 Strongly Disagree	2	3	4	5	6	7 Strongly Agree

Comments

OVERALL GUIDELINE ASSESSMENT

For each question, please choose the response which best characterizes the guideline assessed:

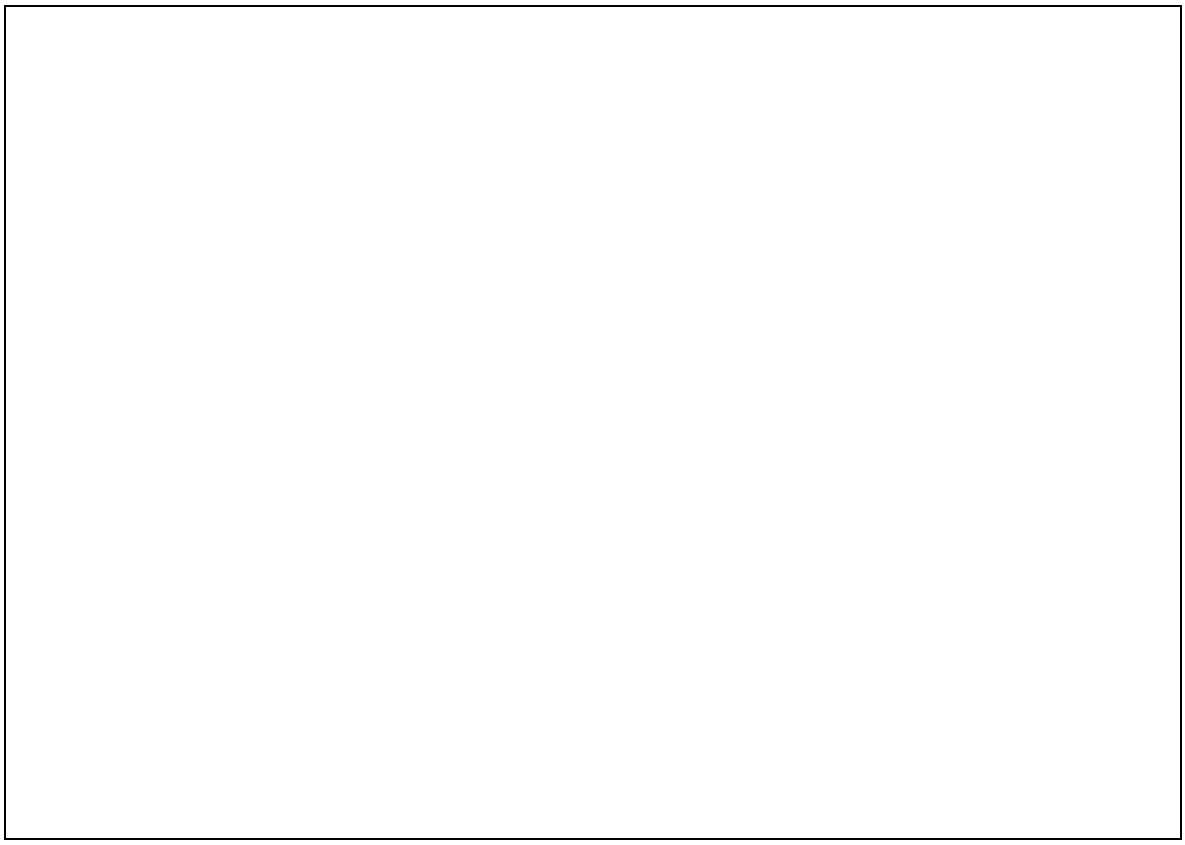
1. Rate the overall quality of this guideline.

1 Lowest possible quality	2	3	4	5	6	7 Highest possible quality

2. I would recommend this guideline for use.

YES	
YES, With modifications	
NO	

NOTES



Appendix D

Protocol: Hypertensive Disorders in Pregnancy-Revised

Protocol: Hypertensive Disorders in Pregnancy

Purpose of this guideline:

1. Standardize care of patients with gestational hypertension/preeclampsia
2. Treatment of critically elevated blood pressure within 1 hour of verification
3. Use of magnesium sulfate in the presence of critically elevated blood pressures, for seizure prophylaxis, regardless if other criteria for preeclampsia are present
4. Early postpartum follow-up assessment

Types of Hypertension

Chronic Hypertension	○ Hypertension diagnosed or present before pregnancy or before 20 weeks gestation; or hypertension that is diagnosed for the first-time during pregnancy and does not resolve in the postpartum period
Gestational Hypertension	○ SBP ≥ 140 **or** DBP ≥ 90 ○ > 20 weeks gestation ○ Absence of proteinuria or systemic signs/symptoms
Preeclampsia	○ SBP ≥ 140 **or** DBP ≥ 90 -WITH- ○ Proteinuria, or Protein/Creatinine ration of >0.3 mg/dL with or without signs/symptoms -OR- ○ Presentation of signs/symptoms/lab abnormalities but no proteinuria
Chronic Hypertension + Superimposed Preeclampsia	○ Preeclampsia in a woman with a history of hypertension before pregnancy or before 20 weeks gestation
Preeclampsia with severe features	-ANY of the following ○ Two severe BP values (SBP ≥ 160 **or** DBP ≥ 110) obtained 15-60 minutes apart ○ Persistent oliguria <500 ml/24 hours ○ Progressive renal insufficiency ○ Unremitting headache/visual disturbances ○ Pulmonary edema ○ Epigastric/RUQ pain ○ LFTs > 2x normal ○ Platelets < 100,000 ○ HELLP syndrome ○ Serum Creatinine > 1.1mg/dL

Adapted from ACOG 2017 and 2019

Definitions

Severe Hypertension

- Systolic Blood Pressure ≥ 160 **or**
- Diastolic Blood Pressure ≥ 110

Hypertensive Emergency

- Persistent, severe hypertension that can occur antepartum, intrapartum, or postpartum
    - Defined as: Two severe values (≥ 160/110) taken 15-60 minutes apart, severe values do not need to be consecutive

If a patient experiences a new onset BP of SBP ≥ 140 or DBP ≥ 90 on two occasions <u>at least</u> 4 hours apart (review prenatal record):

6. Notify provider
7. Obtain labs
    a. CBC (includes Hgb and platelets)
    b. CMP (includes serum creatinine, AST, and ALT)
    c. UA (consider straight catheterization for postpartum)
    d. Protein/Creatinine ratio
    e. LDH
    f. Uric acid
8. Assess for severe features of preeclampsia
    a. Headache not relieved by acetaminophen or ibuprofen
    b. Visual disturbances
    c. Altered mental status
    d. Epigastric pain
    e. Pulmonary edema
    f. Shortness of breath
    g. Increased respiratory rate
    h. Deep tendon reflexes
9. Pad bed rails
10. Continue BP assessment at least hourly intrapartum and at least every 4 hours postpartum

Any Two severe BP values (SBP ≥ 160 or DBP ≥ 110) obtained 15-60 minutes apart:

9. Notify provider
10. Obtain labs, if not done previously
    a. CBC
    b. CMP
    c. UA (consider straight catheterization for postpartum)
    d. Protein/Creatinine ratio
    e. LDH
    f. Uric acid
11. Assess for severe features of preeclampsia
    a. Headache not relieved by acetaminophen or ibuprofen
    b. Visual disturbances
    c. Altered mental status
    d. Epigastric pain
    e. Pulmonary edema
    f. Shortness of breath
    g. Increased respiratory rate
    h. Deep tendon reflexes
12. Obtain order for antihypertensive medication, per provider choice, and refer to algorithm
    a. IV Labetalol
        i. Onset 2-5 minutes, peak 5 minutes
    b. IV Hydralazine

        i. Onset 5-20 minutes, peak15-30 minutes
    c. PO Nifedipine
        i. Onset 5-20 minutes, peak 30-60 minutes
13. Pad bed rails
14. Consider magnesium sulfate for seizure prophylaxis, continue for 24 hours post delivery
15. Once BP in controlled (<160/110), measure:
    a. Every 10 minutes for 1 hour
    b. Every 15 minutes for next hour
    c. Every 30 minutes for next hour
    d. Every hour for 4 hours
16. Continue BP assessment at least hourly intrapartum and at least every 4 hours postpartum

Nursing Assessment:

Preeclampsia without Severe Features			
	Antepartum*	Intrapartum*	Postpartum*
BP, Pulse, Respiration, SaO2	Every 4 hours	Every 60 min	Every 4 hours
Lung Sounds	Every 4 hours	Every 4 hours	Every 4 hours
Deep Consciousness Edema Assessment for headache, visual disturbances, epigastric pain	Every 8 hours	Every 8 hours	Every 8 hours
Fetal status	Every shift	Continuous	N/A
Intake and Output	Every 1 hour with totals every shift and every 24 hours		

*minimum frequency for the patient NOT on magnesium sulfate

Preeclampsia Intrapartum and Postpartum for Women on Magnesium Sulfate	

BP, Pulse, Respiration, SaO2	• Every 5 minutes during loading dose and every 30 minutes during maintenance of magnesium sulfate solution
	• Can change to every 60 minutes if any one or more of the following criteria are met:
	  ○ Preeclampsia without severe features
	  ○ BP stable without increases for a minimum of 2 hours
	  ○ No antihypertensives within last 6 hours
	  ○ Antepartum patient
	  ○ Latent phase of labor
	• Continuous SaO2 during magnesium infusion for intrapartum. For postpartum patient, check with vital signs

Lung Sounds	Every 2 hours
Deep tendon reflexes & clonus Edema Level of consciousness Assessment for headache, visual disturbances, epigastric pain	Every 4 hours
Temperature	Per protocol
Intake and Output	Intake: • IV solutions and medication drips should all be on a pump • Total hourly intake should be ≤ 125 mL/hr • NPO with ice chips or as permitted by practitioner Output: • Insert foley with urometer Calculate hourly, end of shift, and 24-hour totals
Fetal status and uterine activity	Continuous fetal monitoring

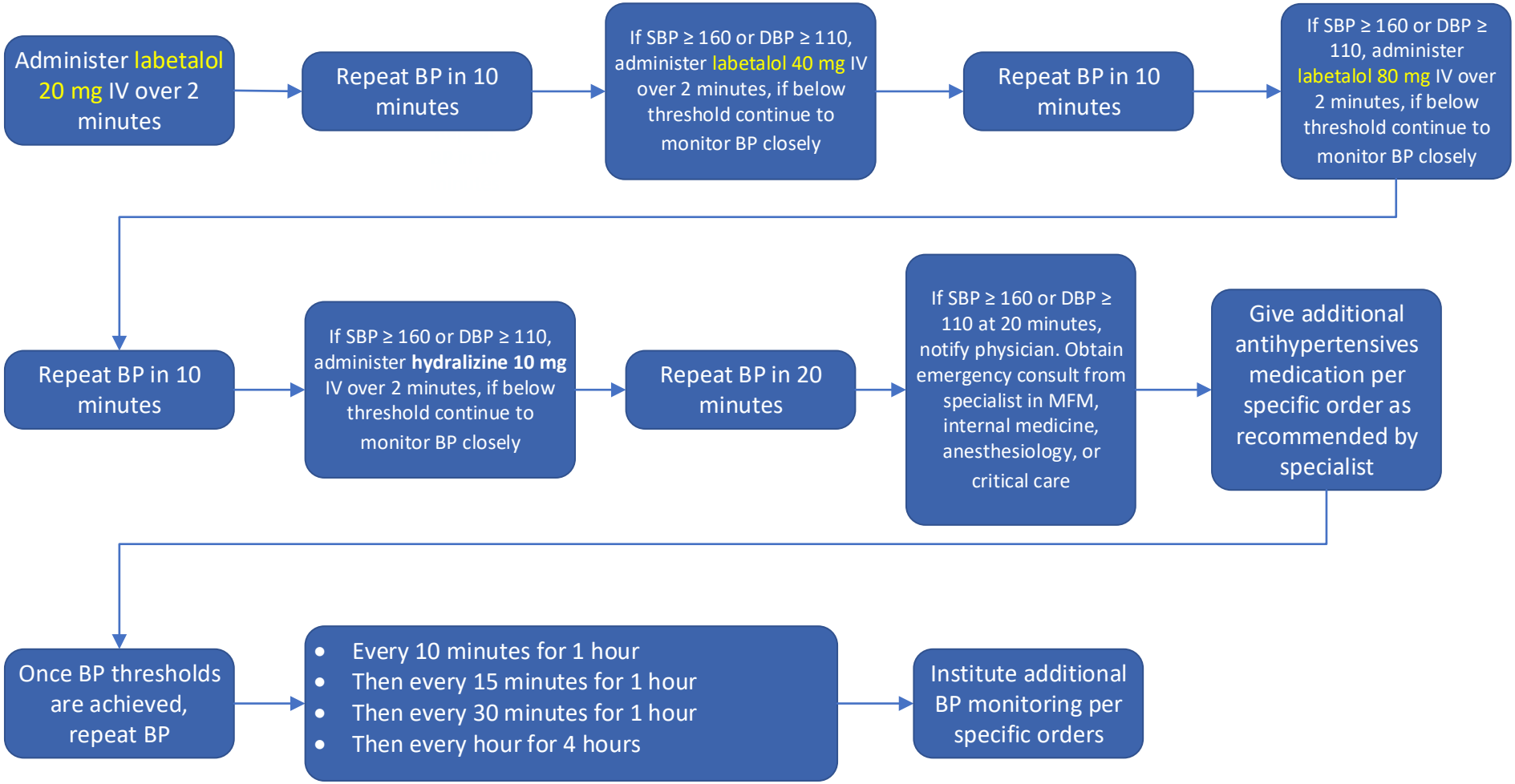
Adapted from CMQCC

Recommend Discharge Instructions for patients with preeclampsia:

1. Take BP daily at home
2. Home Health visit 3-5 days after discharge
3. Follow-up with provider 7-10 post discharge
4. Follow-up with General Practitioner within 6-12 months to ensure BP has normalized
5. Yearly physical including BP, lipid profile, fasting glucose, and BMI

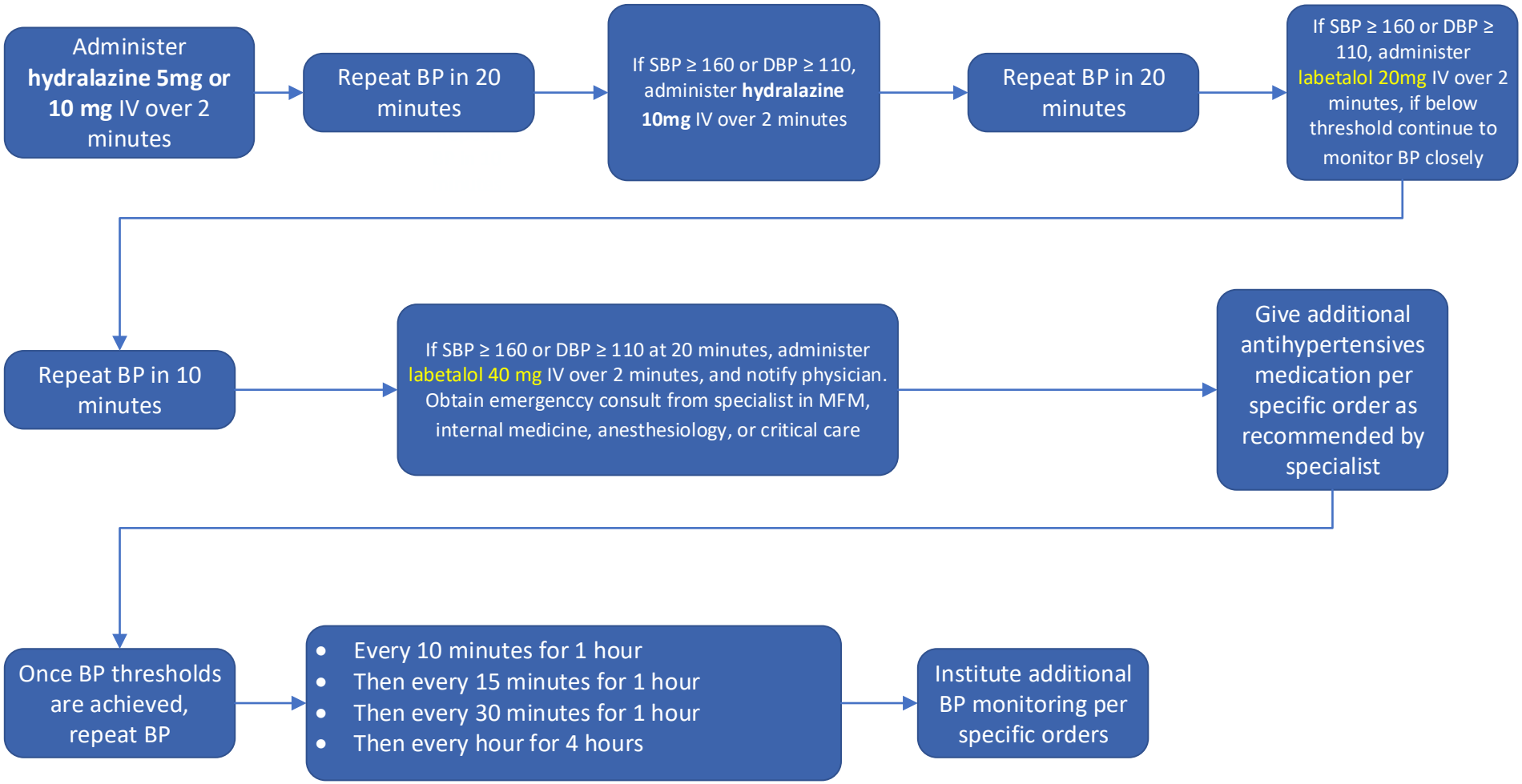
Call your provider immediately if you experience any of the following symptoms:
A blood pressure reading that is greater than: Systolic 160 or Diastolic 110
Headaches, not relieved by medication
Changes in your vision (blurred vision, flashes of light, or spots)
Upper abdominal pain or tenderness
Increase in swelling, especially of face
Change in level of consciousness
Call 911 if you experience any seizures

Labetalol Algorithm

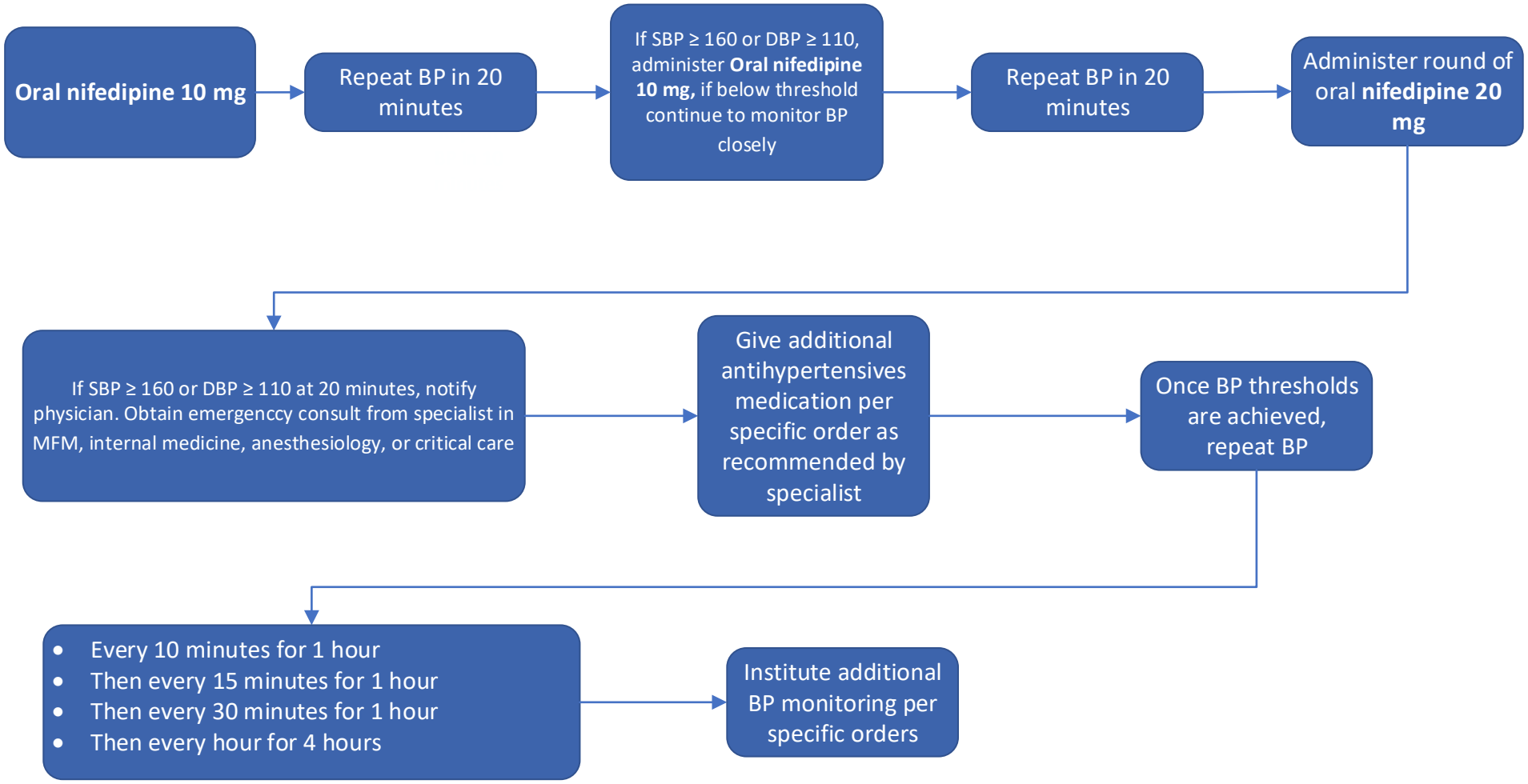


- Hold IV labetalol for maternal pulse under 60 bpm
- Maximum cumulative dose of labetalol should not exceed 220mg in 24 hours
- There may be adverse effects and contraindications. Clinical judgement should prevail
- **Avoid IV labetalol with active asthma, heart disease, or congestive heart failure, use with caution with history of asthma, may cause neonatal bradycardia**
- Active asthma is symptoms at least once per week, use of inhaler or corticosteroids for asthma during the pregnancy, or any history of intubation or hospitalization for asthma

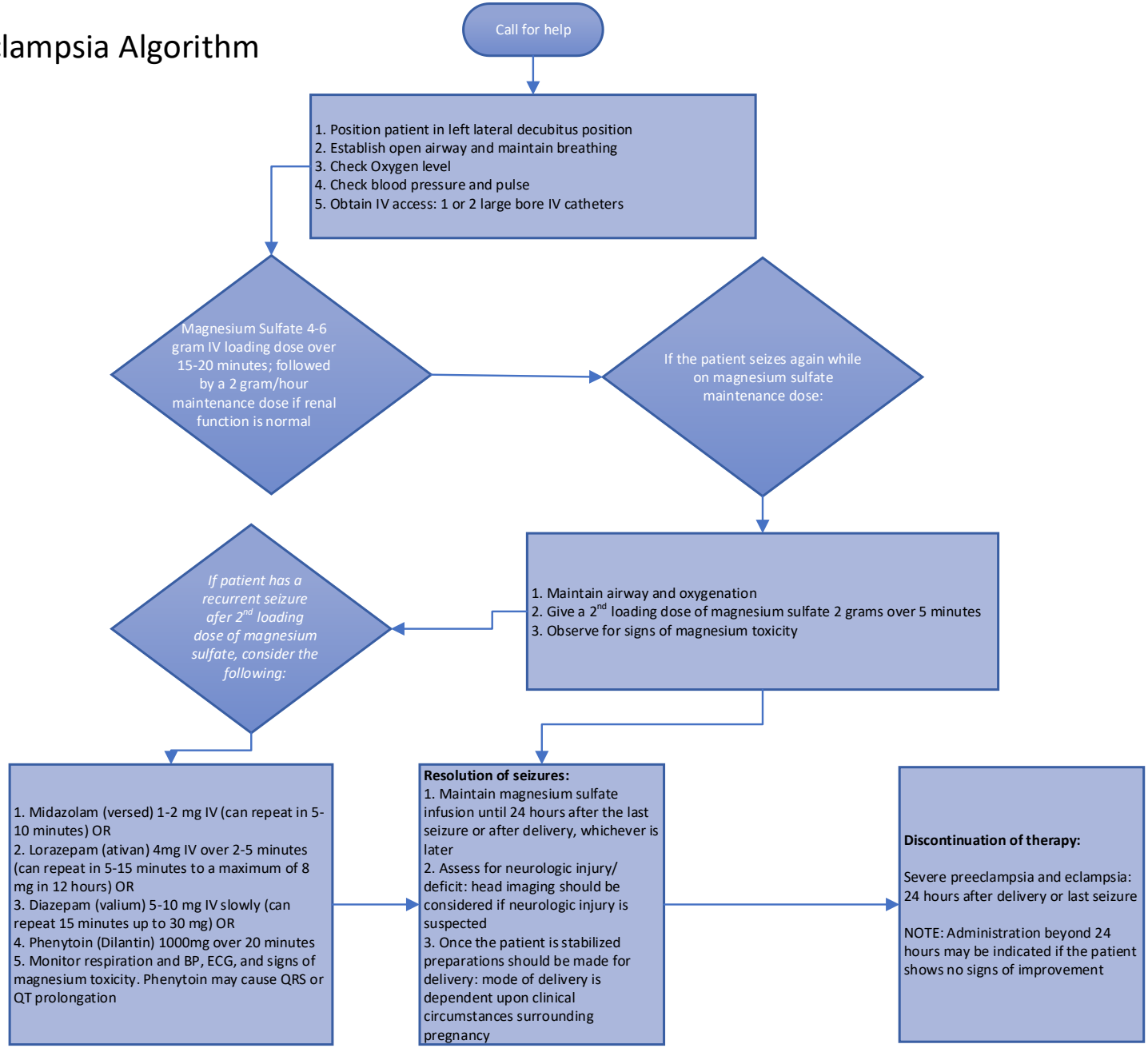
Hydralazine Algorithm



Oral Nifedipine Algorithm



Eclampsia Algorithm



Adapted from CMQCC, 2013

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