



**PHILIPPINE OBSTETRICAL AND GYNECOLOGICAL
SOCIETY (Foundation), INC.**



PHILIPPINE SOCIETY OF MATERNAL FETAL MEDICINE, INC.

COVID-19 and Pregnancy: Interim Guidelines on Labor and Delivery for MFM specialists and General Obstetric Practitioners

INTRODUCTION:

COVID-19 is a disease declared as a global pandemic by the WHO. Currently, more than 100 million women are pregnant globally, virtually all of whom at risk for contracting the virus. Pregnant women in general are immunocompromised and thus may be at higher risk from developing severe disease (pneumonia and respiratory failure) from COVID-19.

A meta-analysis of 41 pregnant patients with COVID-19 showed they have a higher risk of miscarriage, preterm birth, preeclampsia, and cesarean delivery, particularly if they are hospitalized with pneumonia.¹ Their newborns are at a higher risk of stillbirth (2.4%, 1/41) and admission to the intensive care unit.¹

The general guidelines regarding outpatient prenatal care, maternal-fetal medicine guidance for COVID-19 has been recently released by POGS and PSMFM last March 27, 2020.

The objectives of these interim guidelines are the following:

1. To present the new classification system proposed by the DOH for COVID-19.
2. To present diagnostic methods available for COVID-19 and the current recommendation on its use.
3. Provide guidance which are locally applicable regarding methods to appropriately screen and diagnose pregnant patients for COVID-19 prior to and at admission to Labor Unit.
4. Reduce the risk of maternal and neonatal COVID-19 disease through minimizing hospital contact and appropriate isolation.
5. Provide specific guidelines for management of Labor and Delivery of the COVID-19 positive woman as well as the critically ill COVID-19 positive pregnant patient.

These are only best practice recommendations that should be adapted to fit local/institutional settings. This document is offered as best practice recommendations to guide clinical judgement. The reader is advised to adjust practices as needed based on incidence of COVID and limitations in capacity and resources in their settings.

NEW CLASSIFICATION SYSTEM AS PROPOSED BY THE DEPARTMENT OF HEALTH (DOH)

Figure1: Corresponding Old versus New COVID-19 Case Definitions ²

Old Classification	New Classification
Neither PUI or PUM	Non-COVID case
PUM	[Unclassified]
PUI – mild, severe and critical who has not been tested and for testing	Suspect
PUI – mild, severe and critical with inconclusive, inadequate or no available testing	Probable
COVID-19 positive	Confirmed

GENERAL GUIDELINES IN THE DIAGNOSIS OF A PREGNANT PATIENT SUSPECTED OF COVID-19

1. Confirmation of SARS-CoV-2 or COVID-19 infection is done only by a highly sensitive test using nucleic acid amplification tests (NAAT), such as real time Reverse Transcriptase Polymerized Chain Reaction (RT-PCR)³. It is the present standard for diagnosis of COVID-19. The average RT-PCR testing needs up to 2 hours yet it takes between 6-10 hours for completion or even longer when batch testing is done by designated laboratories.⁴

Figure 2: Suggested methods of diagnosis using locally available testing: PCR, Aby (Antibody Test) for limited resource areas) and Aby Test and PCR both available⁵

	PHASE 0 AND PHASE 1 (DAY 1-7)	PHASE 2 (DAY 7-14)	PHASE 3 (DAY >=15)
PCR ONLY (national and subnational laboratories currently)			
PCR (+)	Confirmed COVID-19: Admit, isolate and treat		
PCR (-)	Not COVID-19		Not COVID-19 or possible recovered
RDT (Aby TEST) ONLY (limited resource areas)			
Antibody (+)	Rule in COVID-19: Isolate		COVID-19 IgM(+), IgG(+): developing immunity IgM(-), IgG(+): recovered
Antibody (-)	Inconclusive: Quarantine if with symptoms; monitor, repeat test after 10 days		Rule out COVID-19
Aby TEST and PCR AVAILABLE			
Antibody (+), PCR (+)	Confirmed COVID-19: Admit, isolate and treat		
Antibody (+), PCR (-)	IgM (+), IgG (-): Exposed; Quarantine, repeat antibody test after 10 days IgM(+), IgG(+): developing immunity; Quarantine, repeat antibody test after 10 days IgM(-), IgG(+): Previous infection	IgM (+), IgG (-): Ongoing infection IgM(+), IgG(+): developing immunity IgM(-), IgG(+): Previous infection	COVID-19 IgM(+), IgG(+): developing immunity IgM(-), IgG(+): Recovered
Antibody (-), PCR (+)	Confirmed COVID-19: Admit, isolate and treat		
Antibody (-), PCR (-)	Not COVID-19		

Figure 3: Variation of the levels of SARS-CoV-2 (COVID-19) RNA and Antigen, IgM and IgG after infection⁶

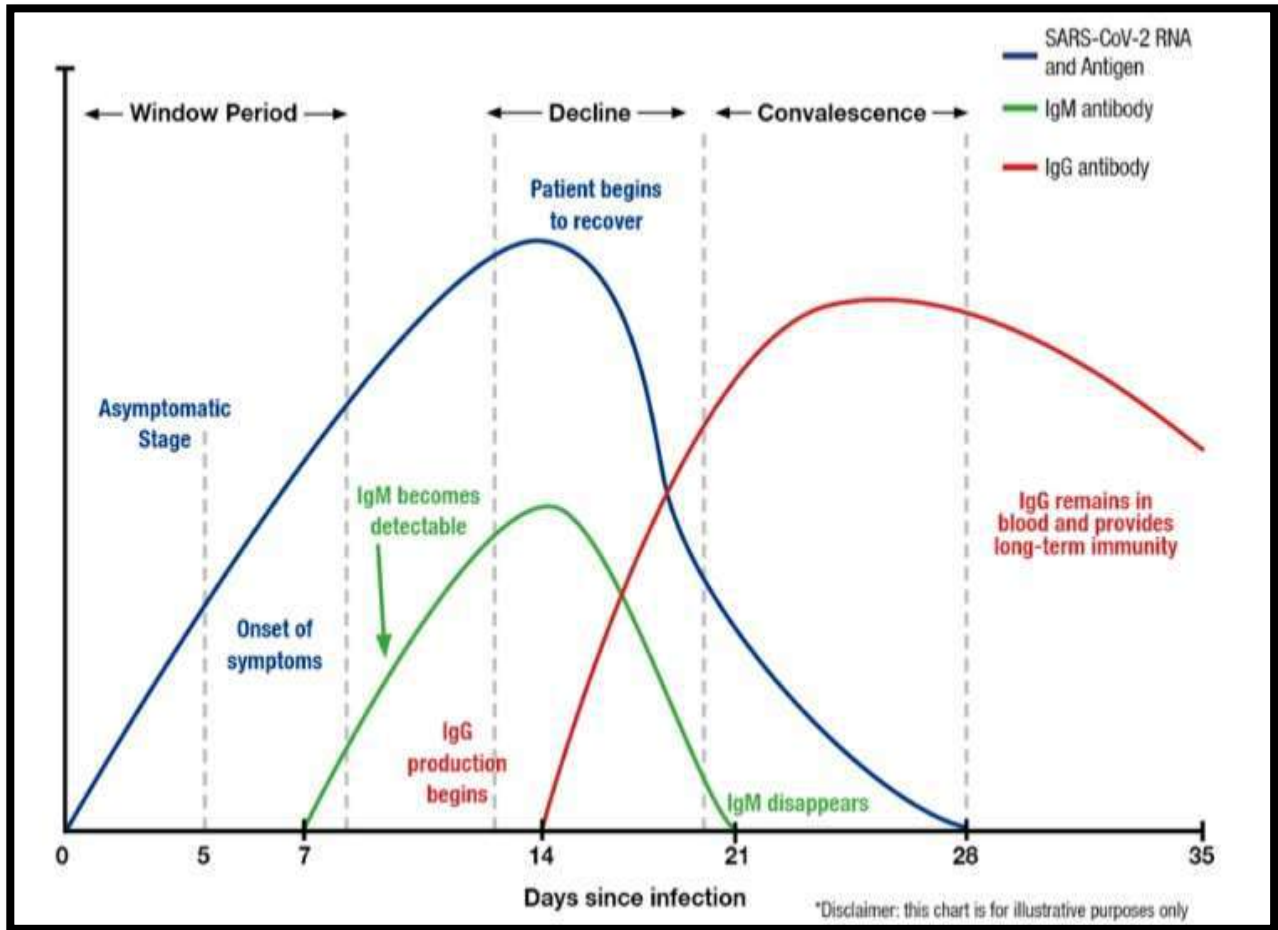


Figure 4: Clinical interpretation of all possible scenarios that can be encountered when testing a patient with both RT-PCR and and IgM/IgG serological test⁶

Test results			Clinical Significance
RT-qPCR	IgM	IgG	
+	-	-	Patient may be in the window period of infection.
+	+	-	Patient may be in the early stage of infection.
+	+	+	Patients is in the active phase of infection.
+	-	+	Patient may be in the late or recurrent stage of infection.
-	+	-	Patient may be in the early stage of infection. RT-qPCR result may be false-negative.
-	-	+	Patient may have had a past infection, and has recovered.
-	+	+	Patient may be in the recovery stage of an infection, or the RT-qPCR result may be false-negative.

2. The present alternative test available is the qualitative IgM/IgG serological assay or Rapid Aby (Antibody testing) detect human antibodies produced in response to COVID-19 infection, this is designed to complement RT-PCR in the diagnosis of COVID-19. Diagnostic accuracy varies greatly depending on the timing of the test.
3. The rapid testing method performed poorly during the early phase of the disease (i.e. less than 8 days from the onset of symptoms. (Phase 0 and Phase 1 in Figure 2)
4. There is a growing interest on the role and appropriateness of chest radiographs (CXR) and computed tomography (CT) for the screening, diagnosis and management of pregnant patients suspected or known COVID-19 infection.⁷
5. Some studies suggest that chest CT in particular may be positive in the setting of a negative test, however the CDC does not currently recommend CXR or CT to diagnose COVID-19. Viral testing remains the only specific method of diagnosis.⁷
6. Confirmation with a viral test is still required, even if radiologic findings are suggestive of COVID-19 on both CXR and CT.⁷
7. The CDC recommends collecting and testing specimens from the upper respiratory tract (Nasopharyngeal AND oropharyngeal swabs) or from the lower respiratory tract for the initial diagnostic testing for suspected COVID-19 infection.
8. CXR and CT should not be used to screen for or as a first line test to diagnose COVID-19.
9. CT should be used sparingly and reserved for hospitalized, symptomatic patients with specific clinical indications for CT.
10. Appropriate Infection Prevention Control measures should be followed before scanning subsequent patients.
11. Chest ultrasound has been advocated by the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) as a tool in the diagnosis of COVID-19 in suspected and confirmed patients.⁸

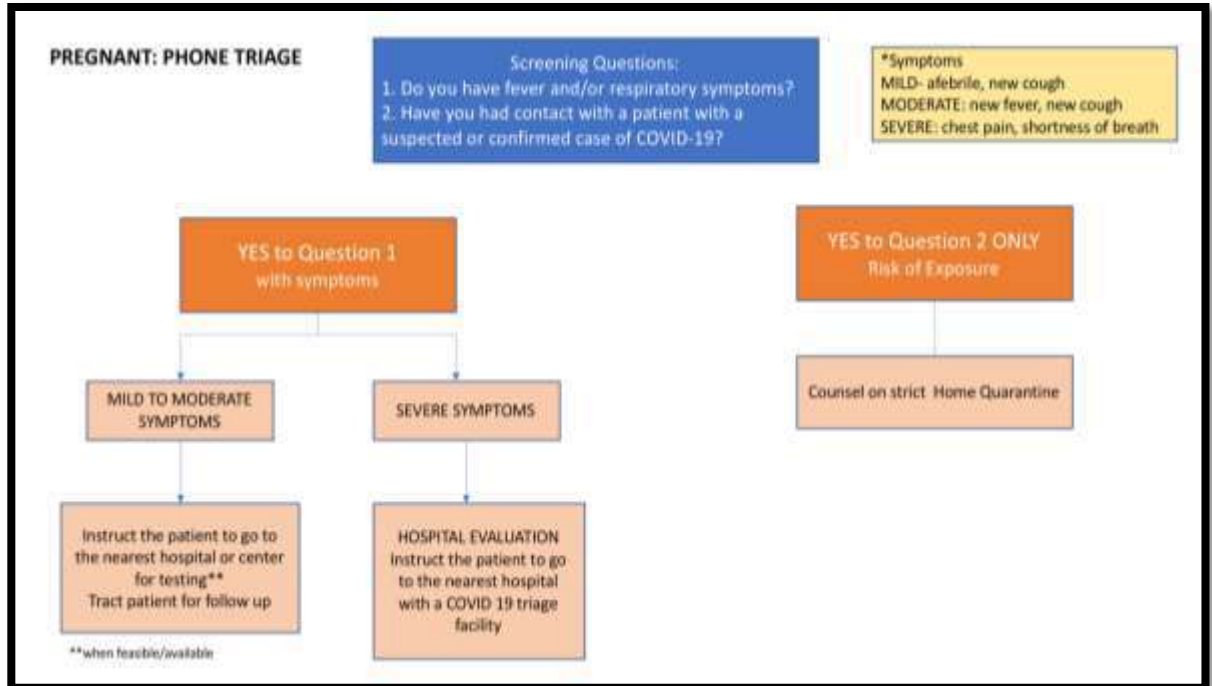
12. Although chest USG can show characteristic findings of COVID-19 infection, these may also be similar to findings seen in other forms of viral pneumonia.⁹
13. Chest USG is not recommended as a primary screening tool for suspected and confirmed COVID-19 patients.⁹
14. Chest USG may be used as a supplemental modality in detection and monitoring of COVID-19 patients who are confined, provided that strict implementation or operator protection and decontamination protocols are adhered to.⁹

SECTION 1. APPROPRIATE SCREENING, TESTING AND PREPARATION OF PREGNANT WOMEN FOR COVID-19 BEFORE VISIT AND/OR ADMISSION TO THE LABOR AND DELIVERY ROOM

- Following the general advice for outpatient management of pregnant women, prevention of spread is top priority. Teleconferencing with the obstetrician is encouraged. As much as possible, visit to the labor and delivery room is reserved for urgent problems.
- Pregnant patients should be triaged based on the presence or absence of maternal or fetal compromise.¹⁰ Phone triage by the obstetrician or the resident on duty in the labor and delivery complex using the flow chart (Figure 1) can be used accordingly.¹¹
- Patients calling with symptoms of COVID-19 or flu or with direct contacts who have no urgent obstetrical issues should be referred for testing in the designated COVID-19 centers nearest to them.
- They should be instructed to stay home to self-quarantine while awaiting results.
- Women with urgent obstetrical problems namely labor, rupture of membranes, vaginal bleeding, decreased fetal movement etc. should be evaluated in a designated area in the labor and delivery room for COVID-19 patients.
- In as much as labor cannot be anticipated, timing of hospital admission should be discussed by the obstetrician and the patient. The pregnant woman should be instructed to discontinue work or work from home beginning 37 weeks.¹¹ This will allow her to self-isolate for 2 weeks to limit the risk of exposure.
- Labor and delivery room units should designate a room for labor and delivery and an operating room for cesarean section.
- The appropriate PPE should be worn by the healthcare providers at all times.

- For women with planned admissions for induction of labor or cesarean section, screening by phone the day before admission is encouraged.

Figure 5: Flow chart for triaging patients who call into Labor and Delivery

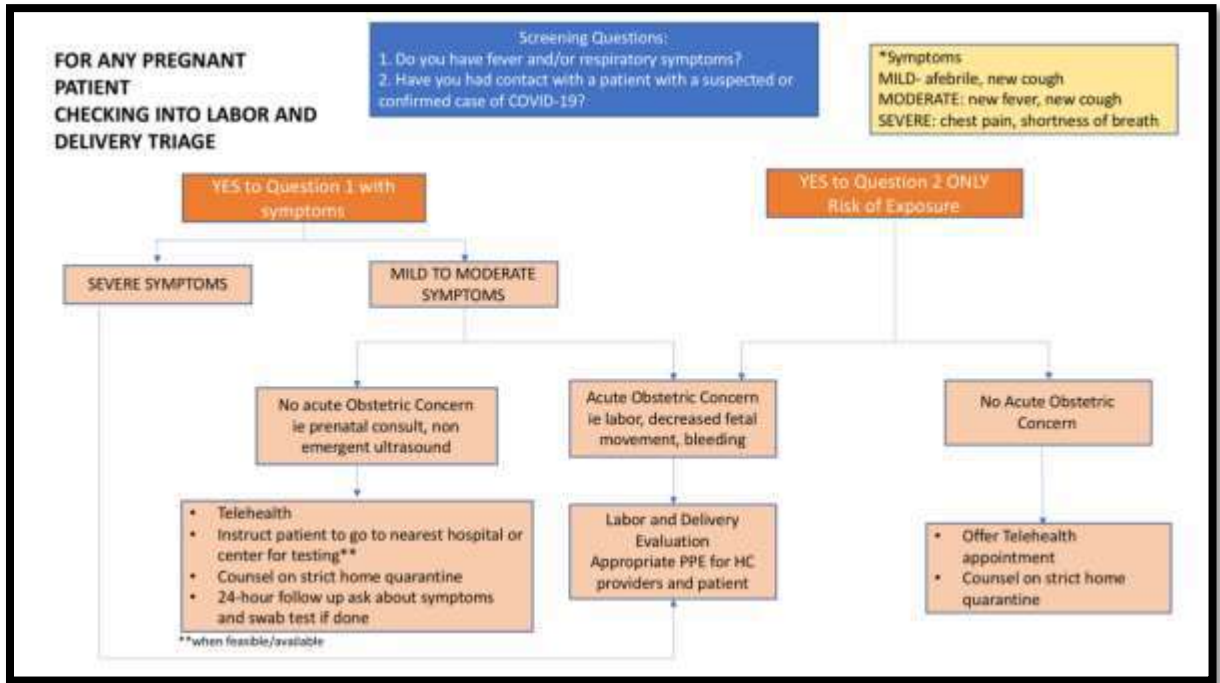


SECTION 2. SCREENING FOR PATIENTS COMING TO LABOR AND DELIVERY TRIAGE

- Ideally, patients coming to the Labor and Delivery Triage should be picked up when screening the patient by phone.
- There should be a designated area at the front of the Labor and Delivery unit for screening of women by a designated staff member.
- Women arriving to the Labor and Delivery Triage should be screened for the following symptoms:
 - Fever $\geq 38.0^{\circ}\text{C}$
 - Cough
 - Difficulty of breathing or shortness of breath
 - Gastrointestinal symptoms
- All birthing partners should be screened. If screen positive, they should be directed to the appropriate testing or medical care as indicated.
- **In women who screen positive**, appropriate isolation and sanitation should be practiced
 - Any woman reporting fever, cough, respiratory or gastrointestinal symptoms should be given a surgical mask and evaluated by the OB provider.

- All health care providers should follow the CDC PPE recommendations until COVID-19 has been ruled out.
 - The current CDC recommendations include:
 - Surgical mask
 - Protective eyewear
 - Gown
 - Gloves
 - N95 for any women with confirmed or suspected COVID-19
 - Aerosolization should be avoided because it increases the spread of the virus. N-95 masks should be used in settings of aerosolization (such as bi-pap, tracheostomy, high flow nasal cannula O2, nebulization, and during second stage of labor).
 - Practice vigilant hand hygiene.
- **In women who screen positive**, severity of illness and clinical/obstetrical risks should be assessed.
 - **Women with acute complaint requiring evaluation** (such as severe symptoms, labor complaints)
 - Send patient to a designated isolation room reserved for patients who screen positive, both for triage and labor.
 - Women with mild respiratory symptoms and stable maternal and fetal conditions may be sent to the appropriate unit in the hospital for testing and proper instructions and counselling, with routine obstetric precautions.
 - Women with obstetric or medical indications for admission should be sent to a designated isolation room.
 - **Women for scheduled cesarean delivery or induction of labor**
 - Ideally, these women should be picked up when screening the patient by phone the day prior to admission.
 - Evaluate if rescheduling in 2-3 days is feasible to allow for results of COVID-19 testing.
 - For COVID-19 positive patients with mild or moderate symptoms not requiring immediate care, it is important to remember that the severity of disease peaks in the 2nd week, so planning the delivery prior to the peak of severity of the disease is optimal.

Figure 6: Suggested flow for screening patients presenting to Labor and Delivery Triage



SECTION 3. GENERAL CHANGES TO ROUTINE LABOR AND DELIVERY WORK FLOW

Respiratory Precautions and Personal Protective Equipment (PPE)

- Given the risk of asymptomatic carriers and transmission and the fact that not all patients can have routine testing for Covid-19, it should be the goal of every unit (ER, OPD, Ward, ultrasound section, LR, DR, OR) that every patient and health care worker wear a surgical mask.^{14,15}
- Avoid giving aerosolized oxygen.¹⁶
- Observe hand hygiene after every patient contact.¹⁶
- Critically observe proper donning and doffing of PPE.¹⁶

Suggested PPE based on clinical situation¹¹

Care Situation	Surgical Mask	Droplet PPE (Gown, Gloves, Surgical Mask, Face Shield)	N-95 Mask
PATIENT (with or without symptoms)	√		
PROVIDER during routine patient encounter (Possible)	√		

PROVIDER during patient with URI symptoms (Suspect)		√	
PROVIDER during patient with suspected or confirmed Covid-19 (Probable -Confirmed)		√	√
PROVIDER caring for patient during indispensable aerosolizing procedures (intubation, extubation, mechanical ventilation, non-invasive ventilation, suctioning, bronchoscopy)		√	√

** Adopted from Labor and Delivery Guidance for Covid-19. American Journal of Obstetrics and Gynecology – AJOG MFM March 24, 2020*

Visitor Policy¹¹

- Visitation should be limited to one support person only from admission until discharge
- If testing is NOT done, the designated support person must wear a surgical mask at all time.
- Parents may visit the NICU one at a time.
- No children < 16 years of age permitted at any time.
- Additional visitors for end-of-life situation may be considered.
- Visitation may be further restricted at the discretion of the hospital.

Patient Admission and Location¹¹

- Efforts should be made to limit movement of women from one care area to another (e.g., triage room to admitting room to labor room to ward).
- Consider admitting the patient from the triage directly to the final admitting floor (e.g. monitor a woman in threatened preterm labor in the triage then if stable, bring immediately to the ward thus avoiding exposure of the labor/delivery room).

Admitting Laboratory Tests¹¹

- Women should have routine admitting labs at the triage or ER to limit movement to different areas of the hospital.

SECTION 4. INTRAPARTUM CARE

Induction of labor

- Should not be postponed or rescheduled among asymptomatic women if with medical indication to do so.
- May consider postponing/rescheduling if with extreme healthcare burden.
 - early COVID-19 emergence, prior to high case burden of the hospital
 - additional 1-2 days stay of patient due to induction will impose a burden to the already high COVID-19 burden
- There is an option to begin induction process at home to limit in-hospital time
 - outpatient Foley bulb cervical ripening
 - Other locally acceptable methods of cervical ripening (i.e. evening primrose oil)
- Cesarean section for failed induction should ¹⁷
 - not be performed before 15 hours of oxytocin and amniotomy if feasible
 - ideally after 18-24 hours of oxytocin

First stage

- **Generally guidance**
 - Continuous bladder catheterization cannot be recommended in labor.
 - Oxytocin augmentation is recommended to shorten the time to delivery for women making slow progress in the first stage of spontaneous labor.
 - Higher doses of oxytocin can be considered.
 - Early intervention with oxytocin and amniotomy for the prevention and treatment of dysfunctional or slow labor is recommended.
 - Arrest of first stage of labor should not be called unless:¹⁷
 - Labor has arrested for a minimum of 4 hours with adequate uterine activity or 6 hours with inadequate uterine activity in a woman with ROM
 - Adequate oxytocin
 - ≥ 6 cm dilated cervix
- **Oxygen therapy**
 - Advised not to utilize oxygen therapy for fetal resuscitation.
 - Oxygen inhalation via nasal cannula may not be an aerosolizing procedure but the equipment is in contact with maternal respiratory tract and secretions there is a higher risk for chance of contamination/exposure between patient and provider, especially in asymptomatic carriers.¹⁸

- Recent meta-analysis has demonstrated that intrapartum oxygen has no fetal benefit, and may cause harm.^{19,20}
- **Nitrous Oxide**
 - Recommend to eliminate use because it involves risk of aerosolization and involves respiratory contamination.²¹

Second stage

- Management should not be altered.
- Pushing should not be delayed as it prolongs time to delivery, and increases chorioamnionitis and postpartum hemorrhage.^{22,23}

Third stage

- Optimize antenatal hemoglobin to decrease need for transfusion as resources for blood is limited amidst the crisis.
- Besides oxytocin, prophylactic tranexamic acid may be considered.²⁴
- If blood transfusion is indicated, transfuse 1 unit then reassess before transfusing for another unit.
- Delayed cord clamping regardless of COVID-19 status may still be done until developing evidence suggests a change in this practice.²⁵⁻²⁶

Anesthesia Considerations²¹

- Recommended to start Epidural anesthesia early in labor to minimize the need for general anesthesia in case the need for emergent cesarean section arises.
- Emergent cesarean deliveries should be avoided as much as possible.
- Proactive communication between obstetrics, anesthesia and nursing teams is highly encouraged.
- Neuraxial (spinal and epidural) anesthesia are not contraindicated for patients with COVID-19.
- Because of the potential risk if aerosolization, use of nitrous oxide is not recommended.

SECTION 5. POSTPARTUM CARE

- Women should be notified that in order to limit the risk of infection to themselves, staff, and other patients, they will be discharged in an expedited and safe fashion.

Expedited Discharge Planning

- All vaginal deliveries should have a goal of discharge on postpartum day 1, or even same day if possible for selected women.
- All cesarean deliveries should have a goal of discharge on postoperative day 2, with consideration of postpartum day 1 discharge if meeting milestones.
- Discuss anticipated maternal discharge with pediatrics/neonatology to determine timing of infant discharge.
- Home care with supplies for blood pressure follow up will be critical to expediting discharge of patients with a hypertensive disorder.

Post-partum visit

- All postpartum visits, including wound checks, should be arranged for telehealth. Postpartum evaluation of cesarean wound healing or mastitis concerns may be optimized through use of photo upload options available in many electronic medical record patient portal programs.
- Encourage either long acting reversible contraceptive (LARC) placement or Depo-provera injection prior to discharge for patients planning to use these to eliminate need for additional in person postpartum visits.

SECTION 6: CARE FOR THE SUSPECTED OR CONFIRMED COVID-19 POSITIVE PREGNANT PATIENTS IN LABOR AND DELIVERY

OBSTETRIC MEDICATIONS

Tocolytic medications and antenatal corticosteroids are the two most commonly used medications in Obstetrics. In the setting of COVID-19, a review of these medications to assess its safety in women suspected or positive for COVID-19 must be taken into consideration.

1. INDOMETHACIN (NON-STEROIDAL ANTI-INFLAMMATORY DRUG)

- There were early reports suggesting that NSAIDs in general may worsen the course of COVID-19.
- The virus binds to cells through the Angiotensin Converting Enzyme-2 (ACE-2) receptor, thus it was postulated that the use of NSAIDs which increase ACE-2 expression may result in worsening disease.²⁷
- NSAID restriction has not been substantiated by studies and some organizations including the WHO and FDA have advocated against it.²⁸

2. NIFEDIPINE (CALCIUM CHANNEL BLOCKER)

- May be considered as an alternative drug for tocolysis given the uncertainty of using NSAIDs for tocolysis in women suspected of having or positive for COVID-19 who are candidates for tocolysis (mild to moderate disease).

3. BETAMETHASONE/DEXAMETHASONE

- The routine use of systemic steroids in the setting of a viral pneumonia has been associated with increased morbidity.^{29,30}
- Given the association between steroids and worsening morbidity of viral pneumonia and specifically COVID-19, steroids for fetal lung maturity should be used judiciously.
- Consultation with multidisciplinary team OB-IDS/IDS, Pulmonary-Critical Care medicine specialist and Neonatologist is recommended.

4. Magnesium Sulfate

- Magnesium Sulfate is used for neuroprotection for pregnancies < 32 weeks AOG or for eclampsia prophylaxis.
- No reported data regarding the impact of Magnesium Sulfate in the setting of COVID-19.
- Magnesium Sulfate however has a potential for respiratory complications (Pulmonary Edema, Dyspnea) and should be used judiciously in the setting of severe respiratory symptoms.
- Magnesium Sulfate may be used as indicated in patients with mild/moderate symptoms.

Table 1: Use of common medications in preterm labor management in the setting of COVID-19 pregnant patient

Gestational Age	< 32 weeks		32-34 weeks		34-36 weeks
	Mild-Mod symptoms	Severe symptoms	Mild-Mod symptoms	Severe symptoms	Any
Steroids for fetal lung maturity	Use	Discuss risk and benefits with multidisciplinary team including ID, Pulmonary-Critical care, Neonatology	Consider	Avoid	Avoid
Indomethacin for tocolysis	May consider	Use Nifedipine instead	Use Nifedipine instead	Use Nifedipine instead	Not indicated
Magnesium Sulfate for Neuroprotection	Use	Discuss risk and benefits with multidisciplinary			

		team including ID, Pulmonary-Critical care, Neonatal-Perinatal medicine			
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*Severe signs or symptoms include need for respiratory support, hypoxia, etc.

LABORATORY VALUE CHANGES

- COVID-19 infection may be associated with transaminitis (elevated transaminase levels) and thrombocytopenia.
- This is an important consideration in a patient presenting with hypertensive disorders to rule out whether she has severe features of preeclampsia or HELLP syndrome.

INTRAPARTUM CARE

- Timing of Delivery
 - COVID-19 peaks in the second week, it may be prudent to expedite delivery of term COVID-19 positive patients with mild symptoms.
- Mode of Delivery
 - COVID-19 alone is not an indication for a cesarean delivery.
 - Mode of delivery dictated by Obstetrical indications.
- Risk of vertical transmission
 - No documented vertical transmission based on a limited case series.^{31,32}
- Precautions for transmission prevention
 - Designate rooms or section of floors to be used for suspected/confirmed COVID-19 positive patients.
 - Respiratory precautions
 - Negative pressure room is not required.
 - If patient is highly suspected of having or is COVID-19 positive, PPE should be used as per hospital specific guidelines.
 - At a minimum, N95 mask and full droplet protective gear (goggles/face shields) should be used by care providers in the room during the second stage of labor.
 - Minimize change in providers to limit exposure.
 - Consider having one team designated for confirmed or suspected COVID-19 patients.
- Medical Care
 - Multidisciplinary care involving MFM, OB-IDS/IDS, Pulmonary/Critical care specialist, OB anesthesiologist and Neonatologist.
 - Consult MFM and OB-IDS/IDS regarding use of steroids for fetal lung maturity, Indomethacin for tocolysis and Magnesium Sulfate for neuroprotection and/or eclampsia prophylaxis.

- Refer to Intrapartum oxygen use guideline, given the lack of fetal benefit and the risk of contamination/transmission with using an intranasal cannula, the use of oxygen for fetal resuscitation is not recommended.
- Consider fluid restriction (<75 cc/hr) unless there is concern for sepsis/hemodynamic instability.
- Cesarean Delivery
 - Designate (when possible), one Operating Suite for use in patients with suspected or confirmed COVID-19 infection.
 - Wear appropriate PPE according to hospital guidelines.
 - Plan appropriate work flow regarding planned or emergent cesarean delivery.
 - Minimize the number of providers involved in direct patient contact.
 - Minimize change in providers to limit exposure.

POSTPARTUM CARE

- Follow local breastfeeding guidelines.
- Breast milk provision (via breast pumping) is encouraged and is potentially a source of antibody protection for the infant.
- Even during temporary separation, women who intend to breastfeed should express their breast milk to establish and maintain milk supply.
- Before milk expression, women must practice appropriate hand/skin hygiene which includes washing not just hands but also breast prior to pumping.
- All parts of the pump that came into contact with breast milk should be thoroughly washed and entire pump appropriately disinfected.
- Expressed breast milk should be fed to the newborn by a healthy care giver.
- Even if current FDA and WHO guidelines do not restrict the use of NSAIDs for pain relief in women suspected or positive for COVID-19, it is best avoided and replaced with safer alternatives until studies become available to justify its use.

SECTION 7. CARE FOR THE CRITICALLY ILL COVID PREGNANT PATIENT / SUSPECTED PREGNANT PATIENT

- A multi-disciplinary team involving infectious disease specialist, Pulmonologist, Obstetrician, Anesthesiologist and Neonatologist should be arranged.
- Conditions necessitating critical care are: Respiratory Failure, Septic Shock or Multi-organ dysfunction or failure. Institute prompt targeted management.
- Discuss the different treatment options, risks, benefits, its outcomes with families for them to be able to make an informed decision about the critical care of the patient.

- Patient should be placed in an intensive care unit / isolation room.
- Priority is to stabilize the patient's condition with standard supportive care therapies.
- Specific guidelines for the management for critical care by NICE³³
 - hourly observation of vital signs, including hourly input / output charts.
 - Signs of decompensation include : an increase in oxygen requirements or $FiO_2 > 40\%$, a respiratory rate of greater than 30, reduction in urine output, or drowsiness, even if the saturations are normal.
- Urgent measures should be initiated once patient exhibits any signs of decompensation.
 - Carry out early mechanical ventilation once with signs of respiratory failure. Place the patient in the lateral decubitus position.
 - Adjust Mechanical ventilation to achieve a higher maternal oxygenation (target of $PaO_2 > 70$ mmHg instead of 55-80 mm Hg) and lower carbon dioxide levels (target $PaCO_2$ of 28-32 mm Hg) to maintain adequate placental perfusion and prevent fatal hypoxemia and acidosis.³³
 - Perform Chest X-ray / CT Scan with abdominal shielding.
 - Other ancillary procedures that can be done: ECG, CGT Pulmonary Angiography as appropriate, Echocardiogram, Sepsis Work-up.
 - Commence the use of Antibiotics if with presence of Leukocytosis.
 - Administer IV fluids with caution: 250-500 ml boluses, reassess for fluid overload before proceeding with further fluid resuscitation. Considering the changes in hemodynamics and renal blood flow in pregnancy, critical Creatinine level signifying renal failure is adjusted to 1.02 mg/dl (instead of 1.20 mg/dl).^{33,34}
 - Administer Prophylactic Low Molecular Weight Heparin, unless delivery is expected within the next 12 hours.
 - Entertain Pulmonary Embolism in any woman exhibiting chest pains, worsening hypoxia or persistence / worsening dyspnea.
 - Monitor Fetal Heart rate patterns on an individual basis, taking into consideration the Age of Gestation and maternal condition. Urgent intervention for birth may be done for fetal conditions, which should not be delayed by administration of corticosteroids
 - Stabilize maternal condition first before initiating intervention for delivery. The priority must always be the well-being of the woman.
- The Monitored Emergency Use of Unregistered Interventions (MEURI) framework from the WHO should guide the ethical use of non-licensed drugs in pregnancy during pandemics.³⁴
 - The broad spectrum antiviral drug, *Remdesivir*, appears to be safe in human pregnancies. It is currently in Phase 3 clinical trial on its use against COVID-19 in the United States and China.

- The antimalarial drug, with broad spectrum antiviral and immunomodulator, Chloroquine phosphate, though it can cross the placenta, is safe to use in all trimesters of pregnancy, Systolic hypotension is an adverse effect associated with higher doses of the drug, which may aggravate the hemodynamic changes caused by the supine aortocaval compression by the gravid uterus.
 - The viral protease inhibitor, lopinavir-ritonavir, used in HIV positive pregnant patients were not associated with teratogenicity, preterm labor or low birthweight infants. This drug has shown benefit as an adjunct in the management of Covid-19 patients.
 - Two antiviral drugs used in COVID-19 therapy should be avoided due to its adverse effects. *Ribavirin*, an antiviral guanosine analogue, is known for its teratogenic effects: craniofacial and limb defects. It is also associated with increased risk for miscarriage. *Baricitnib*, a Janus kinase inhibitor, is embryotoxic.
- The management among COVID-19 pregnant patients are based on consensus and best practice recommendations, as clinical efficacy on the use of antiviral drugs and corticosteroids is still evolving. Corticosteroids for the treatment of COVID-19 associated Pneumonia should be avoided unless other indications are present, as this may cause delayed MERS-CoV clearance.^{36,38}
 - Discuss, sensitively, a possible “Do not attempt cardiopulmonary resuscitation” decision with family members in patients with deteriorating conditions.³⁵ This should be discussed thoroughly with the multi-disciplinary team, taking into consideration ethical guidelines/consultation with Bioethicists. The derived decision should be properly documented.

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