

Managing a tertiary-level NICU in the time of COVID-19: Lessons learned from a high-risk zone

To the Editor,

The novel coronavirus named COVID-19 is a microorganism with a high rate of diffusion among humans. Since 21 February, it has spread exponentially across Italy, with more than 10 000 deaths at the time of writing (28 March). Older people and adults with underlying health conditions seem to be at higher risk of developing severe COVID-19-related illness. Given the limitations of the accuracy of COVID-19 infection diagnosis, young children appear to be at similar risk of infection as the general population, generally experience milder symptoms, and complications appear to be uncommon, but this remains to be independently confirmed.^{1,2} It is well known that preterm newborns are a special population with an immature immune system, placing them at greater risk of severe infections. In addition, most of extremely low birth weight infants develop a severe respiratory distress syndrome at birth and can develop bronchopulmonary dysplasia. Cases of pneumonia have been described in neonates born to mothers with COVID-19.³

No recommendations are available on how to prevent the spread of COVID-19 in neonatal intensive care units (NICUs).

In Italy, Veneto and Lombardy are among the most affected regions, and Padua is among the top 10 cities in Italy for number of cases. That is why Padua was classified as a “high-risk” zone on 9 March. Padua University Hospital's pediatric department is a tertiary-level referral center for eastern Veneto. It manages about 3000 deliveries a year, and its NICU (35 beds) handles 400 hospitalizations a year, including 110 infants born preterm weighing less than 1500 g. We report our experience so far during the COVID-19 outbreak in Padua, where the epidemic is ongoing and rapidly evolving, to promote debate on the preventive measures to adopt in NICUs.

2 | NEONATAL INTENSIVE CARE UNIT

2.1 | Triage

Given the spread of COVID-19 infection, we have established a triage system for all parents of newborn admitted to our NICU. We measure their body temperature and ask them to complete a

questionnaire about their health status, their contacts or travels from affected areas in the previous 2 weeks, and any recent influenza-like symptoms.

2.2 | Nasopharyngeal swabs

All the newborns hospitalized after 21 February, with and without respiratory symptoms, and all patients already admitted the NICU are tested for COVID-19. In addition, all healthcare providers working at the NICU and parents are tested once a week. The test, using the real-time polymerase chain reaction, seeks evidence of the COVID-19 virus in respiratory specimens (nasopharyngeal swabs), as recommended by the Centers for Disease Control and Prevention (CDC) guidelines.⁴

2.3 | Preventive measures

As an additional precaution during the epidemic, all newborns are kept isolated in thermostat-controlled cribs, and preventive measures are in place for both healthcare providers and parents. Physicians and nurses wear surgical masks, wash their hands frequently, and use hand sanitizers containing at least 60% alcohol before and after any contact with the newborn.

Parents' visits are restricted to 2 hours a day, and only one parent for each baby, at scheduled times. All parents must wear masks, gloves, and disposable clothing. Social distancing practices are adopted.

Preterm babies born from mothers testing positive for COVID-19 are kept isolated in a dedicated area of the NICU (“quarantine zone”), where parents are not allowed, and physician and nurses have to wear personal protective equipment according to CDC guidelines (ie, N95 respirators, gloves, eye protection, and gowns).

Any close contact between NICU staff and parents or colleagues is avoided. Meetings, clinical updates, journal clubs, and lessons are kept to a minimum, ensuring a distance of at least 1 m between participants, or replaced with teleconferences. Considering the widespread anxiety among parents of admitted infants, a supportive psychological service has been activated.

TABLE 1 Checklist of preventive measures in our NICU during the COVID-19 pandemic

Maternity service	Mother	Tested if symptomatic or with a recent history of close contact with an individual testing positive for COVID-19
		Isolation of mother and baby until swab test results are available
		Pumping milk without breastfeeding until swab test results are available
NICU	Newborn	Nasopharyngeal swabs on admission and weekly thereafter
		More frequent repetition of tests in the event of contact with an individual testing positive for COVID-19 or showing symptoms
		Quarantine zone for symptomatic patients or those who have been in contact with an individual testing positive for COVID-19
	Healthcare providers	Thermostat-controlled crib
		Weekly nasopharyngeal swabs
		Repetition in the event of contact with an individual testing positive for COVID-19 or showing symptoms
		Surgical masks and gloves
		Hand washing and 60% alcohol hand sanitizer
		Protective clothing, gloves, and N95 masks for COVID-19 positive or suspected newborn
		Avoidance of close contact with other colleagues and parents
		Restriction of face-to-face meetings, replaced with teleconferences
		Supportive psychological service available
		Parents
Nasopharyngeal swabs on admission and weekly thereafter		
Restricted access		
		Avoidance of close contact with parents
		Standardized procedures for hand cleaning and wearing protective clothing before accessing the NICU
		Supportive psychological service available

Abbreviations: COVID-19, coronavirus disease; NICU, neonatal intensive care unit.

Table 1 shows the checklist of preventive measures adopted at our unit for the duration of the pandemic.

3 | MATERNITY SERVICE

Since isolation measures have been made necessary by the epidemic, all mothers delivering at Padua Hospital with symptoms compatible with COVID-19 or a history of contact with a person infected are tested. While awaiting the results, the mothers and babies are kept isolated from each other. The mothers are encouraged to pump milk, but told not to breastfeed, and their babies are given formula milk until the results of the swabs arrive, in accordance with the European Society of Paediatric and Neonatal Intensive Care scientific statement.⁵ The main concern regarding healthy term-born neonates is not whether the virus can be transmitted through breast milk, but whether an infected mother can transmit the virus through respiratory droplets while breastfeeding.⁶ In a 5-week period since establishing these measures, we performed almost 1000

trriages and screened for COVID-19 48 neonates, 59 nurses, 26 physicians, and 94 parents. Three parents presented with fever or flu-like symptoms urgently tested for COVID-19 and restricted to enter until the infection was ruled out. Three asymptomatic healthcare providers and two parents tested positive and were kept isolated for 14 days. No newborn tested positive during the epidemic isolation.

COVID-19 disease took Italy by surprise; we did not expect to have to manage such a pandemic, particularly in the pediatric and neonatal population, for which data were lacking. The main role of the healthcare system is to protect patients and their families, and physicians and nurses as well.

We have opted for a heightened surveillance, testing all admitted newborns, their parents, and healthcare providers. This might seem a questionable approach and it is related to the availability of resources but given that (a) nearly half of patients with COVID-19 could be afebrile, (b) healthcare institutions seem to be environments that facilitate the transmission of COVID-19, and (c) bearing in mind the role of asymptomatic individuals in the spread of this virus, these risks cannot be underestimated.

However, testing is not a substitute for other steps to control the spread of the virus.

Being a tertiary-level NICU in a high-risk zone for COVID-19 exposure, we have adopted this policy in the conviction that "prevention is better than cure." We still do not know how preterm newborns might respond to this virus. We cannot assume they would develop milder symptoms because there are no data available on the issue. Most importantly, effective treatments or vaccines are not available as yet. We are confident that our procedure protects our newborn and healthcare professionals, and enables us to take prompt action if someone tests positive. We take swabs weekly to contain the likelihood of false-negative tests and make sure that infants do not become infected with COVID-19 during their stay in the NICU.

To sum up, we describe here our empirical efforts to keep the virus out of an NICU during the COVID-19 pandemic. We have opted to perform nasopharyngeal swabs on all admitted newborns, parents, and healthcare providers to promptly identify asymptomatic viral carriers and limit further transmission. We prefer not to prevent parents from visiting their children in the NICU, but have only restricted the timing of their visits. Studies are now urgently needed to produce evidence-based recommendations on how to prevent the spread of COVID-19 infection in NICUs.

4 | ACKNOWLEDGMENTS

We thank the Hospital Direction of the Azienda Ospedaliera-Università degli Studi di Padova, the microbiological laboratory, all NICU physicians, residents, and nurses for their valuable contribution.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

Maria Elena Cavicchiolo MD 

Elisabetta Lolli BSN

Daniele Trevisanuto MD

Eugenio Baraldi MD 

Department of Women's and Children's Health, Neonatal Intensive Care Unit, University Hospital of Padua, Padua, Italy

Correspondence

Eugenio Baraldi, MD, Department of Women's and Children's Health, Neonatal Intensive Care Unit, 35128 Padua, Italy.

Email: eugenio.baraldi@unipd.it

ORCID

Maria Elena Cavicchiolo  <http://orcid.org/0000-0002-9965-6549>

Eugenio Baraldi  <http://orcid.org/0000-0002-1829-3652>

REFERENCES

1. Bi Q, Wu Y, Mei S, et al. Epidemiology and transmission of COVID-19 in Shenzhen China: analysis of 391 cases and 1,286 of their close contacts. *medRxiv*. 2020. <https://doi.org/10.1101/2020.03.03.20028423>
2. Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. *Pediatrics*. 2020;145. <https://doi.org/10.1542/peds.2020-0702>
3. Zeng L, Xia S, Yuan W, 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. <https://doi.org/10.1001/jamapediatrics.2020.0878>
4. *Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Persons for Coronavirus Disease 2019 (COVID-19)*. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/lab/guidelines-clinical-specimens.html>. Accessed April 15, 2020.
5. *European Society of Pediatric Intensive Care (ESPIC)*. 2020. <https://espic-online.org/>. Accessed March 28, 2020.
6. *Practice Advisory: Novel Coronavirus 2019 (COVID-19)*. 2020. <https://www.acog.org/Clinical-Guidance-and-Publications/Practice-Advisories/Practice-Advisory-Novel-Coronavirus2019>. Accessed March 28, 2020.