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## Obstetric protocols in the setting of a pandemic

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### ABSTRACT

The purpose of this article is to review key areas that should be considered and modified in our obstetric protocols, specifically: 1) Patient triage, 2) Labor and delivery unit policies, 3) Special considerations for personal protective equipment (PPE) needs in obstetrics, 4) Intrapartum management, and 5) Postpartum care.

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### Introduction

In the setting of a new pandemic certain changes need to be implemented in order to accommodate increased volume of patients seeking care, provide adequate staff protection against acquiring disease, provide adequate patient protection from acquiring disease, and limit disease related morbidity. Recent epidemics that have challenged obstetric care include SARS-CoV-2 (COVID-19), H1N1 influenza, Zika virus, and Ebola virus. The purpose of this article is to review key areas that should be considered and modified in our obstetric protocols, specifically: 1) Patient triage, 2) Labor and delivery unit policies, 3) Special considerations for personal protective equipment (PPE) needs in obstetrics, 4) Intrapartum management, and 5) Postpartum care

### Patient Triage

Training of administrative staff on proper screening protocols is crucial. Verified infectious screening tools should be utilized upon presentation to the labor floor. In addition, screening of support persons should also be performed.

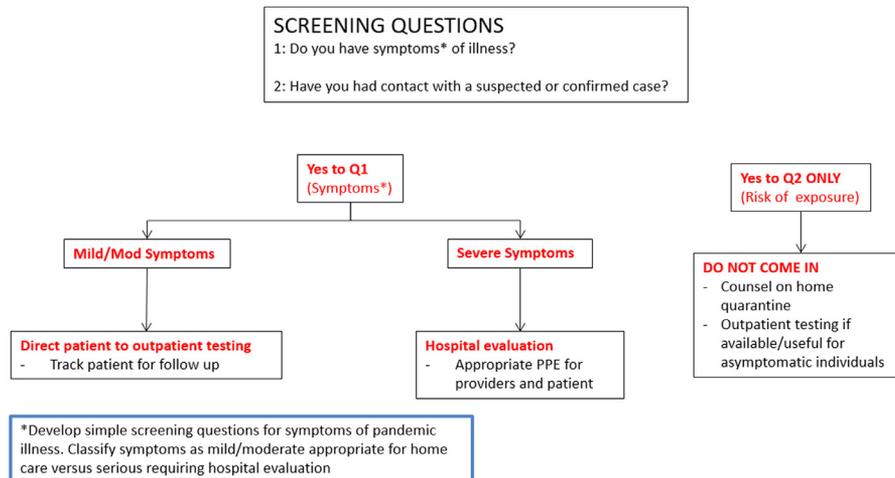
### Phone/Remote Triage

Phone calls to labor and delivery (L&D) should be triaged according to Fig. 1. Patients calling with symptoms of illness or with direct contacts who have no urgent obstetrical issues and mild/moderate symptoms should be referred for testing outside of the hospital as per local protocols. Women without urgent obstetrical issues awaiting results should stay home to self-isolate. Those with urgent obstetrical issues (e.g. labor, rupture of membranes, vaginal bleeding, etc.) or severe symptoms should be evaluated in the hospital with appropriate plans for isolation and PPE. A system should be in place for

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**PREGNANT PHONE TRIAGE**



**Fig. 1 – Phone triage flow.**

continued remote follow up of patients who are self-isolating with test pending or positive test results.<sup>1</sup>

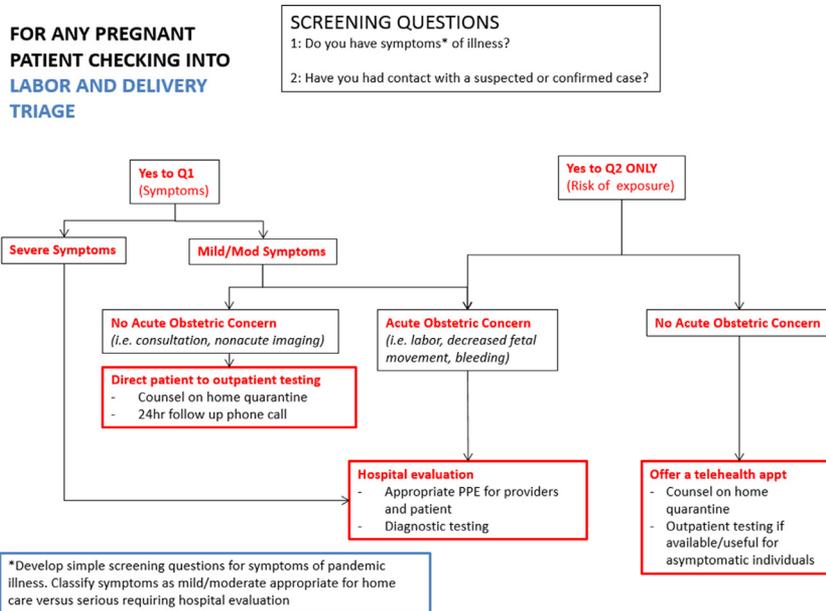
**Labor and Delivery Triage**

When women arrive to L&D, a designated staff member at the front of the unit should verbally screen each individual for symptoms of illness. All patients and support people should be given appropriate PPE to minimize transmission (ie mask or gloves) and evaluated by provider in an isolated area. Patients who screen positive should be managed as in Fig. 2 based on acuity of symptoms and presenting complaint.<sup>1</sup>

**Labor and Delivery Unit Policies**

**Universal Screening and Testing Procedures**

One effective strategy to limit patient and healthcare worker exposure is universal screening and testing when available for case ascertainment<sup>2</sup>. This may be particularly useful for obstetrical patients who interact frequently with the health care system. Moreover, advance knowledge of disease status may allow a labor unit to properly isolate a patient and provide appropriate PPE for healthcare workers. This screen can be simple, such as taking a basic clinical history, and exam, or



**Fig. 2 – Suggested flow for screening patients presenting to L&D triage.**

complex including sophisticated serologic testing. Early in a pandemic there may not be commercial testing available, so implementation of key screening questions is crucial. Protocols for management of screen-positive patients should take into account the sensitivity and specificity of the method. Early in a pandemic, centers should consider over-isolation, particularly when data on the disease is sparse. Support persons should be screened and, if possible, tested. When possible, labor units should perform advanced screening and testing for scheduled deliveries. For any patient who screens positive, delaying delivery until diagnostic testing results are available should be considered, particularly if a rapid test is available for the pathogen. Often a scheduled delivery cannot be safely delayed more than one week and if diagnostic testing cannot be resulted in that time frame, patient should be treated as infected with the appropriate precautions.

### Case Isolation

During a pandemic, obstetrical units should have evidence-based policies on appropriate isolation of cases or persons under investigation (PUI).<sup>3</sup> If patients cannot be appropriately isolated on labor and delivery unit, there need to be contingency plans for isolation off of the unit while still providing maternal and fetal monitoring and care. The level of precaution will depend on the pathogen in question but fall into three levels<sup>4</sup>: 1) Contact precautions for patients known to have infections that represent an increased risk of contact transmission. 2) Droplet precautions for patients infected with pathogens transmitted by a patient who is coughing or sneezing. 3) Airborne precautions for patients infected with pathogens transmitted by the airborne route, including use of an airborne infection isolation room (AIIR).<sup>5</sup> Case isolation includes not just physical isolation room but also PPE for patient to limit transmission, including gloves and/or mask. A center may elect to isolate a patient off labor and delivery to limit exposure to other pregnant patients, in which case they should consider remote fetal monitoring capabilities and having adequate equipment for emergency delivery near the patient.

Unit staffing may need to be modified in setting of a pandemic to limit risk of cross-infection and staffing shortfalls due to illness. One strategy is rotating dedicated teams to care for exposed or infected patients and developing a model of workplace segregation.<sup>6</sup>

### Bed management

A pandemic may strain hospital capacity and bed availability. This can be particularly problematic for busy labor units used to quick turnover. In anticipation of this challenge, centers should identify options for over-flow units, contingency plans for postpartum beds if they are not available, and alternative post-anesthesia recovery beds if this cannot occur on the labor unit. Sites should also consider designating a section or floor for cohorting cases and PUIs. Depending on the pathogen, sites may also have to alter their newborn and NICU rooming policies. Labor unit leaders should work closely with hospital administration, nursing, anesthesia, neonatology/pediatrics, infectious disease, and critical care medicine to best address the unique needs and challenges of labor and

delivery in the setting of particular pathogens. An interdisciplinary approach is necessary especially for pregnant women on “pandemic” floors or in ICUs where the potential for fetal monitoring, use of certain medications and potential need for delivery need to be addressed.

Centers should also develop plans for outpatient management of conditions that may traditionally have utilized inpatient care, this includes, for example, outpatient management of hyperemesis gravidarum, one of the more common reasons for antepartum admission, and early postpartum discharge with telehealth resources for lactation support/medical follow up.<sup>7</sup>

### Converting to High Acuity Care

A pandemic may tap or make unavailable a hospital’s typical critical care resources. Consequently, sites should develop protocols that would allow obstetricians, nursing and anesthesiology to provide critical care on labor and delivery.<sup>8</sup> Critical care resources that can be employed on labor and delivery include use of operating room/anesthesia machines as temporary ventilators, telemetry capabilities with remote cardiology monitoring, and acute nursing care. Training and simulation in critical care obstetrics may be useful and enhance the confidence of members of the labor team (See Critical Care Obstetrics: Development of an OBICU).<sup>9</sup> Additionally, a close relationship with the critical care team allows for consultation and assistance with initial stabilization, and once an ICU bed becomes available, seamless transition. A pandemic can also lead to shortages of blood products, as such it is prudent to incorporate the blood bank into multidisciplinary planning.<sup>10</sup>

### Visitor Policy

Based on the characteristics of the pathogen, a patient’s partners and family may also be a source of infectious risk, and depending on the severity of the pandemic, labor units may have to alter their policies on visitation. Units should consider limiting visitation to a maximum of one support person, perhaps only during labor and delivery, and with limited movement out of the room. Labor units can facilitate this by providing meals for both patient and support person and in-room bathrooms. Risks of allowing a screen/test positive support person to accompany the patient need to be weighed when considering who can be safely allowed on the unit. Centers may even need to prohibit all visitation and support persons. Investment in virtual technologies can mitigate the negative impact on patient care, comfort, and experience from limited visitation. Engaging stakeholders in the community when making these decisions can facilitate understanding of, compliance with and support for infection control policies.

### Delivery Scheduling

When developing protocols during an emerging pandemic, centers should focus on using available data to balance the risks of maternal disease with the risk of prematurity. If not already done so, labor units should ensure evidence-based guidelines for timing of induction of labor. This may reduce

the burden of unindicated deliveries and may protect clinical volume in the case of a pandemic. If a pandemic causes extreme stress on a health system, centers should also develop protocols on how to prioritize deliveries and plan for maternal/fetal outpatient surveillance for those patients where delay of delivery is deemed necessary. As previously mentioned, obstetrical leaders are encouraged to communicate with hospital administration frequently, as the needs of a labor unit change.

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### Obstetric Specific PPE Considerations

Obstetric practice has unique clinical scenarios that need to be considered when determining the personal protective equipment (PPE) needs of healthcare workers in that setting. During active labor and delivery (second and third stage) there is significant close physical contact with a patient for prolonged periods of time with exposure to multiple body fluid types- sweat, respiratory droplets/aerosols, amniotic fluid, blood, urine and feces. Adequate PPE depending on transmission type is critical. The second stage of labor should be considered a risk for aerosol transmission based on heavy/labored breathing and close physical contact.<sup>1,11</sup> SARS-CoV-2, influenza, and other respiratory illnesses have high risk of droplet and aerosol spread during labor and delivery and thus in addition to gown/gloves/face shield, appropriate respiratory protection is necessary to consider as well (i.e. N-95 mask). Another important example an illness that requires obstetric specific PPE is the Ebola virus, which is transmitted easily through direct contact of bodily fluids, including amniotic fluid and cord blood, mucus membranes, or contaminated surfaces/objects<sup>3</sup>. In preparation for such an epidemic, double gloves, eye/face shield, mask, impervious gowns, full coverage of shoes/pants are critical at time of delivery to prevent healthcare worker infection and further spread given the inevitable volume of bodily fluid exposure during labor and delivery.<sup>12</sup>

In addition to considering the distinctive circumstances of active labor, patients on labor and delivery are also unique in that everyone is at risk for needing an emergent surgery necessitating rapid delivery under general anesthesia. This requires careful planning of the changes in PPE required when going from labor to cesarean birth under general anesthesia, including availability of all supplies and consideration of simulations (see Obstetric Simulation in this issue) to prepare for these contingencies. At the time of cesarean, considerations for PPE use include the potential for aerosol generating procedures including during intubation, suctioning, electrocautery, or the administration of aerosolized medications as well as the potential for exposure to body tissues/fluids.

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### Labor Management Protocols

#### *Delivery timing/mode of affected patients*

Unless evidence demonstrate otherwise, standard obstetrical indications for delivery should continue to be used. However, delivery timing should also take into consideration the

natural history of the disease as delivery may or may not improve disease course. For example, in the setting of respiratory illnesses (airborne versus droplet transmission) it is important to consider the extent to which pregnancy pulmonary physiology may complicate the patient's clinical presentation. With a reduction in residual volume and an increase in oxygen consumption, the burden of disease may increase the patient's oxygen requirements and ultimately lead to respiratory compromise. While delivery in the setting of concern for impending respiratory failure requiring intubation may not always improve respiratory status, theoretically it stands to improve pulmonary physiology.<sup>13,14</sup> In arriving at this decision, care providers should weigh the risk of prematurity against the potential maternal benefit bearing in mind that significant maternal compromise also places the fetus at risk.

In deciding on the timing and mode of delivery providers should consider the clinical status of the patient, the gestational age and the fetal status. No current data suggests absolute contraindications for vaginal delivery in most respiratory and blood borne illnesses. Cesarean deliveries should be reserved for routine obstetrical indications, or concern for deterioration of the maternal condition over the course of labor such as acute organ failure or septic shock.<sup>15</sup> This should be balanced against risks of cesarean delivery including bleeding, infection, and fluid shifts.

#### *Anesthesia*

Regional anesthesia continues to be the preferred modality for obstetric analgesia. In fact, given the potential for either limited general anesthesia availability or increased transmission risks associated with intubation, early epidural may be encouraged to avoid the need for general anesthesia should an emergent cesarean delivery be indicated.<sup>16</sup> (see Anesthesia Considerations for the Obstetric Provider) The same absolute contraindications to regional anesthesia apply including patient refusal, infection at or near the site of needle insertion, and acute maternal hemorrhage/severe coagulopathy. In the setting of a blood borne pathogen pandemic, regional anesthesia may also be contraindicated. Contingency plans should be in place in anticipation of the possible limited availability of anesthesia staff for the labor floor to address non-life-threatening conditions. Such plans might include: the use of intravenous narcotics, nitrous oxide, local anesthesia (pudendal block), a virtual companion for breathing techniques, laboring accessories that may assist in pain control, and other alternative means such as intradermal sterile water injections, or relaxation techniques.

#### *Intrapartum Care*

##### *Cervical Ripening/Labor augmentation*

Once patient has been admitted to labor and delivery, judicious use of resources to optimize timely vaginal delivery should be implemented including dual agent induction (e.g foley catheter and misoprostol)<sup>17</sup> and early amniotomy.<sup>18</sup> Limiting the number of cervical exams to those that are most necessary can decrease the risk of exposure to medical personnel.

**Table 1 – Special Considerations for Commonly Administered Obstetric Medications**

Drug	Indication	Special Consideration
Hydralazine	Severe hypertension	Avoid in patients with tachycardia
Labetalol	Severe hypertension	Given theoretical concern of beta-blocker causing bronchial constriction in patients with asthma, consider avoiding in these patients with respiratory distress
Nifedipine	Severe hypertension/Tocolysis	Risk of worsening hypotension and suppression of heart rate and contractility; avoid in patients with hypotension or preload dependent cardiac lesions
Indomethacin	Tocolysis	Avoid if contraindication to NSAID including renal failure.
Terbutaline	Tocolysis	Avoid in patients with contraindication for tachycardia
Carboprost	Postpartum hemorrhage (PPH)	Avoid given the risk of bronchospasm in patients with underlying respiratory compromise
Methylergonovine	PPH	No pandemic specific restrictions outside of normal contraindications
Misoprostol	PPH/Induction	No pandemic specific restrictions outside of normal contraindications
Magnesium sulfate (MgSO <sub>4</sub> )	Neuroprotection/Seizure prophylaxis	Respiratory compromise usually seen in levels of 10–13 mg/dL. Take precautions to avoid the development of toxicity, particularly in patients with renal compromise
Steroids	Fetal lung maturity	Well established benefit between 24–33 6/7 weeks of gestation; in the setting of critical illness, risks and benefits should be considered before administration. <sup>23</sup>

### Intrapartum resuscitation

Depending on the etiology of a concerning fetal heart rate tracing, maternal repositioning, tocolysis, or amnioinfusion remain important tools in intrapartum fetal resuscitation. Maternal oxygen via face mask or nasal cannula for fetal resuscitation is not recommended because although it may have a low risk of aerosol dispersion, but there is risk of surface transmission through handling equipment with nasal secretions and it has not been proven to have any fetal benefit.<sup>19</sup>

### OB medications used and potential impact on disease course

Consideration should be given to the potential impact of commonly used medications in obstetrics and whether they can have a potential impact on the course of the given disease (Table 1). Obstetric services should have protocols in place to adjust the indications/dosing/usage of such medications.

### Fluid Management

Intravenous fluids are typically used quite liberally on labor and delivery. However, it is important to remember that labor and delivery is a significant strain on the maternal heart, lungs, and kidneys. In addition, the peripartum course involves significant fluid shifts, going from possible fluid deficits intrapartum to fluid overload postpartum. Depending on the pandemic and disease course, protocols should be in place to ensure appropriate use and tracking of maternal fluid status.

### Vertical Transmission Risks

In the setting of a pandemic, often there may be limited information of vertical transmission risk, but this may be inferred by mode of transmission. For example, respiratory viruses have thus far demonstrated only minimal risk of vertical transmission, while blood borne illnesses and genitourinary infections are higher risk. Specific obstetric procedures that should be reconsidered in the setting of a pandemic when there is limited knowledge on mode and rates of vertical transmission include:

- Fetal scalp electrode: Use caution if there is risk of transmission from blood or cervicovaginal fluids
- Amniotomy: No current data to suggest risk of maternal—fetal transmission with respiratory illnesses. Use caution if there is risk of transmission from cervicovaginal fluids.
- Mode of delivery: the utility of cesarean delivery in preventing vertical transmission varies not just by transmission mode but also by specific disease. Consideration for cesarean delivery should be reserved for pathogens identified in cervicovaginal fluid and blood borne illnesses and likelihood of transmission.
- Delayed cord clamping: in the absence of data on vertical transmission and given the limited clinical benefit in a term infant, routine delayed cord clamping may be deferred in the setting of a pandemic
- Skin to skin: In the absence of sensitive universal testing, skin to skin with between mother and baby should be avoided depending on transmission mode.

### Second Stage of Labor

Routine management of the second and third stages of labor still apply. Steps to shorten these stages of labor will assist with reducing strain on limited resources including immediate versus delayed pushing,<sup>20</sup> use of operative delivery to shorten second stage especially in setting of maternal compromise, and use of perineal massage/warm compress to reduce risk of obstetric associated anal sphincter injury.<sup>21</sup>

### Post-partum Hemorrhage Prevention

In the setting of a pandemic, it is reasonable to expect a strain on local blood banks due to a significant decline in donations, or inability to accept donations due to transmission risks. Aggressive postpartum hemorrhage prevention is recommended. This starts as early as risk stratifying patients based on their history and intrapartum course as well as active management of the third stage of labor. Early administration of the appropriate uterotonics or tranexamic acid (TXA) to minimize these events is optimal.<sup>22</sup>

## Post partum Care

### Breastfeeding

In the setting of a pandemic, considerations for breastfeeding include transmission through breastmilk, and proximity required for breastfeeding. In illnesses with no documented breast milk transmission, breastfeeding with attention to hygiene and/or pumping with limited neonatal contact to avoid person to person transmission is reasonable. For illnesses such as HIV and Ebola with documented breast milk presence, breastfeeding is not advised; however limited resources or access to breastmilk may mitigate such recommendations.

### Discharge Planning

To alleviate both hospital capacity burdens and risk of nosocomial infection, discharge for all patients should be expedited as medically and socially appropriate, postpartum day 1 or 2 for vaginal deliveries and day 2 for cesarean deliveries. Expedited discharge is facilitated by home blood pressure monitoring, telehealth visits, and placement of long acting reversible contraceptives during hospitalization to avoid need for additional in person visit.

In summary, careful planning in preparation for managing obstetric patients during a pandemic can mitigate risks to patients, their newborns and families and staff.

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## Conflicts of Interest

The authors report no conflicts of interest

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