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Delivery Room Preparedness and Early Neonatal Outcomes During COVID19 Pandemic in New York City

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Abbreviations: DR: Delivery Room; NP: Nasopharyngeal; WBN: Well Baby Nursery; NICU: Neonatal Intensive Care Unit; NYPH: New York Presbyterian Hospital; PPE: Personal Protective Equipment; CPAP: Continuous Positive Pressure Ventilation, PUI: Person under investigation; PI: premature infant

Contributors' Statement Page

Dr. Jeffrey Perlman and Dr. Corrina Oxford conceptualized and designed the study, analyzed the data, drafted the initial manuscript and revised the manuscript.

Dr. Catherine Chang, Dr. Christine Salvatore, and Dr. Jennifer DiPace collected data, and reviewed and revised the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Since the initial report of a novel Coronavirus SARS-CoV-2 in Wuhan in December 2019 there has been widespread dissemination of disease worldwide.[1] The impact on the neonatal population has been reported almost exclusively from China.[2-9] The study goal is to characterize for the first time in the United States, the delivery room (DR) management and early course of infants born to COVID19 positive mothers, during three weeks at the peak of the pandemic in NYC, and to describe the challenges and approaches developed to meet these excessive needs.

Methods

This is a prospective initiative of mothers admitted to labor and delivery all of whom were tested, and focusses on those who tested positive for COVID19 via SARS-CoV-2 PCR obtained from a nasopharyngeal (NP) swab only, and their infants triaged to the well-baby nursery (WBN) or admitted to neonatal intensive care (NICU) at New York Presbyterian (NYPH) Weill Cornell Medicine between March 22 and April 15th, 2020. A check list developed during the process delineated delivery room (DR) preparedness including availability of essential personal protective equipment (PPE) (N95 respirator), resuscitations for COVID19 positive or patient under investigation (PUI) deliveries to follow the NRP algorithm, with subsequent transport and NICU admission steps as outlined in Figure 1. Infants triaged to WBN were managed as per posted guidelines.[10] The study received exempt status approval from the Institutional Review Board.

Results

There were 326 deliveries resulting in 31 (9.5%) mothers testing positive for SARS-CoV-2: 15 (48%) were asymptomatic and 16 (52%) symptomatic. In the DR only the two premature infants

(PI) received any support, i.e. continuous positive pressure ventilation (CPAP); none were intubated. Infants were triaged to WBN (n=29) (94%) and NICU (n=2) (6%). SARS-CoV-2 testing was negative (x1) in all WBN infants (n=29) by 24 hours, and at 24, 48 hours, 7 and 14 days in both NICU cases. The WBN infants were cared for in the mother`s room; breast feeding if desired was allowed.[10] All WBN cases were discharged home with their mothers between 24 and 48 hours. Over three weeks the turnaround for test results decreased from as long as 24 to approximately two hours.

NICU Admission and Management

The two PI were placed in a negative pressure room managed in an isolette (Table 1). Following two negative test results they were moved out of isolation. Concurrently, 9 infants born to PUI mothers, four of whom required CPAP, were admitted to the NICU, initially isolated until maternal testing was negative. Neonatal management remained as per standard NICU guidelines. Visitor restriction for COVID19 positive mothers included 14 days from start of symptoms. Communication was via video-linking.

During the concurrent time period, nine infants within the NICU have been tested for COVID19 for variety of reasons; all tested negative.

Discussion

The salient findings in this report are that 10% of mothers were SARS-CoV-2 positive, of whom 50% were asymptomatic during the peak of the pandemic. This resulted in 31 infants, most (94%) triaged to WBN with two admitted to the NICU. The DR management was uncomplicated

in all 31 cases; both PI received CPAP. All infants tested negative and WBN neonates were discharged home within 48 hours; both PI have exhibited an unremarkable clinical course.

A key factor driving DR preparedness is awareness of the mother's SARS-CoV-2 status. This stresses the importance of rapid turnaround of testing; currently it is approximately 2 down from up to 24 hours. Knowledge of a positive mother status facilitates adequate DR preparation and avoids unanticipated surprises. This is crucial in order to minimize the likelihood of a provider becoming infected and/or infecting the infant. Availability of appropriate PPE (N95 respirators were initially limited in supply) is essential in this regard, allowing providers resuscitating a depressed infant to follow the NRP algorithm.

To date there have been ten reports, all from China, characterizing the outcomes of 82 neonates born to SARS-CoV-2 positive mothers.[2-9] Four (4.8%) tested positive for COVID19 within 36 hours; all four were delivered via cesarean section. This suggests horizontal rather than vertical transmission, likely due to breaks in infectious precautions. These cumulative findings, including the data in this report, suggest a very low risk of vertical transmission. One potential caveat is the COVID positive mother with diarrhea, where the risk of transmission may be increased.[11]

Study limitations include a small cohort and short-term follow-up.

We are reporting these observations for several reasons. First, to stress the importance of being prepared for a rapid surge in cases. This includes having appropriate, sufficient PPE (specifically

N95 respirators) to meet needs, a rapid turnaround in test results which is essential in order to optimize DR resuscitations (all PUI cases are presumed COVID +), to minimize risk of providers becoming infected and to facilitate appropriate admissions. Second, with scrupulous attention to infectious precautions, horizontal viral transmission should be minimized. Finally, the cumulative data suggest that the virus does not confer additional risk to the fetus during labor or during the early postnatal period in both preterm and term infants.

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Table 1 Perinatal clinical characteristics of the two admitted infants

Patient	Maternal Issues	BW	GA	Mode of Delivery	DR Resuscitation	Apgar 1 minute	Apgar 5 Minute	Initial NICU Treatment
#1	PET, Edema, Fever	1600	33 2/7	CS	CPAP	8	8	RA
#2	Preterm Labor	1740g	32 3/7	Vaginal	CPAP DCC	9	8	CPAP

PET= preeclampsia, BW = Birth Weight, GA= Gestational Age, DR= Delivery Room, CPAP= Continuous Positive Airway Pressure; DCC =Delayed Cord Clamping

Figure 1.

Checklist depicting preparation for delivery in either the Operating Room (OR) or Labor Delivery Room and the steps to follow in preparation for resuscitation, transportation to the neonatal intensive care unit, and early post resuscitation care.

Suspected/confirmed COVID-19 alone, in an otherwise uncomplicated pregnancy, is not an indication for the resuscitation team or the neonatal fellow. Delivery room preparation and management should include contact precautions

Preparing for Delivery in either Operating Room (OR) or Labor Delivery Room (LDR)

- ☐ **Don PPE in the anteroom (if available) or outside the room**
  - All providers who enter the room of a COVID+ /PUI mother undergoing a CS or symptomatic mother undergoing a Vaginal Delivery must wear a N95 mask and a covering surgical face shield during the resuscitation, gown and double gloves
  - All providers should perform hand hygiene

If the PPE Kit becomes contaminated discard all disposable items

Neonatal Resuscitation

- ☐ **Pre-brief before the delivery to delineate roles**
- ☐ **Lay down a sterile drape on the warmer, with the excess overhanging the foot of the warmer**
- ☐ **Obstetrician should place the baby on the warmer (over the drape) after delivery, minimizing contact with the warmer as much as possible**
- ☐ **Resuscitation per NRP algorithm by NICU team**
  - Use a disposable laryngoscope (where indicated) and stethoscope to examine patient
  - Be careful to minimize exposure to blood when/if cutting umbilical cord

All PPE and equipment used or that comes into contact with any surface in the room, should be discarded in a red bag (including the laryngoscope)

Transportation to the NICU

- ☐ **NICU brings an isolette to the LDR or OR**
- ☐ **Baby is transferred from the warmer to the isolette INSIDE the room**
  - A staff member should don clean PPE (gown, gloves) prior to transferring the baby from the warmer to the isolette to minimize surface contamination
  - Transferring the baby should be performed INSIDE the room, and as close to the door as possible, to minimize contact of the isolette with other surfaces in the room
- ☐ **All personnel actively transporting the patient need to wear PPE: minimum droplet/contact, along with N95 masks if aerosol-generating procedures are in progress (i.e. NIPPV)**
- ☐ **Have a designated staff member with mask on accompany the team**
  - This person should only be responsible for interacting with the clean environment and stay 6 feet ahead of the team. They should not participate in the physical transport of the baby or come into contact with any equipment related to the baby

Hand only "clean" paperwork to the clerk. Anything that has come into contact with the baby or that was in the OR or LDR with the baby should not be handed to the clerk

Post-Resuscitation Care

- ☐ **Infants born to a COVID +/PUI mother should be placed in an isolation room in the NICU**
  - For babies who are **intubated or require no respiratory support**: receiving RN and team members should don contact gown (yellow), surgical mask with face shield and gloves
  - For babies who are on **CPAP/NIPPV/NC**: receiving RN and team members should don contact gown (yellow), N95 mask and gloves

Nasopharyngeal (NP) swab for SARS-CoV-2 testing for NICU admissions should be obtained at approximately 24, 48 hours, 7 and 14 days if still admitted

Suspected/Confirmed COVID19 alone in uncomplicated pregnancy is NOT an indication for Resus Team

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