

## Commentary

# Management of the mother-infant dyad with suspected or confirmed SARS-CoV-2 infection in a highly epidemic context

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**Abstract.** In the context of SARS-CoV-2 pandemic, the hospital management of mother-infant pairs poses to obstetricians and neonatologists previously unmet challenges. In Lombardy, Northern Italy, 59 maternity wards networked to organise the medical assistance of mothers and neonates with suspected or confirmed SARS-CoV-2 infection. Six “COVID-19 maternity centres” were identified, the architecture and activity of obstetric and neonatal wards of each centre was reorganised, and common assistance protocols for the management of suspected and proven cases were formulated. Here, we present the key features of this reorganization effort, and our current management of the mother-infant dyad before and after birth, including our approach to rooming-in practice, breastfeeding and neonatal follow-up, based on the currently available scientific evidence. Considered the rapid diffusion of COVID-19 all over the world, we believe that preparedness is fundamental to assist mother-infant dyads, minimising the risk of propagation of the infection through maternity and neonatal wards.

**Keywords:** SARS-CoV-2, coronavirus, COVID-19, delivery room, NICU, neonate, breastfeeding, rooming-in

## 1. Introduction

In December 2019, the novel *Betacoronavirus* SARS-CoV-2 was identified in a cluster of few Chinese adults suffering from severe pneumonia. The disease was named “COVID-19” [1]. Since late February 2020, Italy has been dramatically

overwhelmed by the epidemic, with 201.505 cases reported until April 28, 2020, and 27.359 deaths. Forty-three percent of these patients were clustered in Lombardy, Northern Italy [2].

The possibility of vertical transmission of SARS-CoV-2 from a mother to the fetus is largely unknown, but seems possible based on limited data [3]. Postpartum transmission of SARS-CoV-2 from parents to neonates seems far more common, likewise several viral agents that cause respiratory infections [3, 4]. Thus, in such a pandemic context, the management

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of the mother-infant dyad before and after birth poses to obstetricians and neonatologists previously unmet challenges.

On February 26, six days after the beginning of SARS-CoV-2 epidemic in Lombardy, the regional committee of Società Italiana di Neonatologia (SIN) in coordination with regional branches of the Italian Society of Obstetrics and Gynecology (SIGO) and local authorities started to plan the assistance of positive or suspected mother-infant dyads. Here, based on available recommendations [5–8], published data, and on-field experience, we present an overview of how this assistance was organized, and how we are currently managing mothers and infants with suspected or proven SARS-Cov-2 infection before and after birth.

## 2. Identification and reorganization of COVID-19 maternity centers

Lombardy hosts 59 maternity hospitals, for a population of approximately 10 million people and 75.000 births/year. A system of in-utero and neonatal emergency transportation, organized around 11 hub centers with a level III neonatal intensive care unit (NICU) and Maternal-Fetal Medicine (MFM) center, has been connecting maternity hospitals since 1992. On February 26, five of these hubs were designated to centralize all cases of suspected or confirmed SARS-CoV-2 infection in pregnant mothers and neonates, up to 28 days of life. The choice was based on the location and the availability of spaces suitable to isolate mothers and infants, as well as on the presence of infectious disease consultant on-site 24/7 and an adult intensive care unit with dedicated COVID-19 areas and staff. Within each “COVID-19 maternity center”, dedicated spaces and routes to assist mothers and infants with suspected or proven SARS-CoV-2 infection were identified. In obstetric triage, pediatric triage, and delivery wards one or more (depending on availability) rooms with negative pressure and en-suite toilet were dedicated to assist women and neonates with suspected or proven infection. In NICUs, negative-pressure rooms were identified at one extremity of the ward, to cohort confirmed (the farthest from the ward) and suspected (the closest) neonates requiring medical assistance, respectively. If possible, similar rooms were identified and equipped in the nursery, to assist non-critical neonates whose mothers were not in sufficient condition for rooming-in (see below). One-way routes for

healthcare-providers and materials were identified, and both entrance were equipped with double doors and stations for donning and doffing of PPE. When necessary, and elevator was removed from public availability, locked and dedicated to the COVID-19 course.

## 3. Medical management

The high contagiousness of SARS-CoV-2 and the actual pandemic situation impose extreme caution in the management of suspected or proven infections, regardless of the patient’s age. Every staff member who enters a room hosting a patient with suspected or proven SARS-CoV-2 infection, either a woman or a neonate, always dons full personal protective equipment (PPE: N95 or superior respirator, double gloves, splash-proof gown and head cuff, goggles or face shield, and shoe covers).

### 3.1. Pre-partum assistance to the pregnant mother

Based on regulations given by the Italian Ministry of Health, universal testing of pregnant women for SARS-CoV-2 is not performed. All pregnant women are interviewed at hospital admission for symptoms or anamnestic data suggestive for SARS-CoV-2 infection. The interview also covers partner, cohabitants and relatives. In case of clinical suspicion, to confirm or exclude infection (rt-PCR on nasopharyngeal swab) [5] before the woman accesses delivery room is of paramount importance. Pending the screening result, the woman remains isolated in obstetric triage. Whenever the staff is in the room, patients not requiring respiratory support must don a surgical mask. If infection is unconfirmed, the woman is cared through normal assistance protocol. In case of delivery from a confirmed or still suspected mother, the woman is transferred to the maternity ward through the COVID-19 route, by obstetric staff donning full PPE, and is assisted during delivery by a dedicated multidisciplinary team (obstetrician, gynecologist, anesthesiologist, neonatologist, neonatal nurse) in isolation room.

### 3.2. Post-partum assistance to the mother-infant dyad

After birth, skin-to-skin procedure is avoided on a precautionary basis. The management of

mother-infant dyad depends on the clinical condition of both, and on the results of SARS-CoV-2 infection screening.

Possible postpartum scenarios are summarized in Table 1. All scenarios (A, B, C) share common management features.

3.2.1. *Staff equipment and assistance organization*

In case of positive or suspected maternal or neonatal infection, both obstetric and neonatal staff dons full PPE, as highlighted above. Based on epidemiological data, the need for highly intensive care is uncommon for neonates born to mothers with SARS-CoV-2 infection [3]. Nonetheless, preterm neonates may require full medical assistance, independently from the infection. Thus, nursing and medical shifts in the NICU isolation rooms are adjusted daily, based on the clinical severity of admitted neonates. In postpartum ward, one midwife every 4–6 women per shift is dedicated exclusively to the assistance of isolated mothers.

3.2.2. *Transfer of mother and infant between hospital wards*

Obstetric staff, plus an anesthesiologist and ICU specialists if needed, transfers the mother through dedicated route to the isolation room in post-partum area or ICU, donning full PPE. The mother dons a surgical mask if she doesn't need respiratory support. In scenario "A", the neonate can be transferred together with the mother by obstetric staff, after neonatologist's approval. In scenario "B" and "C" the neonate is transferred into dedicated transport incubator by fully equipped NICU staff to the isolation room in the appropriate neonatal ward area (nursery or NICU).

3.2.3. *Rooming-in*

Based on actual, limited evidence, rooming-in of the neonate in case of scenario "A" is not contraindicated [8]. Within the room, the mother is instructed to don a surgical mask and perform careful hand hygiene before assisting the neonate. When mask is not worn, mother and neonate must remain at a minimum distance of 6 feet apart, and a curtain should be placed between mother and baby.

3.2.4. *Testing of the neonate for SARS-CoV-2*

If the mother tested positive, the neonate is screened for SARS-CoV-2 infection within the first 12 hours of life (nasopharyngeal swab, urine, blood,

Table 1  
Management of mother-infant dyads based on clinical conditions and virological screening for SARS-CoV-2 infection

| Clinical scenario | Maternal SARS-CoV-2 screening | Neonatal SARS-CoV-2 screening | Clinical conditions*                          | Area of Hospitalization                            | Isolation room          | Rooming-in | Breastfeeding  |
|-------------------|-------------------------------|-------------------------------|---|--|-------------------------|------------|--|
| A                 | Positive or pending           | Pending                       | Mother: good<br>Neonate: good                 | Mother and infant:<br>post-partum ward             | Yes                     | Yes        | Allowed  |
| B                 | Positive or pending           | Pending                       | Mother: good<br>Neonate: requiring assistance | Mother: post-partum ward<br>Infant: NICU           | Yes (cohorting allowed) | No         | Direct breastfeeding not feasible<br>Expressed milk administered by NICU staff allowed |
| C                 | Positive or pending           | Pending                       | Mother: requiring assistance<br>Neonate: good | Mother: post-partum ward or ICU<br>Infant: Nursery | Yes (cohorting allowed) | No         | Direct breastfeeding not feasible<br>Expressed milk administered by NICU staff allowed |

\* Good clinical conditions, mothers: not requiring respiratory support, fever < 38°C, able to take care of her baby according to the treating physician. Good Clinical conditions, neonates: not requiring respiratory support, normal vitals, no signs or symptoms of suspected sepsis according to CDC criteria, able to feed regularly.

rectal swab). In scenario “A”, the neonate is not separated from the mother even in case of discordant results (mother positive, neonate negative at birth screening). In scenario “B” and “C”, positive neonates are cohorted in dedicated COVID-19 areas within the NICU or nursery. Negative neonates at birth screening remain cohorted with suspected cases, given the actual paucity of data regarding the possibility of SARS-CoV-2 vertical transmission and viral shedding.

### 3.2.5. Breastfeeding

Based on limited evidence [3, 8], and after careful discussion with parents, the use of mother’s milk is not discouraged for any scenario. In scenario “A”, direct breastfeeding is not discouraged. In “B” and “C” scenarios, mother can express milk, administered to the neonate by the NICU/nursery staff. Careful hand hygiene with 70% alcohol solution is recommended before using the milk pump.

### 3.2.6. Parental visits

Considered the pandemic situation and the fact that partners are close contacts of mothers, visits of any relative, including father, to the dyad are not permitted.

### 3.3. Assistance to neonates admitted from home, or from other hospitals, with confirmed/suspected infection

Neonates accessing the pediatric triage with suspected infection are isolated with parents in the dedicated COVID-19 area. Screening for SARS-CoV-2 infection (nasopharyngeal swab) is performed in the pediatric triage. In case of positive test, the neonate is admitted to the appropriate COVID-19 area of the neonatal ward. Both parents are tested as well, and quarantined at home if not in need for immediate medical assistance. Parental visit to the admitted baby are not permitted. Expressing breast milk to feed the admitted baby is not contraindicated. Nonetheless, considered the mandatory strict parental quarantine, formula feed is administered to the neonate until parental quarantine is over.

### 3.4. Hospital discharge and follow-up

The rapidly changing pandemic situation of COVID-19, the limited evidence-based data and

different local policies hinder definitive and universal recommendations on the management of maternal-infant dyads after hospital discharge. Clinical conditions of mother and neonate seem the best indicator for hospital discharge of the dyad. Laboratory resolution of the infection (i.e. two negative nasopharyngeal swabs 24 hours apart) [5] is not considered a mandatory criterion to discharge the dyad home. In case of positive mother or infant, provided good clinical conditions of both, the whole family is quarantined home. Mother and neonate are re-tested for SARS-CoV-2 14 days after hospital discharge, in dedicated areas of obstetric triage equipped to visit the infant as well. For transportation from home to hospital and back, the use of personal vehicle, if available, is recommended. Parents must always don surgical masks outside home. Recommendations on how to continue clinical and virological follow-up on mother-infant dyads are not available at present. Anyway, in case of persistent positivity, virological screening is carried on until confirmed negativity (two negative nasopharyngeal swabs 24 hours apart).

## 4. Conclusions

After spreading out of Chinese borders, COVID-19 is rapidly diffusing all over the world, and several healthcare systems are predicted to be overwhelmed by the pandemic within the next weeks. The aim of this work is to share our experience, as obstetricians and neonatologists, on the management of mother-infant dyads with suspected or confirmed SARS-CoV-2 infection, in a highly epidemic European region that is currently facing a sanitary emergency. Our purpose is also to encourage debate on several, still poorly known aspects of COVID-19 management in pregnant mothers and neonates. Considered the projected numbers of this sanitary crisis worldwide, maternity wards and NICUs should rapidly prepare for the management of suspected or proven SARS-CoV-2 infections.

### Disclosure statements

#### Declarations of interest

We declare no competing interest relevant to the topics discussed.

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### References

- [1] Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med.* 2020; published online Feb 28. DOI:10.1056/NEJMoa2002032
- [2] World Health Organization (WHO). Coronavirus disease 2019 (COVID-19): Situation Report - 71 (31 March 2020). March 31, 2020. [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200331-sitrep-71-COVID-19.pdf?sfvrsn=4360e92b\\_8](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200331-sitrep-71-COVID-19.pdf?sfvrsn=4360e92b_8)
- [3] Zeng L, Xia S, Yuan W, Yan K, Xiao F, Shao J, et al. Neonatal early-onset infection with SARS-CoV-2 in 33 neonates born to mothers with COVID-19 in Wuhan, China. *JAMA Pediatr.* 2020. doi: 10.1001/jamapediatrics.2020.0878
- [4] Poon LC, Yang H, Lee JCS, Copel JA, Leung TY, Zhang Y, et al. ISUOG Interim Guidance on 2019 novel coronavirus infection during pregnancy and puerperium: Information for healthcare professionals. *Ultrasound Obstet Gynecol.* 2020; published online Mar 11. doi:10.1002/uog.22013
- [5] World Health Organization (WHO). Global Surveillance for human infection with coronavirus disease (COVID-19). Interim Guidance. February 27, 2020. [https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-\(2019-ncov\)](https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-(2019-ncov))
- [6] Liang H, Acharya G. Novel corona virus disease (COVID-19) in pregnancy: What clinical recommendations to follow? *Acta Obstet Gynecol Scand.* 2020; published online Mar 5. doi:10.1111/aogs.13836
- [7] Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, Jamieson DJ. Coronavirus disease 2019 (COVID-19) and pregnancy: What obstetricians need to know. *Am J Obstet Gynecol.* 2020; published online Feb 24. doi:10.1016/j.ajog.2020.02.017
- [8] Centers for Disease Control and Prevention (CDC). Interim guidance on breastfeeding for a mother confirmed or under investigation for COVID-19. - February 19, 2020. [https://www.cdc.gov/coronavirus/2019-ncov/prepare/pregnancy-breastfeeding.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fpregnancy-faq.html](https://www.cdc.gov/coronavirus/2019-ncov/prepare/pregnancy-breastfeeding.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fpregnancy-faq.html)