

Management of Care for Neonates Born to SARS-CoV-2 Positive Women with or without Clinical Symptoms (COVID-19)

Statement of the German Society for Pediatric Infectious Diseases (DGPI) in accordance with the German Society for Gynecology and Obstetrics (DGGG) and the German Society for Perinatal Medicine (DGPM)

Umgang mit Neugeborenen SARS-CoV-2 positiver Mütter mit oder ohne klinische Erkrankung (COVID-19)

Stellungnahme der Deutschen Gesellschaft für pädiatrische Infektiologie (DGPI) im Einvernehmen mit der Deutschen Gesellschaft für Gynäkologie und Geburtshilfe (DGGG) und der Deutschen Gesellschaft für Perinatale Medizin (DGPM)

Authors

Arne Simon¹, Johannes Hübner², Markus Knuf³, Markus Hufnagel⁴, Reinhard Berner⁵

Affiliations

- 1 Pediatric Oncology and Hematology, Children's Hospital Medical Center, University Clinics, Homburg, Germany
- 2 University Children's Hospital at Dr. von Haunersches Kinderspital, LMU Munich, Munich, Germany
- 3 Helios Dr. Horst Schmidt Hospital, Clinic for Pediatric and Adolescent Medicine, Wiesbaden, Germany. Pediatric Infectious Diseases, University Medicine Mainz
- 4 Department of Pediatrics and Adolescent Medicine, University Medical Center, Medical Faculty, University of Freiburg, Freiburg, Germany
- 5 Department of Pediatrics, University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany

Key words

SARS-CoV-2, pregnancy, neonates, vertical transmission

Schlüsselwörter

SARS-CoV-2, Schwangerschaft, Neugeborene, vertikale Transmission

Bibliography

DOI <https://doi.org/10.1055/a-1168-2845>
 Published online: 5.6.2020
 Klin Padiatr 2020; 232: 173–177
 © Georg Thieme Verlag KG Stuttgart · New York
 ISSN 0300-8630

Correspondence

Arne Simon (Prof. Dr. med.)
 Children's Hospital Medical Center Pediatric Oncology and Hematology
 University of Saarland
 Kirrberger Straße Building 09
 66424 Homburg
 Germany
 Arne.Simon@uks.eu

Common scenarios and current recommendations

Possible approaches in different scenarios

Precautions must be taken for the management of different scenarios depending upon the condition of the child (► **Tab. 1**) and the mother's SARS-CoV-2 infection status (► **Fig. 1**). If the father or any other member of the household has tested positive, proceed ac-

ording to the same precautions described until the mother has tested negative:

The above algorithm also takes into account the clinical condition of the mother. Women severely ill with COVID-19 usually will not be treated in the obstetrics department, but rather in other special units (including ICU). Certain considerations apply women who must be hospitalized during the first week following childbirth over an extended time period due to obstetrical indications and/or other complications.

Recommendations for neonates born to SARS-CoV-2-positive women

Generally speaking, the considerations informing the recommendations presented here should be discussed and documented in a review meeting with parents.

Scenario A: Uncomplicated history: term infant, otherwise healthy

In this scenario, mother and child are isolated together in the same room if the mother's condition allows it. Grouping together several mother-child pairs may be permitted. If possible, keep a minimum distance of 1.5 meters between the child's crib and the mother's bed. Alternatively, place a mobile partition between the two. Ideally, in order to allow eye contact, this partition should be

made of transparent material. If such measures are not possible, then the mother will need to wear mouth/nose protection all the time – not just when coming into close contact with her child. In most instances, this is not likely to be workable. The mother may either breastfeed (if possible) or else express her breast milk. There is no need for breast milk pasteurization. The mother will need to wear a medical face mask each and every time she is in close contact with her child. Also, she will need to disinfect her hands each and every time before coming into contact with her baby, as well as before expressing breast milk. In scenario A, there is no principal provision allowing for a visit by the father, who usually is considered to be category I for SARS-CoV-2 exposure and who thus will be subject to domestic quarantine. Exceptions to this rule will require advance approval of the specific process by the physicians in charge, and must be in accordance with guidance from the hospital's infection prevention and control team. Discharge of newborns is based upon common criteria. Below we propose an outpatient after-care concept for newborns who have been exposed to SARS-CoV-2.

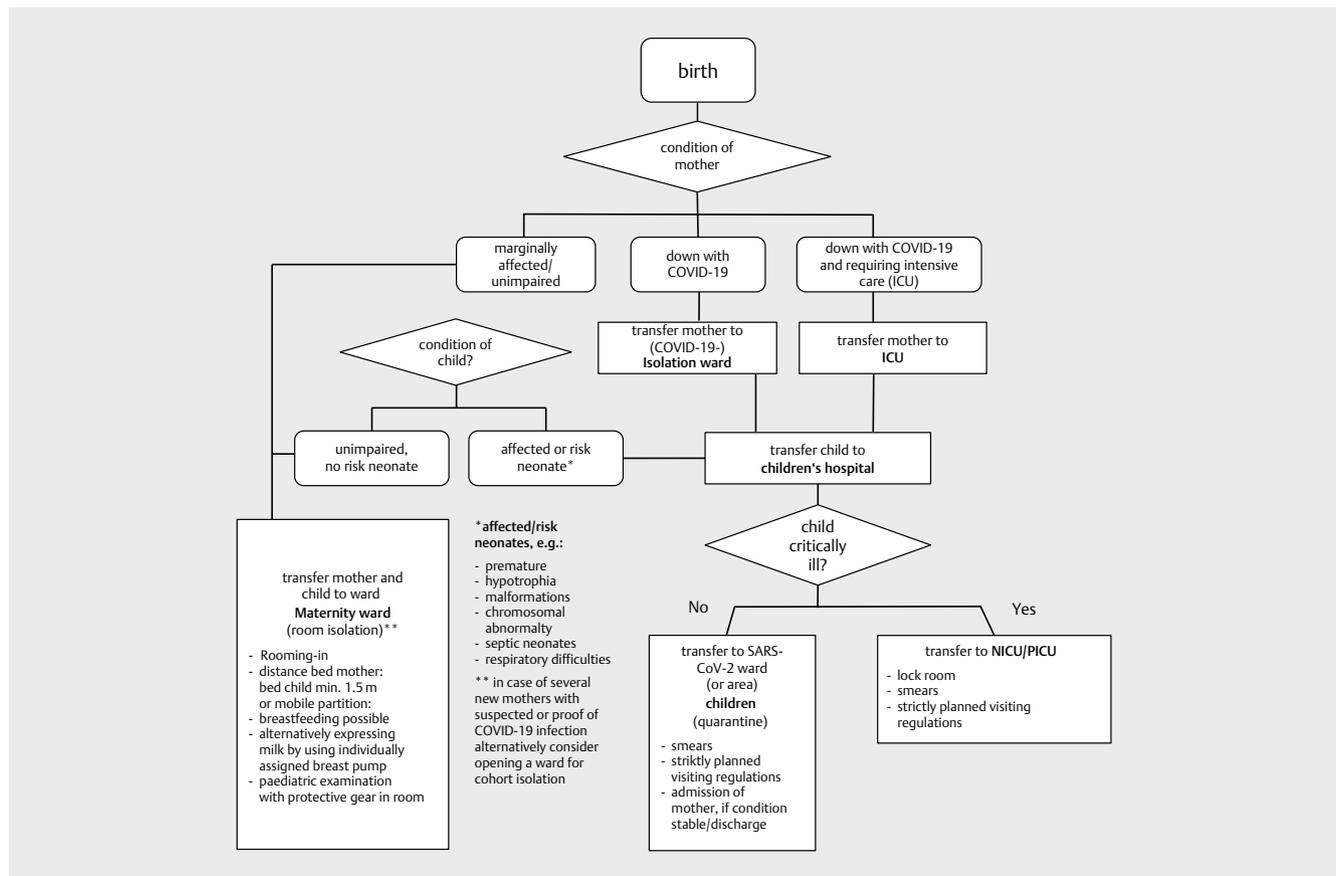
► **Tab. 1** Three important scenarios for SARS-CoV-2-positive, pregnant women and/or mothers (with or without signs of infection) that require forward planning:

Scenario	Situation of the newborn
A	Term infant, otherwise healthy, uncomplicated history immediately after birth
B	Term infant, complicated history immediately after birth, e.g. asphyxia or signs of neonatal infection
C	Premature infant or child with other risk factors, e.g. complex congenital heart disease, congenital abnormalities of the lung

Scenario B: Term infant, complicated history immediately following birth, e.g. with asphyxia and/or signs of neonatal infection and

Scenario C: Premature infant or child with other risk factors, e.g. complex congenital heart diseases or congenital abnormalities of the lung

In these scenarios, in accordance with an on-site treatment plan which contains provisions for the prevention of nosocomial trans-



► **Fig. 1** displays a potential algorithm for care depending upon the SARS-CoV-2/COVID-19 status of the mother.

mission (even to medical staff), the child's treatment takes place at the neonatal unit. This concept includes rules for visits from asymptomatic parents. Since SARS-CoV-2-positive parents officially are required to observe domestic quarantine until they are no longer contagious, neonatologists must coordinate the details of the on-site rules together with the hospital infection control team and the public health authorities in charge.

SARS-CoV-2-positive parents (and/or parents potentially still in an incubation period) only are allowed to enter the neonatal or intensive care unit under very strict safety regulations and only if they are asymptomatic or their symptoms already have resolved. If possible, access to the neonatal or ICU should be limited to a clearly defined, separate entrance that connects to an isolated area. Only one parent may visit the child during the allotted time. The mother may express breast milk for the newborn. Breast milk may be given to the child without prior pasteurization.

Background information

Significance of SARS-CoV-2 infections in pregnant women and newborns

Based upon current knowledge, infection with the new coronavirus (SARS-CoV-2; the pathogen causing the COVID-19 disease; Coronavirus Infectious Disease-19) during pregnancy is not associated with risk of premature birth or intrauterine transmission of the virus to the unborn child [1, 6, 13, 15]. To date, there has been no evidence to suggest that SARS-CoV-2-infected pregnant women (or women during the first days or weeks following childbirth) may have a higher risk of suffering from a complicated course of COVID-19 disease [21].

From a pediatrician's perspective, as well as from the perspective of hospital infection prevention and control, there are specific considerations regarding care for newborns born to SARS-CoV-2-positive women with or without COVID-19 disease. The considerations and conclusions presented here are based upon publications available to date (March 31, 2020) and may need to be updated as new findings become published. The medical society responsible for these guidelines (the German Society for Pediatric Infectious Diseases, DGPI) will continually adjust its recommendations based upon new findings. Because prospective studies are not yet available, the DGPI's current recommendations are based upon expert consensus. The goal of the recommendations is to assist and support medical treatment teams, but ultimate responsibility for any specific procedures or policies remains with the local team in charge [8].

The principal aim of the current recommendations is to protect newborns as much as possible against infection with SARS-CoV-2 (symptomatic infection = COVID-19). In addition, the goals are:

- to permit secure contact between SARS-CoV-2-positive mothers and their children by means of the aforementioned hygiene measures;
- to prevent any long-term damage to the child and/or the child's family that might be caused as a result of an early, strict separation of mother and child;
- to enable the mother to breastfeed (or express milk and then feed) her child.

Modes of transmission of SARS-CoV-2

To date, SARS-CoV-2 has not been detected in amniotic fluid, cord blood or breast milk of infected mothers [4, 10, 22]. In addition, no virus has been found in the placenta smears of infected mothers [5]. Based upon current knowledge, SARS-CoV-2 primarily is transmitted via physical contact (touching with hands, kissing, cuddling or touching of contaminated objects and surfaces), as well as by via airway droplets (an infected person without a mask who coughs within 2 meters of another person). Although rates are unknown (epidemiological data missing), transmission of SARS-CoV-2 may be possible through droplet nuclei (aerosols) that hover in the air for an extended time and get transported longer distances in mid-air [7, 9, 12, 18]. Transmission via droplets (from the mother's airways) or via physical contact (hands, objects, contact surfaces) is considered to be the most important transmission pathway from the mother, (as well as from the father and/or medical staff), to the child [14]. Based upon present assessments, no transmission of infectious SARS-CoV-2 occurs via blood [3].

Transmission of SARS-CoV-2 to newborns

As of March 31, 2020, the DGPI's survey of children hospitalized with COVID-19 in Germany reported 6 newborns, 3 of which were premature. Scientific publications have documented fewer than 40 case reports of COVID-19 in newborns born to COVID-19-positive mothers [4, 11, 16]. Among these case reports are newborns (including premature babies) hospitalized during the first weeks of life, some of whom were severely ill during in-patient supervision. Two letters to the editors (JAMA and JAMA Pediatrics), both of which report findings in newborns of IgM antibodies against SARS-CoV-2 immediately after birth¹, need to be independently verified, as no virus was able to be isolated in the babies surveilled. The case series of Zhu et al., which documents 10 cases of babies born to mothers with COVID-19 pneumonia in China, describes one of the newborns under surveillance as having died from multi-organ failure on the ninth day of life [23]. This premature baby (GA 34 + 5) had a respiratory distress syndrome after birth. No SARS-CoV-2 diagnostics were performed in this child. Zhu et al. [23] state that although none of the newborns' throat swabs were positive for SARS-CoV-2, no additional samples were tested. In this regard, it remains unclear whether the observed symptoms and courses of disease displayed by these newborns may be linked to SARS-CoV-2. In all likelihood, the severe clinical course rather was (and still is) related to hypoxaemia in the pregnant mothers, a condition caused by their COVID-19 pneumonia. Zheng et al. report on one newborn with COVID-19 pneumonia [20]. In a letter referring to the guidelines published by Favre et al. [6], Schmid et al. explicitly reject the recommendation of invasive measures that may have significant, negative, long-term consequences, (e. g., early clamping of the umbilical cord, separation of mother and newborn, no breastfeeding), as the benefits of these measures have not been proved [15]. Schmid et al. also discuss the ethical dilemma experts currently face, given the lack of a reliable evidence when making recommendations. In analyzing 32 cases to date of COVID-19 in pregnant

¹ Type IgM antibodies in the neonate's blood would speak for a prenatal infection. Currently, the sensitivity and specificity of the serological test in use by the Chinese reference laboratory cannot be verified.

women, Schwartz et al. found no evidence for intrauterine transmission of the disease. None of the pregnant women died as a result of COVID-19 [16]. In a second publication, the authors stress that simple analogies to corresponding data for infections caused by other coronaviruses (SARS-1, MERS) are not useful [17].

In substance, the recommendations of the International Federation of Gynecology and Obstetrics are nearly identical to those offered by experts from the People's Republic of China [19]. In a FAQ document for pregnant women and their families, the German Board and College of Obstetrics and Gynecology (GBCOG) – an alliance of the German Professional Association of Gynecologists (BVF) and the German Society of Gynecologists (DGGG) – has clarified its position regarding “the specific risks of COVID-19 virus infection”.

Based upon current knowledge, healthy neonates do not need to be separated from their mothers, and mothers may breastfeed their babies [8]. The Centers for Disease Control and Prevention (CDC, Atlanta, USA) stress that breastfeeding has a positive effect on infection prevention; however, they classify transmission through breast milk as unresolved issue. In response to Schmid's publication, Baud et al. recommend expressing breast milk if the mother is COVID-19 positive [1].

In order to prevent a transmission of SARS-CoV-2 to the newborn, the CDC recommends *considering* a temporary separation of COVID-19 positive mothers from their children (“... facilities should consider temporarily separating...”). However, this recommendation should be discussed with the parents. The same document provides explicit instructions for cases in which the parents do not agree to the separation of mother and child. In such cases, the CDC recommends that the newborn be kept in a separate isolation room for as long as the baby remains a “person under investigation” (PUI). All persons who have contact with this newborn should wear Personal Protective Equipment (PPE) [2].

Breastfeeding if/when the mother is infected with COVID-19 (and has tested SARS-CoV-2 positive)

To date, there has been no documented transmission of SARS-CoV-2 via breast milk to a newborn. Possible transmission via droplets or via close mother-child contact is considered to constitute the main risk of infection (see transmission) [4]. It is well-documented that breastfeeding is particularly important, both to early emotional bonding and to newborns' health (including infection prevention). From the mother's side, important measures for preventing infection of the newborn include:

- wearing a medical face mask during close contact with the child;
- disinfecting hands or hand washing with soap for 20 seconds before any contact with a newborn, as well as before expressing breast milk;
- rigorously adhering to instructions for the handling of breast pumps and assigning a personal breast pump to the SARS-CoV-2-positive mother;
- having another person feed the newborn with expressed breast milk. There is no indication that breast milk needs to be pasteurized;
- In the event of rooming-in (isolation of the mother and her child in the same room), keep a minimum distance of 1.5

meters between the mother's bed and the child's crib, or else install a mobile partition;

- Touching the child with disinfected or thoroughly washed hands may be permitted, but no kissing or close cuddling.

With respect to necessary hygiene measures, medical staff must take pains to closely instruct, train and supervise mothers.

Preventive measures (hospital hygiene and infection control)

Treatment teams working in direct contact with SARS-CoV-2-positive pregnant women and their newborns must establish infection control measures. These measures include provisions for meticulous basic hygiene, while also significantly extending this hygiene in certain aspects (e. g. respirator FFP2, medical face-shields or safety goggles, etc.).

Among in-patients in both pediatric and obstetric wards, there are some who are considered to be particularly vulnerable and who must be protected against nosocomial transmission of SARS-CoV-2. Moreover, medical staff also must be protected against SARS-CoV-2 transmission.

Premature and newborn babies who need in-patient treatment at a neonatal/pediatric ICU are considered particularly vulnerable. In obstetrics departments too, the availability of hospital beds may become limited, depending upon the course of the pandemic. In this context, it will not be possible to offer in-patient surveillance to term and healthy neonates purely on the basis of SARS-CoV-2 exposure, and it does not seem reasonable to do so based upon what we know today.

Tests to detect SARS-CoV-2

Testing a full-term neonate by means of a validated PCR-based test for SARS-CoV-2 (throat smear) is only mandatory if the neonate develops signs of infection.

Premature or newborn babies with other risk factors, (e. g., complex congenital heart diseases, congenital abnormalities of the lung, etc.), who need in-patient treatment due to an inherent indication should be tested for SARS-CoV-2 according to local guidelines.

For SARS-CoV-2-positive premature and newborn babies in intensive care, additional testing for SARS-CoV-2 may be considered if samples already have been taken for other medical reasons, (e. g., tracheal secretion samples in intubated children, or else sterile specimens such as cerebral spinal fluid, pleural effusion, ascites, etc.). To date, there only have been a few reports showing the detection of SARS-CoV-2 in these types of samples.

After-care concept for SARS-CoV-2-exposed premature infants and neonates

Neonatologists should establish a local after-care concept for SARS-CoV-2-exposed premature infants and neonates in close cooperation with pediatricians in private office and local public health authorities. This concept must be realistic, achievable and affordable given existing resources. Before discharging the child, parents should be given detailed information regarding warning signs of infection in their newborn. They must know who they can turn to for information and who to call in the event of clinical anomalies (safety net). Usual clinical criteria apply with respect to decisions about re-hospitalization and blood sampling.

Acknowledgement

The authors would like to thank all the colleagues who actively participated in the internal discussions regarding this publication and Natalie Diffloth for the final editing of the manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

- [1] Baud D, Giannoni E, Pomar L et al. COVID-19 in pregnant women – Authors' reply. *Lancet Infect Dis* 2020; online first
- [2] Centers for Disease Control and Prevention (CDC) Interim Considerations for Infection Prevention and Control of Coronavirus Disease 2019 (COVID-19) in Inpatient Obstetric Healthcare Settings. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-health-care-guidance.html> 2020; February 18, 2020
- [3] Chang L, Yan Y, Wang L. Coronavirus Disease 2019: Coronaviruses and Blood Safety. *Transfusion medicine reviews* 2020; online first
- [4] Chen H, Guo J, Wang C et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet* 2020; 395: 809–815
- [5] Chen S, Huang B, Luo D et al. Pregnant women with new coronavirus infection: a clinical characteristics and placental pathological analysis of three cases. *Zhonghua Bing Li Xue Za Zhi* 2020; 49: E005
- [6] Favre G, Pomar L, Qi X et al. Guidelines for pregnant women with suspected SARS-CoV-2 infection. *Lancet Infect Dis* 2020; online first
- [7] Feng S, Shen C, Xia N et al. Rational use of face masks in the COVID-19 pandemic. *The Lancet Respiratory medicine* 2020; online first March 20 2020
- [8] German Board and College of Obstetrics and Gynecology (GBCOG), Berufsverband der Frauenärzte e.V. (BVF), Deutschen Gesellschaft für Gynäkologie und Geburtshilfe e.V. (DGGG). Zu spezifischen Risiken der COVID-19-Virusinfektion – FAQ für schwangere Frauen und ihre Familien. <https://www.bvfde/aktuelles/fachliche-meldungen/artikel/news/faq-fuer-schwangere-frauen-und-ihre-familien-zu-spezifischen-risiken-der-covid-19-virusinfektion/> 2020
- [9] Kampf G, Todt D, Pfaender S et al. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect* 2020; 104: 246–251
- [10] Li Y, Zhao R, Zheng S et al. Lack of Vertical Transmission of Severe Acute Respiratory Syndrome Coronavirus 2, China. *Emerg Infect Dis* 2020; 26: doi:10.3201/eid2606.200287
- [11] Liu D, Li L, Wu X et al. Pregnancy and Perinatal Outcomes of Women With Coronavirus Disease (COVID-19) Pneumonia: A Preliminary Analysis. *AJR Am J Roentgenol* 2020; online first 1–6
- [12] Ong SWX, Tan YK, Chia PY et al. Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient. *JAMA* 2020; online first
- [13] Rasmussen SA, Smulian JC, Lednický JA et al. Coronavirus Disease 2019 (COVID-19) and Pregnancy: What obstetricians need to know. *Am J Obstet Gynecol* 2020; online first
- [14] RCOG Coronavirus (COVID-19) infection and pregnancy. In: 2020
- [15] Schmid MB, Fontijn J, Ochsenbein-Kolble N et al. COVID-19 in pregnant women. *Lancet Infect Dis* 2020; DOI: 10.1016/s1473-3099(20)30175-4
- [16] Schwartz DA. An Analysis of 38 Pregnant Women with COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes. *Arch Pathol Lab Med* 2020; online first
- [17] Schwartz DA, Graham AL. Potential Maternal and Infant Outcomes from (Wuhan) Coronavirus 2019-nCoV Infecting Pregnant Women: Lessons from SARS, MERS, and Other Human Coronavirus Infections. *Viruses* 2020; 12: E194. doi:10.3390/v12020194.
- [18] van Doremalen N, Bushmaker T, Morris DH et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *N Engl J Med* 2020; online first
- [19] Wang L, Shi Y, Xiao T et al. Chinese expert consensus on the perinatal and neonatal management for the prevention and control of the 2019 novel coronavirus infection (First edition) *Annals of translational medicine* 2020; 8: 47
- [20] Zeng L, Tao X, Yuan W et al. China's first neonatal coronavirus pneumonia Article in Chinese Chin. *J Pediatr* 2020; 2020: 58
- [21] Zhang JP, Wang YH, Chen LN et al. Clinical analysis of pregnancy in second and third trimesters complicated severe acute respiratory syndrome. *Zhonghua Fu Chan Ke Za Zhi* 2003; 38: 516–520
- [22] Zhang L, Jiang Y, Wei M et al. Analysis of the pregnancy outcomes in pregnant women with COVID-19 in Hubei Province. *Zhonghua Fu Chan Ke Za Zhi* 2020; 55: E009
- [23] Zhu H, Wang L, Fang C et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. *Translational pediatrics* 2020; 9: 51–60