

Guidelines for the medical management of the pregnant patient with diagnosis of COVID-19

General Information:

- Pregnant patient NOT more susceptible to infection by the COVID-19 virus but based on the changes to the immune system in pregnancy, may have more severe symptoms-particularly towards the end of gestation. Note most cases of COVID in pregnancy reported in the literature where >34w GA.
- 2 cases of infection in T2 between 18-20 w (local experience; **not published**)
- Pregnant women with additional co-morbidity are at increased risk of more severe disease (DM, hypertension, PET, BMI, asthma, immunosuppression). In the GIM population, COVID-19 patients without other comorbidities but with diabetes were at higher risk of severe illness,
- Case report: 2/7 pregnant women with COVID-19 pneumonia (severe infection) had a viral induced cardiomyopathy: moderately reduced left ventricular ejection fraction and hypokinesis. In GIM population 33% COVID + patients in ICU develop a cardiomyopathy. Experience from peer (Switzerland): 3 patients sent to ICU- 1 patient was placed on ECMO for cardiac failure. **Suggest if in ICU (severe illness) to have an echocardiogram (2D ECHO).**
- In GIM population, with severe illness and elevated d-dimer, use of anticoagulation was shown to decrease mortality. Consider use of empiric enoxaparin if severely ill COVID + patient antepartum and/or postpartum given predisposition to coagulopathy.
- Recent evidence suggest vertical transmission is probable (1 confirmed UK case and 1 MSH case; possible 3 cases in China and 1 in Italy) BUT rate of vertical transmission, the influence of gestational age or disease severity on transmission risk/rate or the significance to the fetus/neonate is NOT determined.
- No data to suggest increased risk of T1/T2 SA or teratogenicity.
- There were 2 cases reported of PPROM. There are several cases of preterm birth reported but the indications for preterm birth were iatrogenic for maternal health concerns OR fetal health concerns.
- One case of intrauterine demise has been reported: may be related to the critical illness of mother (mechanical ventilation) as opposed to direct effect of COVID-19 on the fetus.

3 cases of IUFD at term (not reported) – one case associated with co-morbidity of active drug addiction (heroin).

- Most pregnant women affected by COVID-19 make full recovery; similar shared experience of peers in France, Switzerland and USA (NY).
- Official website of the Ministry of Health and Medical Education in Mazandaran and Zanzan provinces in Iran: **2 COVID + women developed ARDS after delivery and died.** (*Karimi-Zarchi et al, Fetal and Pediatric Pathology; 2020*)
- If pregnant COVID + patient does deteriorate, it typically happens day 7-9 after symptoms presented.
- Pregnant women seeking medical care may have OB concerns but also symptoms meeting case definition for COVID (overlapping symptoms) - investigate and treat as COVID PUI in addition to routine work up.
- Most common presentation of COVID-19 in pregnancy: fever > 37.8oC, cough

Admission to hospital in pregnancy:

- Indications for admission: (based on illness assessment +/- co-morbidity)
 - o Shortness of breath (unable to walk across room, speak full sentence)
 - o Cough with blood
 - o Chest pain
 - o S/S dehydration
 - o Decreased level of consciousness
 - o Oxygen saturation < 94%
 - o CXR consistent with pneumonia (ground glass opacities)
- Consultation with ID , OB Medicine and ACCESS (ICU)
- Investigations: Baseline at admission, repeat as indicated
 - o COVID NP swab
 - o ECG
 - o Routine bloodwork: lytes, creatinine
 - o Prognostic bloodwork: CBC, PT, PTT, CRP, LDH, ferritin, fibrinogen, d-dimer (not to be used to detect risk of VTE as in non-pregnant population)
 - o Blood gas (suggest venous- if abnormal proceed to arterial blood gas)
 - o CXR
 - o 2D ECHO (maternal) if severe illness/ICU admission

- CT scan only if clinically indicated (rule out pulmonary embolism) (single scan with abdominal shield does not exceed radiation dose in pregnancy)

Note: Can develop a pattern similar to atypical PET/HELLP: increased AST, ALT, LDH, increased PTT and decrease platelets.

** May consider baseline PLGF to help distinguish diagnosis- particularly in patient at risk of PET.

- After resuscitation and stabilization of the pregnant patient, then fetal well-being should be monitored if indicated by gestational age: NST daily , BPP with Doppler q1-2w
- Use conservative fluid management when there is no evidence of shock- aggressive fluid resuscitation may worsen oxygenation.
- If evidence of sepsis, although the patient may be COVID-19 positive/PUI, follow **Sepsis Six** response:
 1. Oxygen Rx to keep O2 saturation > 94%
 2. Strict In/Out assessment and balance
 3. Lactate: for diagnosis and to guide hydration
 4. Hydration (cautious of fluid overload with COVID; bolus as clinically indicated)
 5. Blood culture x2
 6. Broad spectrum ABX *

Note: look at CBC- in particular WBC- bacterial infection will have leukocytosis, COVID will have normal WBC or lymphopenia

***Empiric antibiotic treatment should be based on the suspected clinical diagnosis** (UTI, Pyelonephritis, Community acquired pneumonia, Chorioamnionitis) and **NOT** because of diagnosis of COVID.

- Criteria for recovery: improved respiratory symptoms

Antenatal Care:

- Mild disease: symptomatic support at home (anti-pyrexia, fluids)
- Come to hospital if increasing SOB, work of breathing, chest pain, fever > 38.5oC
- If admitted for other OB indications, monitor for s/s COVID as may develop symptoms during hospitalization (incubation period mean 5-6d (0-14d): new onset respiratory s/s OR fever > 37.8oC
- Start empiric thromboprophylaxis (enoxaparin) as hospitalized pregnant patient with an inflammatory condition at risk of VTE.
- If COVID positive and “unwell” /admitted to hospital due to disease severity AND taking ASA (low dose for prevention of PET) consider holding until recovery complete (suggested to exacerbate acute kidney injury in critically ill COVID patients)

- In acutely ill COVID patient, restrict use of indomethacin for treatment of preterm labor; consider alternative tocolytic agent if appropriate.
- Maternal surveillance: vitals with O2 saturation q4h- if requiring oxygen support increase vitals to q hourly with 1:1 RN care
- **If requires oxygen support-** warning sign of potential maternal deterioration- contact ACCESS (ICU)
- **If RR increases despite normal O2 saturation or if requires increasing amount of oxygen to maintain saturation >94%-** warning sign of acute maternal decompensation- contact ACCESS (ICU)
- **Experience also noted additional warning signs of maternal deterioration:**
 - a. **Increased O2 demands by 50% over 1-2h**
 - b. **O2 sat < 94% despite O2 support**
 - c. **>4.0L O2 by facemask**
- **Suggest that these signs might be indication to deliver under regional anesthesia-to facilitate maternal care**
- If preterm: once maternal respiratory deterioration, initiate celestone Rx in preparation for potential iatrogenic preterm birth
- If preterm, once patient is on mechanical ventilation, in consultation with ICU and the NICU team...
 - a. If < 28w GA and can maintain mechanical ventilation: expectant management
 - b. If >28 w GA and CAN NOT maintain mechanical ventilation- deliver by C/S to facilitate mechanical ventilation (NOT to improve maternal disease process, not to alter fetal/neonatal outcome)
 - c. If delivering < 34w GA, give MgSO4 4g bolus before delivery- over 1 hour to limit maternal respiratory depression.
- Once symptoms improve, continue with ongoing observation as there can still be a rapid deterioration- typically 24-48h after initial recovery.
- Safe for discharge if clinically well. Instruct to continue to quarantine for 14 days after onset of symptoms. No need for repeat COVID testing.
- Once meet criteria for discharge, implement ongoing fetal surveillance within 14d of discharge: BPP with Doppler and EFW (consider serial assessment)

COVID recovery algorithm

1. COVID diagnosis confirmed. Stays as an outpatient. Performs 14d self-isolation. Now has no symptoms consider COVID recovered. Does not need a swab for "test of cure". Can come back into medical system as COVID recovered/not infectious/negative.

2. COVID diagnosis confirmed, admitted for COVID support but then discharged before the 14d completed. Complete 14d self-isolation. Now has no symptoms, consider COVID recovered.

Does not need a swab for "test of cure". Can come back into medical system as COVID recovered/not infectious/negative.

3. COVID diagnosis confirmed, admitted for COVID support and/or OB indication and is NOT discharged. At day 14 and with no symptoms we should perform 2 sets of NP swabs separated by 24h- both need to be negative and then she will be clear and released from droplet precaution (as per IPAC at MSH) Then she will be treated by us as COVID recovered/not infectious/negative.

Note: COVID + patients in the community are followed by Public Health for ongoing wellness surveillance during the 14d period.

Intrapartum Care:

- Regardless of GA and disease severity: recommend in hospital birth
- Regardless of GA: CEFM based on case reports of fetal compromise in women with COVID diagnosis (8/18 – 44% incidence)
- If mild symptoms: Maternal vital signs (HR, BP, RR, O2 sat) q 2h. Note: if RR increases despite normal O2 saturation- warning sign of acute maternal decompensation. Inform Anesthesia team and increase vitals to q hourly
- If moderate symptoms: Maternal vital signs (HR, BP, RR, O2 sat) q 1h. Note: if RR increases despite normal O2 saturation- warning sign of acute maternal decompensation. Inform Anesthesia team
- Oxygen to keep O2 sat >94%
- Hourly fluid status to avoid fluid overload (affects ventilation, work of breathing)
- No hydrotherapy in labor/birth
- Encourage epidural anesthesia to minimize risk for general anesthesia if urgent (STAT) delivery
- No use of nitrous oxide for pain management (potential aerosolization)
- No indication for C/S unless to improve maternal resuscitation efforts
- Emergent C/S for OB indications not because of COVID diagnosis
- Elective C/S should not be delayed based on COVID diagnosis unless need for maternal stabilization.
- COVID diagnosis is not an indication for IOL; diagnosis of COVID is not a reason to delay an indication/urgent IOL unless need for maternal stabilization.
- **Consideration:** If SOB, maternal exhaustion or increasing hypoxia: may use assisted vaginal birth to shorten the second stage
- Routine use of steroids is not recommended in moderately ill patients for the symptoms associated with COVID; short course may be indicated with severe illness (decision to be made by ICU team). No evidence to support or refute use of steroid with an anti-emetic

medication for antenatal/labor nausea management; may consider alternative anti-emetic treatment but may use if not response to alternative therapy.

- If a **COVID asymptomatic/screen negative patient** develops a fever in labor $>37.8^{\circ}\text{C}$ unresponsive to a fluid bolus (500 cc R/L or N/S)- this symptom overlaps with diagnostic criteria for COVID- consider the patient a PUI- perform COVID swab and treat with Droplet/contact precautions.

Postpartum care

- Supportive care: oxygen, anti-pyrexia medication
- No relapse of symptoms was found after delivery
- If severe disease, consider use of empiric thromboprophylaxis (enoxaparin) as hospitalized pregnant patient with an inflammatory condition at risk of VTE- especially with
- Restrict the use of NSAIDs for post-partum pain management in the moderate to severely ill patient (suggested to exacerbate acute kidney injury in critically ill COVID patients).
- Once symptoms improve, continue with ongoing observation as there can still be a rapid deterioration typically 24-48h after improvement.
- If admitted for birth without symptoms, continue, monitor for s/s COVID as may develop symptoms during hospitalization (incubation period mean 5-6d (0-14d): new onset respiratory s/s OR fever $> 37.8^{\circ}\text{C}$).
- Safe for discharge if clinically well. Instruct to continue to quarantine for 14 days after onset of symptoms. No need for repeat COVID testing.

COVID recovery algorithm

- 1. COVID diagnosis confirmed, admitted for labor and birth, then discharged before the 14d completed.** Complete 14d self-isolation. Now has no symptoms, consider COVID recovered. Does not need a swab for "test of cure".
- 2. COVID diagnosis confirmed, labor/delivered and remained hospitalized (for OB complication or COVID complication)** At day 14 and with no symptoms we should perform 2 sets of NP swabs separated by 24h- both need to be negative and then she will be clear and released from droplet precaution (as per IPAC at MSH) Then she will be treated by us as COVID recovered/not infectious/negative.