# Hypertension in Pregnancy

## Site Applicability

SPH – Pregnancy, Birthing, and Newborn Centre

## Practice Level

Specialized: Physicians (with perinatal privileges), Registered Midwives, Perinatal Registered Nurses

## Requirements

Severe hypertension is an obstetrical emergency and requires urgent assessment and treatment. (See Acute Management of a Severe Hypertensive Episode.)

## Need to Know

Hypertensive disorders of pregnancy (HDP) affect 7% of pregnancies in Canada. HDP requires effective management to reduce perinatal and neonatal complications. (See Management of Hypertension in Pregnancy.) (See Appendix A for Risk Factors.) HDP includes chronic/pre-existing hypertension, gestational hypertension, preeclampsia/eclampsia and HELLP. (See Differentiation of Hypertension in Pregnancy.) The course of HDP is unpredictable and delivery is the only cure.

Hypertension in pregnancy is defined as SBP greater than or equal to 140 mmHg and/or DBP greater than or equal to 90 mmHg. (Severe hypertension in pregnancy is blood pressure (BP) greater than or equal to 160/110 mmHg.) Elevated BP is associated with an increased risk for cardiovascular incidents.

Measure blood pressure (BP) with a sphygmomanometer and compare with automated machine value to validate automated measurements. If BP is consistently higher in one arm, use the arm with the higher values for all BP measurements.

Common adverse outcomes include fetal growth restriction, preterm delivery, morbidity and mortality of the pregnant/birthing person and morbidity and mortality of the fetus/newborn.

In cases of preterm pregnancies adversely affected by HDP, consider delaying delivery for 24 to 48 hours (if birthing person and fetal status permit) to allow for administration of corticosteroids to stimulate fetal lung maturation.

Most HDP resolve post-delivery; however, individuals may experience a peak in BP between days 3 and 6 postpartum.

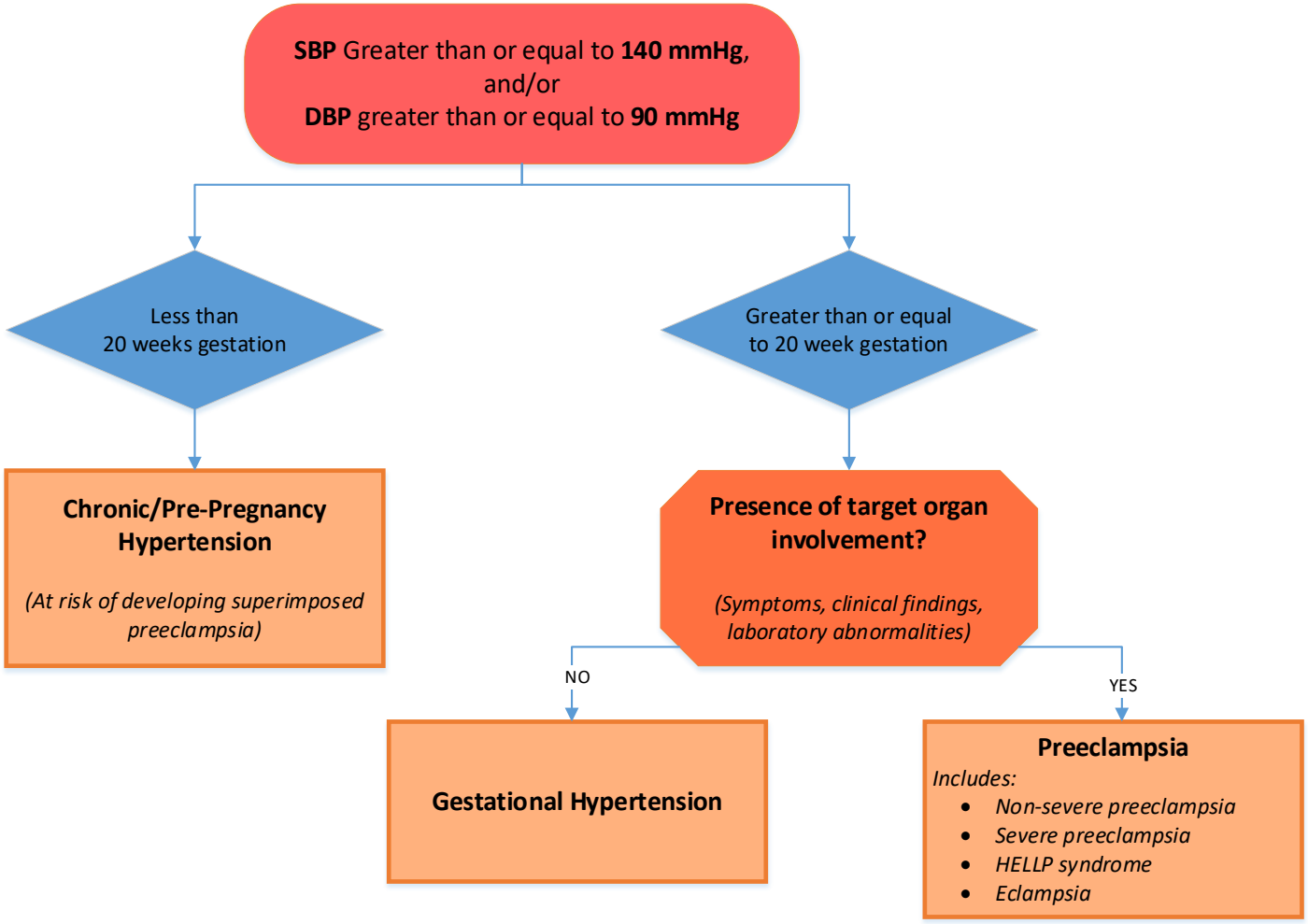
When preeclampsia is suspected, intravenous (IV) fluids are restricted to 80 mL/hour to minimize the risk of pulmonary edema, and in cases of severe preeclampsia, an infusion of magnesium sulfate is used for seizure prophylaxis. (Note: Provider Order required for IV fluids and medication therapy.)

Excessively lowering BP may result in decreased placental perfusion and adverse perinatal outcomes.

Consider reordering antenatal antihypertensive therapy in the postpartum period.

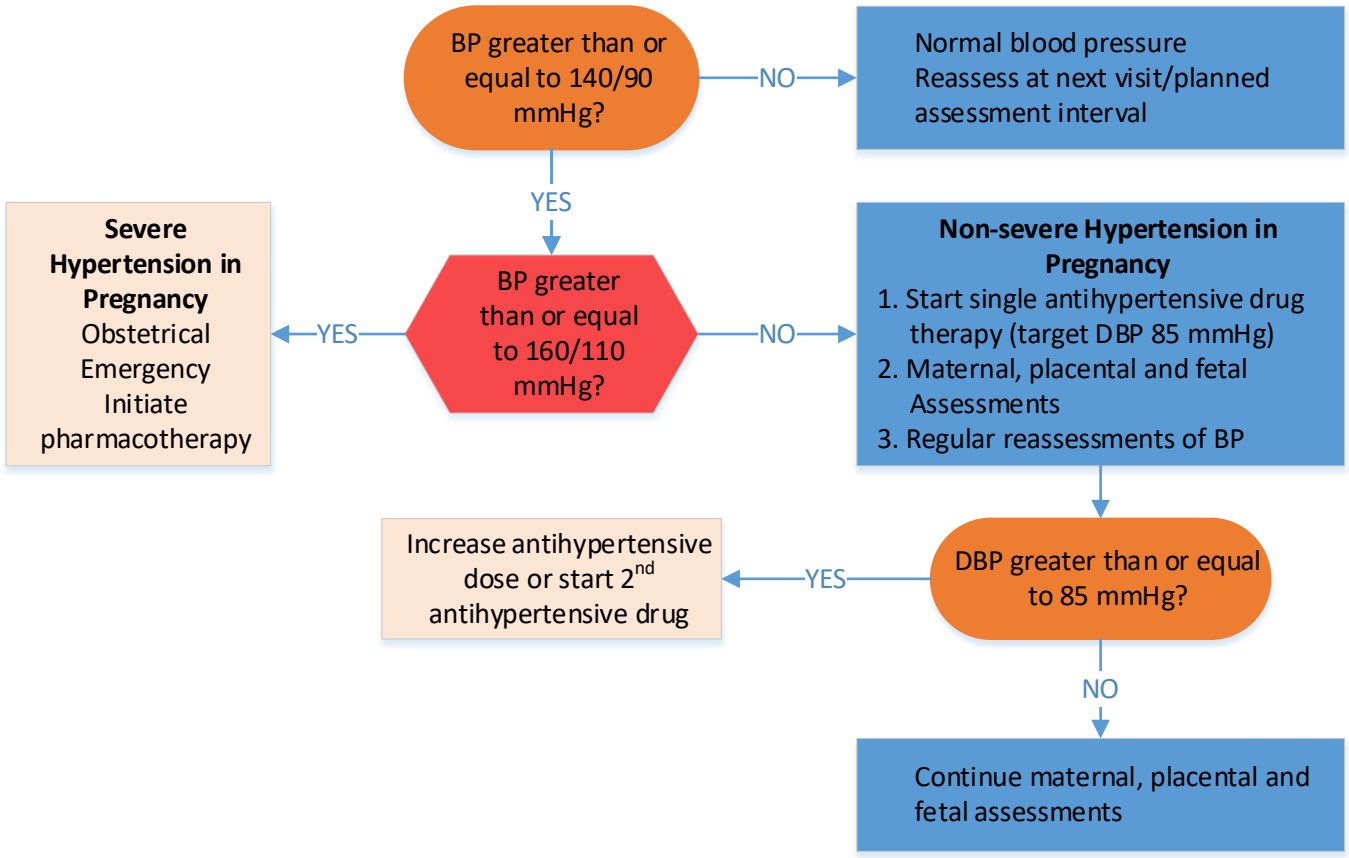
# Algorithms

## Differentiation of Hypertension in Pregnancy



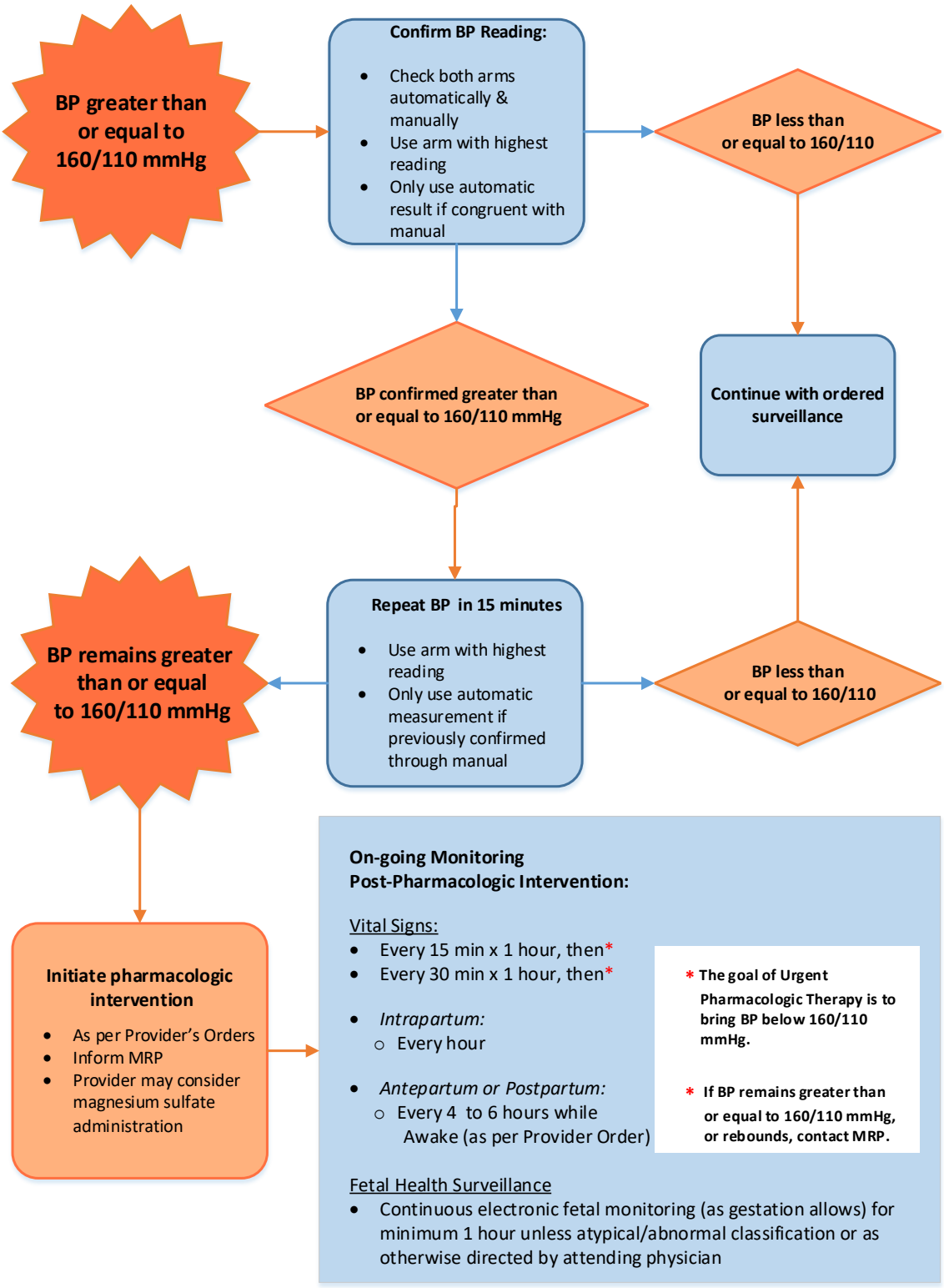

Adapted from Hypertension Canada Guideline (2018)

## Management of Hypertension in Pregnancy




Adapted from Hypertension Canada Guideline (2020)

## Acute Management of a Severe Hypertensive Episode



## Equipment and Supplies

**Ensure all standard and additional safety and assessment equipment is available, accessible and functioning.**

- Sphygmomanometer (manual BP) and stethoscope
- Automatic blood pressure device with correct size BP cuff
- Pulse oximeter
- Obstetrical emergency equipment as needed
- Epidural cart as needed
- Urinary catheterization equipment as needed
- IV infusion equipment as needed
- Electronic fetal monitor and appropriate equipment
- Pillows/rail padding (seizure management)
- Reflex hammer
- Bedside resuscitation equipment:
  - Adult simple face mask & nasal prongs
  - Yankauer suction handle and suction tubing
- Adult Ambu bag – located outside of patient rooms

## Protocol

### Assessment

**Initial and on-going:**

- Vital signs: BP, Heart Rate (HR), Respiration Rate (RR), oxygen saturation ($O_2$ sat), Temperature (T)
- Level of consciousness (LOC) and sedation (POSS)
- **Signs & Symptoms (S&S) of preeclampsia**: headache, visual disturbances, RUQ/epigastric pain, nausea and vomiting, edema, pulmonary edema, $O_2$ sat less than 97%, weight gain, proteinuria, oliguria, hyperreflexia
- Blood work: hematologic, renal and hepatic function
- Fetal Health Surveillance (FHS): Fetal heart rate and imaging

For the first reading, take the BP measurements with both the manual manometer and the automatic BP machine on both arms.

- Ensure BP machine is accurate (both SBP and DBP readings within 5 mmHg of the manual readings)
- If BP is consistently higher in one arm, the arm with the higher values should be used for all BP measurements

**Note:** If the automatic BP machine is not accurate, DO NOT use it.

**Tips and Tricks: BP Monitoring**

Manual Manometer

Use the Korotkoff phase V (disappearance of Korotkoff sounds) to designate the DBP

Blood Pressure Cuff Sizing

Select the appropriate BP cuff size. The length should be about 1.5 x the circumference of the arm.

The white lines on the cuff should overlap

Patient Positioning

Position the patient sitting with their arm and the level of their heart

**If BP is consistently higher in one arm, the arm with the higher values should be used for all BP measurements**

## Interventions

**Conservative Management:**

- Reduce central nervous system (CNS) stimulation by maintaining a calm and quiet room
- Monitor VS for trends over time
    - Target of conservative pharmacologic management is to maintain DBP less than 85 mmHg
    - Initially: BP, HR, RR, $O_2$ sat, LOC and sedation
        - Every 1 hour x 3 hours, and PRN
        - Maintain $O_2$ sat over 97% (or as per provider order)
    - Reassess frequency once initial monitoring is completed and continue as per Provider Orders (e.g. every 4 to 6 hours while awake as per Provider's Orders, and PRN)
    - Temperature daily
    - Weigh daily
- Assess for signs and symptoms of preeclampsia when assessing VS
- Monitor fetal health status:
    - Non-Stress Test (NST) and/or intermittent auscultation (IA) as per Provider order and PRN
    - Imaging as per Provider
- Monitor laboratory and investigation results, including urinalysis (daily or as ordered)
- Monitor patient status:
    - Head to Toe Assessment (every shift and PRN, unless otherwise indicated):
        - Respiratory status: Breath sounds, $O_2$ sat (with VS)
        - Cardiovascular status: Edema
        - Neurological: Deep tendon reflexes (DTR) (daily) (Shared responsibility between provider and nurse) (Appendix C)
    - Ins and Outs (I&O) every shift:
        - Oral and IV intake (IV intake limited to 80 mL/hr) as per provider order
        - Urinary output
- Consider establishing IV access
- Medications
    - Ensure patient's antihypertensive medication regimen has been reassessed and reordered as appropriate on admission
    - **HYPOTENSION:** If SBP is less than or equal to 110 mmHg, or DBP is less than or equal to 60 mmHg, HOLD medication and notify provider
    - Consider Venous Thromboembolism (VTE) Prophylaxis
    - Consider administration of corticosteroids

**Call/Inform PCP/OB when:**

- BP greater than or equal to 160/110 mmHg
- Decreasing $O_2$ saturation, less than 97%
- Decreased urinary output (less than 30 mL/hour or 100 mL in 4 hours)
- Hematuria
- Worsening signs and symptoms of preeclampsia (e.g. headache, etc.)

**Management of Worsening or Severe HDP:**

- Close nursing care (e.g. 1:1 or 1:2 nurse patient ratio)
- Increase frequency of VS and assessments, including LOC, sedation and DTR
  - Every 15 min x 1 hour, then if stable (i.e. if BP below 160/110 mmHg and no new or worsening symptoms)
    - Every 30 min x 1 hour, then if stable
    - Every 1 hour x 2 hours, then if stable
    - Every 4 hours
    - And PRN
  - Initiate continuous pulse oximetry
  - Temperature every 4 hours and PRN
  - DTR every 4 hours (Shared responsibility between provider and nursing) (Appendix C)
    - Increasing reflexes may indicate pending eclampsia
    - Decreased reflexes may indicate magnesium toxicity
- Establish IV access if not already done
- Strict Ins and Outs:
  - Every 4 hours
  - Test urine for protein every 4 hours
  - Consider urinary catheterization with urometer
- Initiate continuous electronic fetal monitoring (EFM) for FHS for a minimum of 1 hour, unless atypical or abnormal, then as per Provider Order:
  - FHR must be normal in order to discontinue
  - Consider NST daily with IA every hour, and/or NST every 4 hours if patient condition stable and FHS normal
- Initiate seizure precautions:
  - Consider need to initiate magnesium sulfate infusion for seizure prevention prophylaxis (see B-00-07-10052 – Magnesium Sulfate Infusion in the Pregnancy, Birthing and Newborn Centre)
  - Consider installing bedrail pads for injury prevention
- Consider need to deliver (see 'Indications for Delivery')
- Consider whether administration of corticosteroids is warranted and feasible

**Signs & Symptoms of Worsening or Severe Preeclampsia:**

- Worsening or new onset of S&S preeclampsia
- Oliguria
- Pulmonary edema
- $O_2$ sat less than 97%,
- Chest pain
- Hyperreflexia
- Decreasing kidney function
- Decreasing liver function
- Oligohydramnios
- Atypical/Abnormal NST
- Absent/reversed end-diastolic flow UA doppler

**In the Event of Severe Complications of HDP:**

1. Call for Help
   - Ensure PCP and OB on-call have been called
2. Call a Code BLUE and/or Code PINK OB as appropriate
3. Initiate continuous pulse oximetry (if not already done)
4. Initiate continuous EFM (if not already done)
5. Establish IV access (if not already done)
6. Treatment of seizures includes administration (IV or IM) of magnesium sulfate
7. Prepare for delivery

**Severe Signs & Symptoms and Complications of HDP:**

- Eclampsia/Seizure
- Stroke or transient ischemic attack (TIA)
- Uncontrolled, severe hypertension
- Decreasing $O_2$ sat (less than 90%)
- Myocardial infarction
- Severe uncontrolled abdominal pain/Abruption
- Sudden/rapid increase in BP

**Management of Acute Hypertensive Episodes: (see also Algorithm above)**

- In the event that BP is greater than or equal to 160/110 mmHg at a single reading, the elevated reading must be confirmed:
  - Compare BP reading from both arms
    - If one arm reading is higher than the other, use the higher reading
    - Continue to use this arm for all subsequent assessments
  - Compare both manual and automatic readings
    - Automatic reading (both SBP and DBP) must be within 5 mmHg of the manual reading in order to be considered accurate
    - If automatic reading is confirmed as accurate, may continue to use automatic measurements for subsequent assessments
- Once elevated reading is confirmed, repeat assessment in 15 minutes
  - If BP reading remains elevated, initiate urgent antihypertensive therapy
  - Inform Primary Care Provider
- Continue to monitor patient's and fetal status and response to pharmacotherapy

❖ **The goal of urgent antihypertensive therapy is to bring BP below 160/110 mmHg. If BP remains greater than or equal to 160/110 mmHg, or rebounds, contact MRP.**

- Post administration of urgent antihypertensive therapy, monitor VS:
  - Every 15 min x 1 hour, then
  - Every 30 min x 1 hour, then
  - Antepartum and Postpartum: Every 4 to 6 hours while awake and PRN, as per Provider Orders
  - Intrapartum: every 1 hour and PRN
- Monitor for S&S of (worsening) preeclampsia
- Monitor fetal health status:
  - Continuous EFM x 1 hour at a minimum:
    - FHS must be normal in order to discontinue monitoring
    - Additional FHS as per Provider Order
  - Continuous EFM indicated intrapartum
- Monitor laboratory results and observations as per Provider Orders

**Management of Eclampsia**

- Seizures can occur unexpectedly at any time, including the postpartum period, and even when the BP is not severely elevated. Close observation is required.
- Initiate continuous Electronic Fetal Monitoring and assess fetal movement and uterine activity/tone
- Establish IV access (if not already done)
- Initiate magnesium sulfate therapy (either IV or IM if IV access not available)
- Assess for vaginal bleeding and/or rupture of membranes
- Prepare for delivery once birthing person and fetal conditions are stabilized as delivery is indicated by induction or Caesarean birth
- Ensure that type and screen has been completed and run
- Maintain NPO

## Documentation

- Documentation will follow PHC and Cerner guidelines
- All assessments and interventions should be documented in real time (at the time of care)
- FetaLink
- Computer Provider Order Entry
- Cerner PowerChart →
    - Interactive View and I&O – document in all relevant bands/sections including but not limited to:
        - OB Triage, Antepartum, Labour and Delivery
        - OB Special Assessment →
            - Point of Care Testing → Urinalysis Dipstick POC Type
            - Gestational Hypertension Evaluation
            - Magnesium Sulfate Therapy Assessment
            - Seizure Assessment
        - OB Postpartum, OB Recovery
        - OB Systems Assessment
            - Mental Status/Cognition
            - Respiratory and Breath Sounds Assessment
            - Edema Assessment
            - Sedation Scales
            - Measurements → Weight Measured
        - OB Education
        - Intake and Output
    - MAR
    - Notes (Narrative documentation for any event requiring further detail or explanation)

### Patient and Family Education

- Explain procedures and treatments
- Explain need for limited visitors and a calm quiet environment
- Provide on-going information about condition of birthing person and fetus/newborn
- Provide information about the signs and symptoms of the disease, treatment plan and potential complications
- Stress the need to inform RN and/or provider of any possible symptoms, signs of worsening and side effects of medication
- Explain to patient and family/support person(s) why medication is needed, desired effects and potential side effects, symptoms to report to RN, monitoring and nursing care required
- Review with patient and support person: the reasons and frequency of assessments, the role of equipment and supplies related to assessments, and education as per BC Postpartum Clinical Path and the BC Newborn Clinical Path

## Related Documents

- B-00-07-10036 – Code Pink: Obstetrical Emergency
- B-00-07-10043 – Antepartum Non-Stress Test (NST)
- B-00-07-10048 – Fetal Health surveillance (FHS): Intrapartum
- B-00-13-10080 – Code Blue Team Responsibilities and Response to Cardiac Arrest Calls
- B-00-07-10052 – Magnesium Sulfate Infusion in the Pregnancy, Birthing and Newborn Centre

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## Appendices

**Appendix A: Risk Factors for Hypertensive Disorder of Pregnancy**

**Appendix B: Indications for Delivery (Regardless of Gestational Age)**

**Appendix C: Checking Reflexes and Clonus**

## Appendix A: Risk Factors for Hypertensive Disorder of Pregnancy

| | High Risk Factors | Moderate Risk Factors |
|---|---|---|
| **Pregnancy History** | Prior preeclampsia | Prior placental abruption<br>Prior stillbirth<br>Prior fetal growth rate concerns |
| **Demographics** | Pre-pregnancy BMI greater than 30 $kg/m^2$ | Age greater than 40 years<br>Family history of hypertension or cardiovascular disease |
| **Pre-Existing Medical Conditions** | Chronic hypertension<br>Pre-gestational diabetes mellitus<br>Chronic kidney disease<br>Systemic lupus erythematosus<br>Antiphospholipid antibody syndrome | |
| **Current Pregnancy** | Assisted reproductive therapy | Nulliparity<br>Multifetal pregnancy |

(Adapted from SOGC Guideline No. 426: Hypertensive Disorders in Pregnancy (2022))

## Appendix B: Indications for Delivery (Regardless of Gestational Age)

| | |
|---|---|
| **CNS** | • Eclampsia<br>• PRES<br>• Cortical blindness or retinal detachment<br>• Glasgow coma scale less then 13<br>• Stroke, TIA, reversible ischemic neurological deficit (RIND) |
| **Cardiorespiratory** | • Uncontrolled severe hypertension (over a period of 12 hours despite use of 3 antihypertensive agents)<br>• Oxygen saturation less then 90%, need for 50% oxygen for greater then 1 hour, intubation (other than for Caesarean section), pulmonary edema<br>• Positive inotropic support<br>• Myocardial ischemia or infarction |
| **Hematological** | • Platelet count less then 50 x $10^9$/L<br>• Transfusion of any blood product |
| **Renal** | • Acute kidney injury (creatinine greater then 150 with no prior renal disease)<br>• New indication for dialysis |
| **Hepatic** | • Hepatic dysfunction (INR greater then 2 in absence of DIC or warfarin)<br>• Hepatic haematoma or rupture |
| **Uteroplacental dysfunction** | • Abruption with evidence of maternal or fetal compromise<br>• Absent or reversed ductus venosus a-wave by Doppler velocimetry<br>• Intrauterine fetal death |

**Appendix C: Checking Reflexes and Clonus**

Relaxation is critical during assessment of deep tendon reflexes; tendon reflexes are difficult to elicit when patients tense the muscles being tested. It is helpful to distract patients by engaging them in conversation while testing their reflexes.

The joint under consideration should be at about 90 degrees and fully relaxed. It is often helpful to cradle the joint in your own arm to support it. With your other arm, hold the end of the hammer and let the head of the hammer drop like a pendulum so that it strikes the tendon.

Reflexes are graded as:

0 = reflex absent

1 = reflex small, less than normal; includes a trace response or a response brought out only with reinforcement

2 = reflex in lower half of normal range

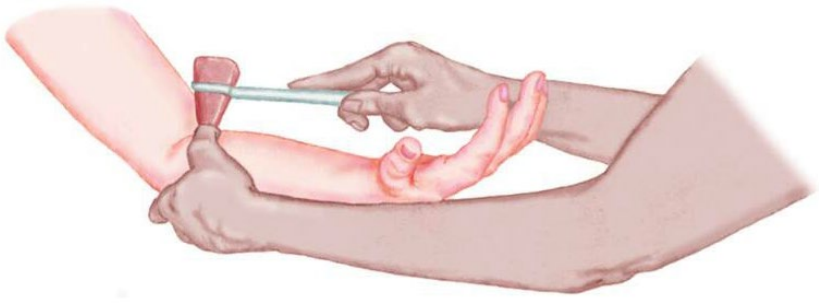
3 = reflex in upper half of normal range

4 = reflex enhanced, more than normal; includes clonus if present, which optionally can be noted in an added verbal description of the reflex

EITHER the biceps OR patellar reflex may be tested, it is not necessary to do both. It is often easier to test the patellar reflex.

**Testing the bicep reflex:**

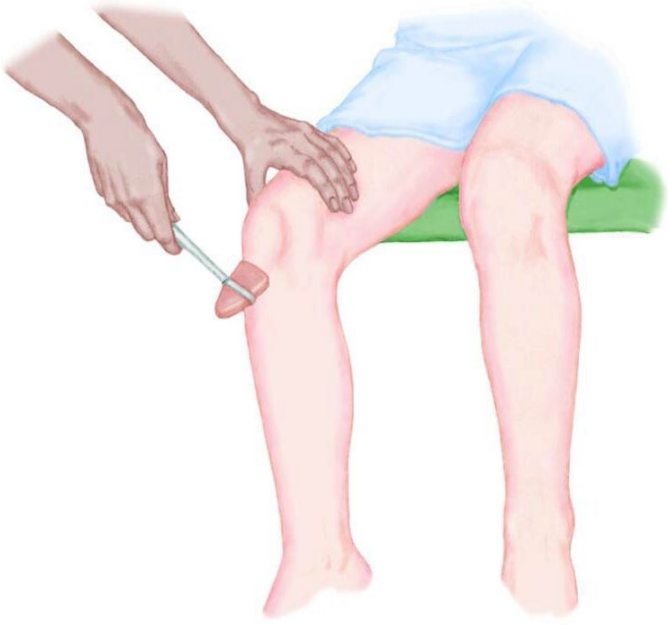
1. Support the patient's arm so it is slightly flexed and the biceps tendon can be palpated with the thumb
    - Have the patient flex and extend the arm until the tendon is palpable
2. Instruct the patient to relax the arm being tested
3. Place the thumb of the non-dominant hand over the patient's biceps tendon and strike the thumb with the small end of the reflex hammer
    - Normal response is slight flexion of the patient's forearm and slight constriction of the biceps muscle
4. Repeat the procedure with the other arm



**Testing the patellar reflex:**

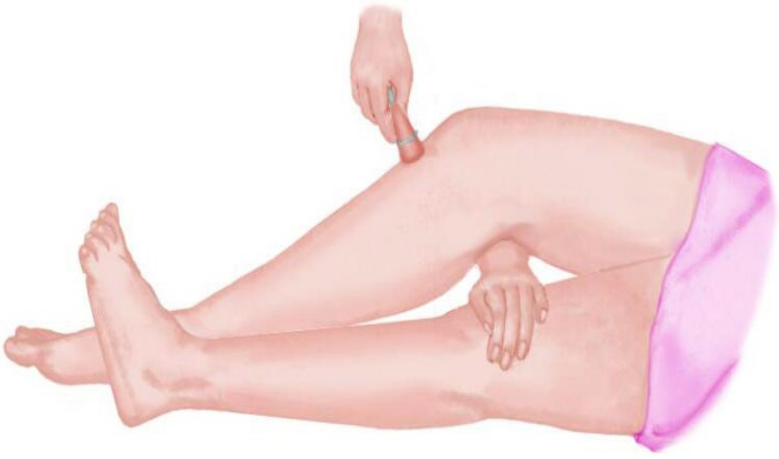
Seated –

1. Position the patient so their legs dangle freely
2. Palpate the patellar tendon just below the patella
    - Have the patient flex and extend their lower leg until the tendon is palpable
3. Instruct the patient to relax the leg being tested
4. Strike the patellar tendon briskly with the wide end of the reflex hammer
    - Normal response is a slight extension of the leg or a brief twitch of the quadriceps muscle of the thigh
5. Repeat the procedure with the other leg



Supine –

1. Support the weight of one leg using the non-dominant hand
2. Palpate the tendon just below the patella
    - Have the patient flex and extend their lower leg until the tendon is palpable
3. Instruct the patient to relax the leg being tested
4. Strike the patellar tendon briskly with the wide angle of the reflex hammer
    - Normal response is a slight extension of the leg or a brief twitch of the quadriceps muscle of the thigh
5. Repeat the procedure with the other leg

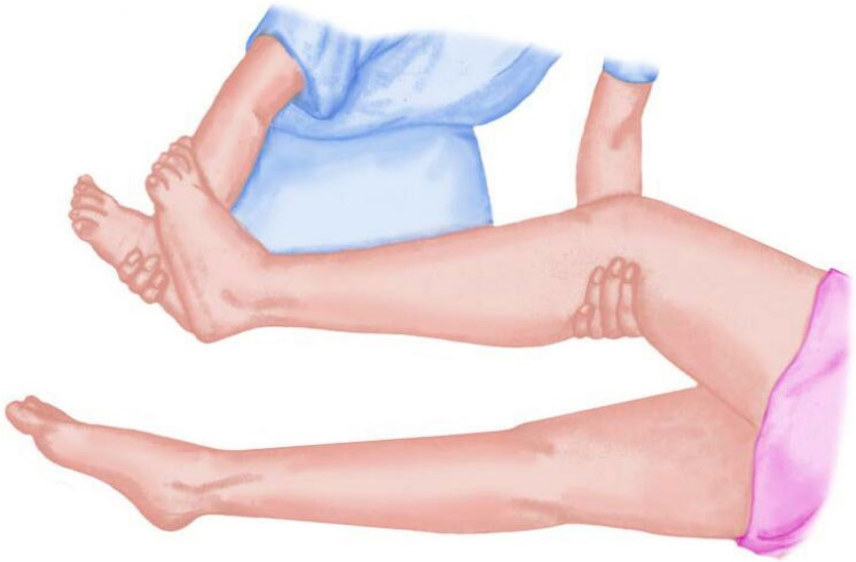


Clonus is a result of CNS irritability, and indicates that the patient has an increased risk of seizure activity. It is a rhythmic series of muscle contractions induced by stretching the tendon as is easiest to observe occurring at the ankle. It is elicited by suddenly dorsi-flexing the patient's foot and maintaining light upward pressure on the sole.

Clonus is quantified by the number of beats

**Assess the patient for clonus:**

1. Position patient supine with a left lateral tilt
2. Support their lower leg with one hand and sharply dorsi-flex the foot (towards head) with the other hand
3. Maintain flexion of the foot and count the number of rapid tapping or jerking motions
    - Clonus is felt as a rapid, rhythmic tapping or jerking motion of the foot
    - Absence of movement indicates that clonus is not present
4. Repeat the procedure with the other leg.



Adapted from Elsevier Clinical Skills Deep Tendon Reflexes (Maternal-Newborn), 2022.

**Persons/Group Consulted**

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PHC Professional Practice – Medication Safety

PHC Physician Program Director Maternity Services

PHC Obstetric Physician

PHC Obstetric Anesthesia Physician

PHC Physician Lead for Family Practice

PHC Assistant Department Head for Midwifery

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PHC Program Director – Maternity Services

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PHC Clinical Nurse Leader – Maternity

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PHC Clinical Nurse Leader – NICU

PHC Clinical Nurse Educator – NICU

PHC Maternity Registered Nurses

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| **Owners:** *(optional)* | PHC |
| | SPH Pregnancy, Birthing, and Newborn Centre |