



Response of an Obstetric Unit during the Coronavirus Disease of 2019 (COVID-19) Pandemic: Experiences from a Tertiary Care Center

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Abstract

Objective To describe our experiences in preparing our obstetric unit in Westchester County, New York, during the COVID-19 (coronavirus disease of 2019) pandemic. We focus on describing our timeline, continuously evolving actions, observations, and challenges.

Methods With guidance from the New York State Department of Health (NYSDOH), our institutional epidemiologist, and key multidisciplinary faculty members, we evaluated emerging national data as well as expert opinions to identify issues and challenges to create action plans.

Results We created and modified policies for our patients presenting for obstetrical care on the labor and delivery unit to accommodate their unique needs during this pandemic.

Conclusion The COVID-19 pandemic has posed many unique challenges. Balancing communication, risks of infection to providers, patient autonomy and rights, and resources for testing and personal protective equipment were among the valuable lessons learnt. We have shared our experiences and described our observations and challenges in Westchester County, New York.

Keywords

- ▶ COVID-19
- ▶ labor and delivery
- ▶ experiences
- ▶ observations
- ▶ challenges

During the ongoing COVID-19 (coronavirus disease 2019) pandemic, hospitals in New York City have experienced challenges in caring for its obstetrical patients. A recent communication cited 15.3% of obstetrical patients being COVID-19 positive, with 13.5% being completely asymptomatic.¹ The management of these patients, including pneumonia and risk of preterm delivery, makes COVID-19 a veritable threat to this patient population.

The surrounding communities of New York City experienced similar challenges during this pandemic. Westchester

County, New York, was an early epicenter of the pandemic. Our institution is a tertiary referral center in Westchester serving patients from varying economic and ethnic backgrounds. We prepared for a surge of cases that would include pregnant patients. Daily conference calls with key faculty members from obstetrics and gynecology, anesthesiology, and perinatal nursing units were initiated. Under the guidance of the New York State Department of Health (NYSDOH) and our institutional epidemiologist, we identified issues and developed strategies for patients presenting for obstetrical care during this

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Date	Event
Feb 28 th – March 10 th	<ul style="list-style-type: none"> ○ Hospital institutes screening questionnaire for patients ○ First COVID-19 case in New York state ○ First case in New Rochelle, Westchester, New York ○ 2 support persons only for inpatients
March 11 th – 20 th	<ul style="list-style-type: none"> ○ March 11- World Health Organization declares COVID-19 a pandemic ○ Universal mask procedure instituted for healthcare workers ○ No visitors (except Labor and delivery, pediatrics and end of life events) ○ March 17 - "Non-essential" surgeries postponed ○ March 18 NYSDOH- Suspend visitation except when medically necessary ○ Institutional drive-through COVID-19 testing implemented ○ Availability of Inpatient rapid testing (45 min, 2 hours turnaround time)
March 21 st – 30 th	<ul style="list-style-type: none"> ○ March 27 NYSDOH: Hospitals required to allow 1 support person in labor and delivery settings ○ N95 mask with protective eyewear for all patient encounters
April 1 st – 10 th	<ul style="list-style-type: none"> ○ Full PPE for second stage of labor ○ CDC- Cloth face coverings in public settings ○ Pre-procedural COVID-19 testing required includes cesarean deliveries ○ Universal testing for Labor and Delivery implemented ○ Apr 10 NYSDOH- support persons should remain in room
April 11 th – 20 th	<ul style="list-style-type: none"> ○ Partners of COVID-19 negative patients allowed in cesarean deliveries
April 21 st – 30 th	<ul style="list-style-type: none"> ○ April 29- New York state COVID- 19 maternity task force- universal testing for patients and support persons ○ April 29 – New York state COVID- 19 maternity task force - support person to stay with mother until discharge
May 1 st – 18 th	<ul style="list-style-type: none"> ○ New York Stay-at-home order extended to June 13 ○ "Elective" surgery to resume in Westchester

COVID-19 Coronavirus Disease of 2019, CDC – Centers for Disease Control and Prevention, NYSDOH- New York State Department of Health

Fig. 1 COVID-19 timeline 2020. CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease of 2019, NYSDOH, New York State Department of Health.

pandemic. We describe our experiences as we formulated policies, from mid-March 2020 to late May 2020. A timeline of events and state guidelines is presented to frame our actions (→Fig. 1).

Minimizing Staff and Patient Exposure to the Virus

Close-range aerosol transmission by droplet and inhalation, and contact followed by self-delivery to the eyes, nose, or mouth are likely routes of transmission of COVID-19.² Hand hygiene, respiratory hygiene, and cough etiquette, along with observation of contact and airborne transmission precautions and donning of protective eyewear (goggles or face shields) are recommended during the care of COVID-19 patients.³ We placed visual alerts at strategic locations and provided increased resources for sanitization. Transparent acrylic panels were installed at the registration desk and triage areas to serve as physical barriers.⁴ To avoid cross-contamination, paper documents were not allowed in rooms of patients with suspected or confirmed COVID-19. If necessary, they were placed in resealable plastic bags.

Social distancing is a vital component of reducing the spread of this virus. Individuals are recommended to remain at least six feet apart from other individuals.⁵ Clinical huddles were critical, and controlling the size of these gatherings, although difficult, was given high priority. All staff were required to self-monitor for COVID-19-like illness. An entry log was maintained for personnel entering rooms with infected patients. Although in-person communication was used sometimes, audio and video conferencing was increasingly used to disseminate information.

Personal Protective Equipment

The evolving pandemic necessitated changes in policies regarding personal protective equipment (PPE). In mid-March, our institution was requiring personnel to wear a procedure mask in all patient care areas. By late March, all personnel providing direct patient care were asked to wear an N95 respirator and protective eyewear for all patient encounters. Gowns had to be additionally worn during direct patient care for suspected or confirmed COVID-19 patients. Visitors were also required to wear procedure masks. By early April, patients were required to wear procedure masks. We observed patients removing masks, with a minority wearing ill-fitting personally procured N95 masks. Procedure masks were supplied to all patients along with education regarding donning of masks.

During this pandemic, hospitals experienced some degree of shortage of PPE. Decontamination and reuse of disposable filtering facepiece respirators such as N95 masks was being done.^{6,7} Our institutional policy was to not discard N95 respirators routinely after single use, through the use of a covering mask (that could be disposed) to prevent contamination of the underlying N95 respirator. Exceptions included loss of structural or functional integrity of the mask or soiling of the mask. Employees were advised against wearing nonhospital-issued PPE.

Errors in removal of PPE are common and are associated with contamination of health care workers with pathogens.^{8,9} Our obstetric unit can encounter a high volume of patients simultaneously, and thus donning and doffing PPE correctly and quickly is critical. We prioritized education using live instructor-led training with small group demonstrations and video-based instructions for learning donning and doffing

New York- Antibody Testing Results		
Location	Healthcare workers (% positive)	General Population (% positive)
Westchester	6.8 %	13.8 %
NYC	12.2 %	19.9 %
Long Island	11.1 %	11.4 %

Fig. 2 Data from New York Governor's Coronavirus briefing on May 13, 2020.

PPE.^{10,11} Face-to-face training may reduce errors but increases staff exposure risk. Video training involves less time and may be a more resource-efficient method.¹²

Our hospital system reacted well to the nationwide shortages of PPE and developed appropriate and effective methods of reuse. Recent data suggest that in Westchester, while nearly 14% of the general public had antibodies, only approximately 7% of health care workers did (→ **Fig. 2**). These results suggest that PPE worn by health care workers was effective against preventing the spread of this virus.

Education for Trainees

The dilemma of obstetrical training in the COVID-19 era became apparent during multidisciplinary discussions. Medical students' rotations through the obstetric unit were suspended starting in mid-March 2020. Residents faced challenges in balancing learning with potential exposure. They were provided additional video-based learning opportunities including research. Senior residents were permitted to partake in COVID-19 deliveries as a valued part of their learning. Flexibility in the assessment of resident competence was essential as disruptions in rotation schedules occurred.

Screening in the Obstetric Unit

In early March, we began administering a screening questionnaire to all pregnant patients and support persons to identify "persons under investigation" (PUI). A PUI was defined as an individual with clinical symptoms suspicious for COVID-19 in addition to epidemiological risk.¹³ A challenge was that symptoms of fatigue and shortness of breath could have been attributed by the patient to pregnancy and not reported as a COVID-19-related symptom. An illness severity assessment that included evaluating for comorbid-

ities was useful when allocating care.¹⁴ Reducing overcrowding and improving time to key decisions was essential. We streamlined our triage processes with a goal to isolate all patients on arrival and minimize spread of the disease.

Pregnant Patients Coming to the Emergency Department

Our obstetric and emergency departments worked together to modify the workflow for evaluating pregnant patients. They were now stratified depending on the reason for their emergency department visit into obstetric complaints, non-obstetric complaints, and illness due to presumed COVID-19 infection. Only patients with obstetric complaints and a gestational age of >23 weeks were sent to the obstetric unit. The modified workflow allowed pregnant patients to be triaged efficiently.

Testing for Patients

Asymptomatic COVID-19 presentations are reported to be common and represent a substantial contribution to disease spread.¹⁵ Universal testing for women admitted for delivery is recommended in communities with a high rate of infection. During this pandemic, our hospital system had to adapt to different COVID-19 test kits with varying turnaround times.

With the introduction of drive-through COVID-19 nucleic acid testing, we began testing patients scheduled for elective procedures including cesarean deliveries and induction of labor. Real-time reverse transcription-polymerase chain reaction tests were performed on samples obtained by a nasopharyngeal swab with a turnaround time of 2 to 4 days. With the subsequent availability of a bedside rapid molecular diagnostic test with a virus detection time of approximately 45 minutes, we were able to implement testing for all our nonelective patients. These included patients arriving in labor, those

transferred to our unit for higher level of care, and those under observation with likelihood for admission. Universal testing was beneficial as some of our parturients tested positive for SARS-COV-2 (severe acute respiratory syndrome coronavirus 2) despite being asymptomatic.

Test results for elective patients were often unavailable at the time of admission. This resulted in case delays and necessity for retesting with the rapid test. A subsequent shortage of even the rapid test kits necessitated using alternative test kits with a turnaround time of 3 to 4 hours. Due to concerns for the safety of our staff, we mandated contact and airborne transmission based precautions and use of protective eyewear for all invasive procedures (e.g., neuraxial anesthesia, vaginal examinations) including operative interventions performed on all pregnant patients prior to test results coming back.

Formulating a testing plan for antepartum patients presented a challenge. Initial nucleic acid testing was performed on admission to the unit. The average incubation period for this disease is 5 days, and onset of disease may occur up to 14 days after exposure.¹⁶ Due to the risk of unexpected delivery, we instituted a retesting policy of every 4 days until 14 days after admission. Thereafter, testing was performed prior to anticipated delivery. We transitioned from using an inpatient COVID-19 test kit with a turnaround time of 12 to 18 hours to the one with 3 to 4 hours for these patients. Retesting prior to delivery was not always feasible. Patients were evaluated daily for symptoms or signs of disease. Despite being counseled about health care worker safety, some patients declined repeated nasopharyngeal swab testing.

Antibody response to COVID-19 varies with different clinical manifestations and disease severity.¹⁷ It does not have a role in perioperative screening and risk stratification, and we do not offer this test to our patients.

Support Persons

Considerations involving support persons in the obstetric unit became controversial and underwent several changes as the pandemic progressed. In the early stages of the pandemic, our institution began prohibiting visitors for all hospitalized patients; exceptions included the obstetric and pediatric units. During this time, some New York City hospitals began prohibiting visitors from attending deliveries citing a high rate of COVID-19 infection in asymptomatic parturients. The measures were intended to protect mothers, their infants, and the obstetric care team. The NYSDOH then issued a health advisory stating that hospitals were required to allow one support person in the obstetric setting.¹⁸ From this perspective, our policy had remained unchanged. We allowed one support person with the patient during labor and delivery. If the support person was febrile or the screening questionnaire was indicative of possible infection, the person was required to leave the hospital. The patient was then given the option of obtaining another support person who underwent similar screening.

Initially, we did not allow support persons into the operating rooms or postpartum units. We then adapted our policy to allow support persons of only COVID-19-negative patients into

the operating room. A subsequent NYSDOH directive specified that support persons were to remain in a patient's room except for entrance and exit from the hospital.¹⁹ We implemented this recommendation. Initially, we permitted support persons to only stay for 2 hours postdelivery. Based on recommendations from the New York State COVID-19 Maternity Task Force,²⁰ we began allowing them to stay with the patient until discharge from the hospital. Although this task force recommended universal COVID-19 testing for all support persons, we are not currently doing so because of limited availability of test kits.

Peripartum Considerations

Labor

The issue of aerosolization in the context of forceful exhalation during the second stage of labor is a subject of controversy. Wearing a mask during pushing in the second stage of labor was not adhered to by most parturients. The CDC maintains that forceful exhalation during the second stage of labor would not be expected to generate aerosols to the same extent as procedures more commonly considered to be aerosol-generating.²¹ Leading obstetric medical societies believe that it is reasonable to consider N95 mask use when caring for patients with confirmed or suspected COVID-19 during the second stage of labor.²² Initially, all staff wore impermeable gowns along with the N95 respirator and protective eyewear while providing care for every parturient during the second stage of labor. After the availability of universal testing, these precautions were followed only for COVID-19 patients.

A negative-pressure delivery room in our unit and a second delivery room equipped with a high-efficiency particulate air (HEPA) filter were designated for infected patients. HEPA filters provide increased air turnover and help achieve the equivalent of ≥ 12 air exchanges per hour.²³ If patients placed in nondesignated rooms tested positive for the virus, those rooms were provided with HEPA filters.

The issue of delayed cord clamping is controversial in the setting of COVID-19 infection.^{24,25} Currently, we do not practice delayed cord clamping after delivery in these patients.

Surgical Interventions

Designated main hospital operating rooms were made operational for elective cesarean deliveries for COVID-19 patients. An operating room with a HEPA filter on the obstetric unit was designated to be used for urgent and emergency cases. All operating room personnel observed contact and airborne transmission precautions and donned protective eyewear for these cases. The use of powered air-purifying and elastomeric respirators has been discouraged in surgical settings due to concerns that exhaled air may contaminate the sterile field.²⁶

In late March, several surgical societies released statements regarding minimally invasive and endoscopic surgery and concerns of theoretical virus aerosolization.^{27,28} Their recommendations became relevant to obstetric practices. An electrocautery with the lowest possible setting for hemostasis combined with a smoke evacuation system was to be reserved for COVID-19 operating rooms.²⁹ Bipolar cautery

devices were avoided during procedures. During laparotomy, instruments were to be kept clean of blood and other body fluids.³⁰

Anesthesiology

Communication with the anesthesiology staff has been essential during this crisis. Telehealth preoperative assessments were adopted for all patients referred for consultation.³¹ In preparation for COVID-19 cases, nonessential materials were removed from operating rooms. Surfaces that harbor droplets can serve as reservoirs for the virus.³² The anesthesiology equipment cart and medication dispensing systems were placed outside the operating room. All cases with suspected or confirmed COVID-19 patients involved a “runner.” This person would be stationed outside the operating room and utilized for obtaining additional drugs and equipment. Two-way radios and dry-erase whiteboards were used for communication. Patients were brought to the operating room only after confirmation that the team had donned PPE.

Emergency cases in COVID-19 parturients were challenging due to the additional time required for preparation as anesthesiology equipment and medication dispensing systems were kept outside these operating rooms. We were able to successfully perform neuraxial anesthesia on some of our COVID-19 patients during labor and cesarean delivery.³³ Intubation and extubation during general anesthesia should ideally be performed in a negative-pressure room.³⁴ In the absence of these rooms, they were performed in an operating room with a HEPA filter. Portable ventilators to transport intubated patients were used.

The anesthesia machine has unique considerations and needs to be protected from contamination by an infected patient. We covered the outer surface of the machine using a clear plastic drape and placed a heat and moisture exchanger and viral filter between the breathing circuit and the patient’s airway and between the expiratory limb and the machine.^{35,36}

Postpartum Considerations

Babies born to COVID-19 parturients require special considerations. These include the mother’s health, ability to care for the infant, and risk of disease transmission. Limited evidence exists for transplacental transmission of COVID-19 as well as risk of infection from breast milk.³⁷ While separation of the infant and transfer to an isolation room has been suggested, making decisions on a case-by-case basis is recommended.^{38,39} The emphasis in our institution has been to allow rooming-in of the affected mother and baby (if mother and baby are well), breastfeeding while wearing a procedure mask, and avoiding skin-to-skin contact. If an infected mother was unable to take care of her baby, the baby was placed in a postpartum cohort room. Patients welcomed rooming-in and breastfeeding with precautions rather than mother-infant separation. If the baby needed further care, he/she was taken to the intensive care unit. Babies underwent COVID-19 antigen testing after 24 hours.

To minimize infection risk,⁴⁰ a plan to facilitate early discharge of all patients was formulated. If clinically stable, most patients were discharged after 24 hours following a vaginal delivery and after 48 hours following a cesarean delivery. They were counseled to continue social distancing, wear a mask while in public, and avoid visitors at home. We did not see any postpartum complications after early hospital discharge.

Conclusion

We have learned many lessons from developing our obstetrical policies during this pandemic. In our institution, 32 obstetric patients tested positive for COVID-19 during this period. Among these, there were 8 vaginal and 11 cesarean deliveries, and 13 parturients were asymptomatic. Three patients were intubated after delivery, needed prolonged ventilatory support, and were eventually extubated. These patients may have undergone respiratory decompensation after delivery due to autotransfusion of blood from the contracting uterus. Three patients reported testing COVID-19 positive, then negative, and then positive over a prolonged time period. No neonate tested positive for the virus.

As the pandemic timeline unfolded and the risks shifted, the evolution of policies proved challenging. Close communication between leadership and staff was critical. Social distancing requirements and desire to protect staff from exposure to the virus forced us to change our practice. We learned that the use of video and telephone are good supplements. Management of these patients consumed resources. We needed to consider available equipment, strategies for testing, and PPE when providing care. We recognize that labor and delivery is an important and unique time in a woman’s life. However, balancing risks to providers from exposure to COVID-19 and patient autonomy and rights were considerations. We followed expert opinions and recommendations by different medical societies to reduce transmission of infection. We prioritized keeping personnel safe so that we could staff a fully functioning unit to provide optimal care for our patients. All this impacted patients’ experience, patient autonomy, and trainees including medical students and residents. A big learning point has also been our continually striving to promote a culture of safety in pregnant patients, considering diverse cultural systems and beliefs. All these lessons have strengthened our institution and prepared us to best serve our patients during the COVID-19 pandemic and future emergencies.

Conflict of Interest

None declared.

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