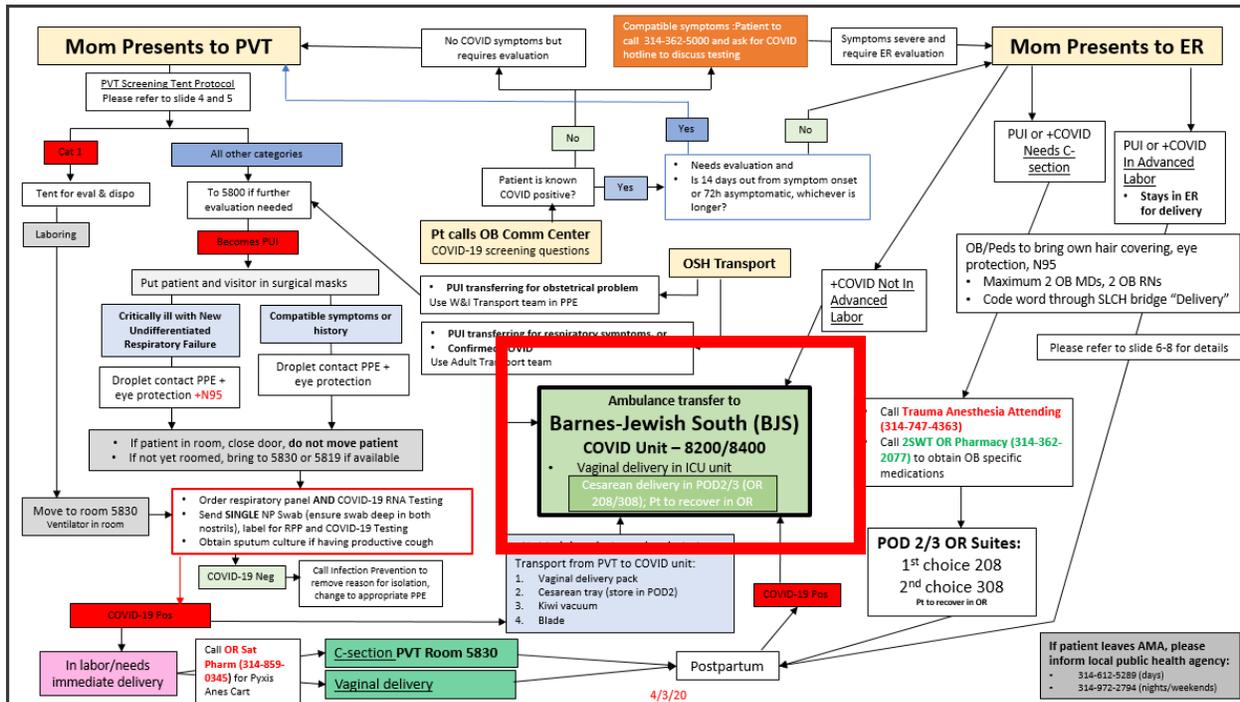


### WUSM COVID Critical Care in Pregnancy



### Location and general information on the COVID Units (rapidly evolving)

- Multiple floor and ICU units exist to take care of COVID and PUI patients
- Obstetric COVID/PUI patients with gestational age  $\geq 22$  weeks should be cared for in South campus for proximity to POD2/3 ORs which are set up for cesarean delivery.
- Obstetric COVID/PUI patients requiring ICU care should be cohorted in 8200

### Transferring to the COVID unit(s)

- Indications for transfer:
  - COVID + pregnant patients with gestational age  $\geq 22$  weeks and respiratory symptoms will be cared for in a COVID ICU
  - COVID + pregnant patients  $< 22$  weeks or postpartum can be considered for care on a floor-level COVID unit or COVID ICU as dictated by clinical status
  - COVID + pregnant patients  $\geq 22$  weeks with obstetric indications for admission (ie, no COVID indications for admission) can be cared for on a floor-level unit
- Mechanics of transfer
  - Transferring team shall call patient placement to arrange the transfer.
    - Patients on north campus will come via ambulance, which is arranged by Patient Placement.
    - For precautions during transport
      - At least two healthcare providers (nurse, physician) from the sending unit should accompany during transport, wearing standard COVID-19 PPE (gown, gloves, N95, goggles or face shield)

for any patient contact. One team member must remain “clean” in order to push elevator buttons, open doors, etc.

- Patient Transport is NOT involved in the transfer of critically ill COVID-19 patients at all.
- If intubated, then a Y-piece HEPA filter must be used.
- Bed or wheelchair rails shall be wiped before transporting the patient. Other people cannot ride in same elevators (transport team only).
- Security does NOT need to be present to clear the hallways or anything else. Hallways will generally be clear as there are no visitors in the hospital at present.
- Call Infection Prevention if any further questions on how to transport.

### **Care teams for COVID OB patients in the ICU**

- COVID ICUs staffed by critical care attendings and supported by CCM fellows.
- OB care to be provided by attendings and fellows only, minimizing providers as possible.
  - OB fellow phone 24/7 coverage **314-659-0549**
  - Backup number in case of no answer 314-362-5178 and ask for “Laborist on call”
- Trauma Anesthesia Attending (314-747-4363) is the covering OB attending on South Campus and should be made aware of every admitted OB patient  $\geq 22$  weeks in COVID units
- 1030-1200: multidisciplinary COVID ICU rounds, OB will attend if patient in Unit.

### **COVID care in pregnancy**

- As a general rule, pregnancy should not alter the principles of care of COVID patients including critical care
- Respiratory care
  - Physiologic changes of pregnancy
    - Respiratory alkalosis secondary to increased TVs
      - Normal ABG in pregnancy: pH 7.40-7.44, **PaCO<sub>2</sub> 27-32mmHg**, PaO<sub>2</sub> 72-104mmHg, [HCO<sub>3</sub>] 18-22, SaO<sub>2</sub> 95-100%
      - Allows for gas exchange at placental interface
      - Maintains uterine circulation
      - A “normal” (for non-pregnant patients) pCO<sub>2</sub> in a pregnant patient suggests some degree of CO<sub>2</sub> retention
    - Decreased FRC and increased O<sub>2</sub> metabolism reduce respiratory “reserve”
    - **All patients considered difficult airway secondary to tissue laxity and swelling, reduced esophageal sphincter tone**
      - 1:224 OB intubations failed by experienced provider
      - Consider intubation in OR if concerned about need for urgent/emergent delivery post-intubation

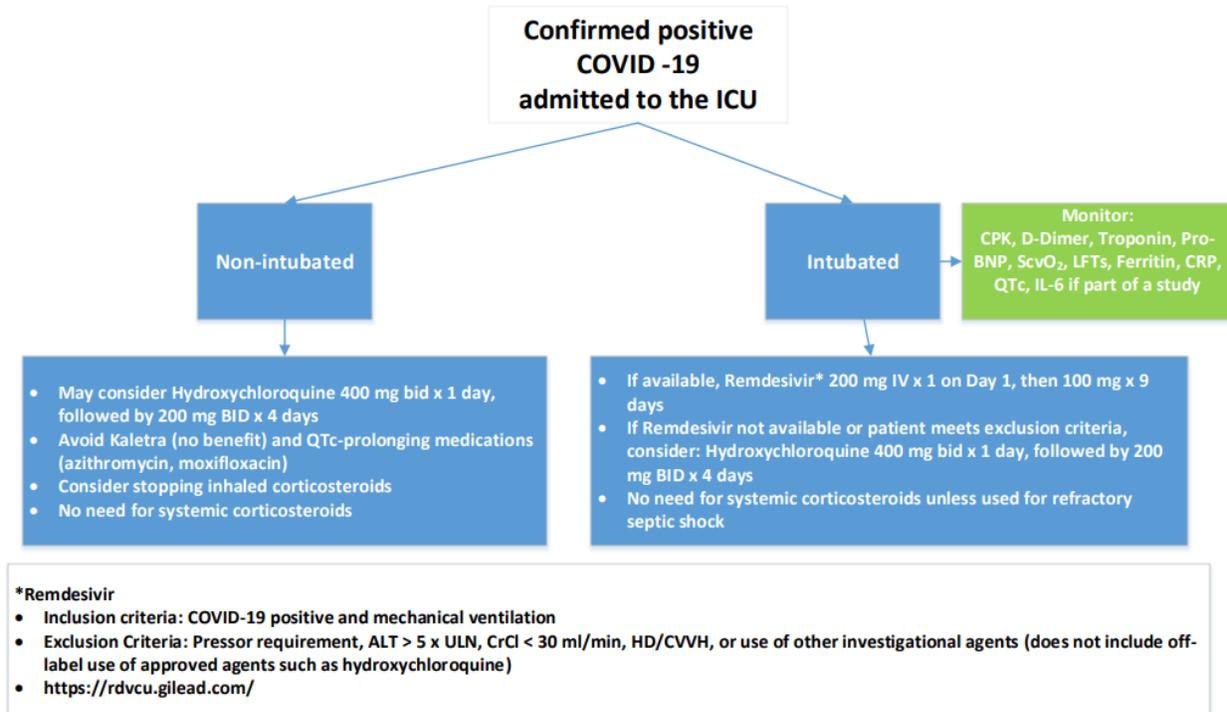
- Decreased chest wall compliance secondary breast hypertrophy
- Ventilator Strategy
  - No data to guide specific ventilator management
  - Experience suggests permissive hypercapnia may be safe
    - Uterine blood flow decreases with increasing CO<sub>2</sub>
    - Fetal monitoring may be used as an indicator of adequate perfusion
  - SpO<sub>2</sub> target  $\geq 95\%$  likely optimizes fetal oxygenation
    - Expert opinion for PaO<sub>2</sub> target  $\geq 92\%$  in ARDS in pregnancy
    - Adverse outcomes associated with maternal PaO<sub>2</sub> < 75
    - Lower levels may be acceptable in earlier gestations
- Adjunctive measures
  - Prone positioning is safe in pregnancy
    - Adequate bolstering is required to avoid abdominal compression
    - Please involve OB at time of prone positioning
  - Pulmonary vasodilator therapy can be used in pregnancy
    - Nitric oxide, sildenafil, and epoprostenol (IV and inhaled) are safe in pregnancy
    - Bosentan is contraindicated
  - Neuromuscular blockade is safe in pregnancy
    - Cisatracurium and vecuronium may be used
  - ECMO can be used in pregnancy
    - Recommend early MFM involvement if ECMO cannulation is considered
- Hemodynamic support
  - Physiologic changes
    - Plasma volume increased 40-50%, RBC volume 20%
    - Cardiac output increased by 40%
    - HR increased 15-20 BPM
    - Arterial BP decreased 10-15 mmHg
    - SVR decreased
    - PCWP decreased
    - Uterine compression of great vessels when supine, limiting venous return
      - **Left lateral tilt should be maintained**
  - Vasopressor use
    - Limited data supports a MAP goal >60-65
    - All vasopressors safe in pregnancy
  - Cardiac arrest and resuscitative hysterotomy
    - Maternal cardiac arrest lasting longer than 4 minutes is an indication for immediate bedside delivery at any gestational age  $\geq 20$  weeks **to improve maternal outcomes**
    - For non-shockable rhythms, some experts suggest immediate fetal delivery

- Cesarean supplies will be available on the COVID unit and their location should be confirmed on daily OB rounds
- COVID therapeutics in pregnancy
  - Hydroxychloroquine
    - Generally considered safe in pregnancy
    - No dose adjustments required in pregnancy
    - Crosses the placenta at near 1:1 concentration
    - Long term use of doses >400mg/day associated with retinal toxicity
    - No current trial protocols include pregnancy
  - Remdesivir
    - Very limited data in pregnancy
      - 6 pregnant women in the largest Ebola trial showed no adverse fetal effects
    - NIH trial protocol excludes pregnant patients
    - Two other trials exist and do not exclude pregnancy, but WashU is not a clinical site
    - Available through Gilead compassionate use
      - Application via: <https://rdvcu.gilead.com/>
  - Tocilizumab
    - Limited data (36 live births) suggests may be compatible with pregnancy
    - Crosses placenta
  - Anticoagulation
    - LMWH and UFH do not cross the placenta and are considered safe in pregnancy
    - UFH preferable in patients who may need emergent cesarean section
    - NOACs and Warfarin cross into fetal circulation and should be avoided if possible
    - Pregnancy is a hypercoagulable state and strong consideration for heparin prophylaxis is recommended
      - 5,000-7,500 units SC BID first trimester, 7,500-10,000 units SC BID second trimester, 10,000 SC BID third trimester

### ICU COVID-19 Treatment Guidelines

Last Updated March 25, 2020

**DISCLAIMER:** At present, the mainstay of treatment for COVID-19 remains supportive care, which should be initiated and optimized in all COVID-19 patients. The options listed below are **NOT** currently licensed for the treatment of COVID-19. Use of these agents is based on *in vitro*, animal model data, and limited and/or not-yet peer-reviewed clinical data, often in related coronaviruses such as Severe Acute Respiratory Syndrome (SARS) and Middle Eastern Respiratory Syndrome (MERS) CoVs. Whether or not to initiate therapy is at the prescriber's discretion based on evaluation of risks and benefits.



- Management of Obstetric Issues in the COVID positive patient
  - Timing of delivery
    - Timing of delivery will depend on gestational age, clinical course of COVID, and other obstetric indications for delivery
    - Early term or late preterm delivery may be indicated by COVID infection alone
    - Due to logistic needs, emergent delivery is difficult in COVID patients – can consider delivery at time of intubation if concern that patient will further decompensate in days following intubation
    - Decisions on delivery timing should be made in a multidisciplinary setting.
  - Fetal monitoring
    - Once maternal stability has been achieved in the acute setting fetal monitoring should be considered
    - Fetal monitoring during prone positioning is possible, but intervention based on this information may be limited by the safety concerns with position changes.
    - This should be address in a conversation with the patient or their clinical decision maker, MFM/OB and pediatrics
    - Remote fetal monitoring can be viewed in real time on L&D

- Tocolytics
  - Indomethacin, nifedipine and magnesium may all present clinical challenges in the COVID positive patient
  - Use should be addressed on a case by case basis with MFM consultation
- Magnesium
  - Magnesium may worsen respiratory distress
  - The benefit of therapy may outweigh these risks for very premature neonates (<28 weeks)
  - Use should be addressed on a case by case basis with MFM consultation
- Steroids (betamethasone) for fetal lung maturation
  - Some evidence suggests that steroids may worsen COVID-19 clinical course, but these data are evolving
  - The fetal benefit of therapy supports use at gestational ages < 34 weeks
  - Use should be addressed on a case by case basis with MFM consultation