






Guidelines

Management of infants born to mothers with suspected or confirmed SARS-CoV-2 infection in the delivery room: A tentative proposal 2020

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Abstract

Coronavirus disease 2019 (COVID-19) has spread worldwide within a short period, and there is still no sign of an end to the pandemic. Management of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-infected pregnant women at the time of delivery presents a unique challenge. To fulfill the goal of providing adequate management of such women and their infants, and to decrease the risk of exposure of the healthcare providers, tentative guidelines are needed until more evidence is collected. Practical preventative action is required that takes into account the following infection routes: (i) aerosol transmission from mothers to healthcare providers, (ii) horizontal transmission to healthcare providers from infants infected by their mothers, and (iii) horizontal transmission from mothers to infants. To develop standard operating procedures, briefings/training simulations should be carried out, taking into account the latest information. Briefings should be carefully conducted to clarify the role and procedures. Healthcare providers should wear personal protective equipment. If it is physically possible, neonatal resuscitation should be performed in a separate area next to the delivery room. If a separate area is not available, the infant warmer should be placed at least 2 m away from the delivery table, or partitioned off in the same room. A minimum number of skilled personnel should participate in resuscitation using the latest neonatal resuscitation algorithms.

Key words a tentative proposal 2020, neonatal resuscitation, SARS-CoV-2.

The outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first identified in December 2019 in Wuhan, China.¹ The COVID-19 pandemic has been ongoing as there is currently no effective treatment for or prevention against it. The outbreak of COVID-19 has had a substantial impact on intensive care and general practice. Data on the rates of transmission and clinical course of COVID-19 in special populations such as pregnant women and neonates, are scarce in Japan, which led to difficulty in preparing for

the domestic pandemic. Management of SARS-CoV-2-infected pregnant women at the time of delivery presents a unique challenge. To fulfill the goal of providing adequate management of SARS-CoV-2-infected pregnant women and their infants and to decrease the risk of exposure of the healthcare providers, provisional guidelines are needed until evidence is collected. On April 2 2020, the Neonatal Resuscitation Committee of the Japan Society of Perinatal Neonatal Medicine published (in Japanese) a tentative proposal for delivery room management of infants born to mothers with suspected or confirmed SARS-CoV-2 infection.² It is presented here based on new knowledge and public comments.

Basic perspectives on the preventive strategy

Infection control in the delivery room is extremely important because appropriate protection of healthcare providers and newborns during labor and after delivery by mothers with COVID-19 is essential. The primary and most important mode

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of transmission for COVID-19 is person-to-person transmission through close contact, via respiratory droplets or through direct contact. The respiratory droplets can enter the mouths or noses of people who are nearby. A person could also contract COVID-19 by touching a surface contaminated by the virus.³ On the other hand, vertical transmission of SARS-CoV-2 remains to be evaluated. According to the US Centers for Disease Control and Prevention report, among 610 infants with positive SARS-CoV-2 test results, perinatal infection was infrequent (2.6%) and occurred primarily among infants whose mothers had SARS-CoV-2 infection identified within 1 week of delivery.⁴ If vertical transmission of SARS-CoV-2 through body fluid contact is possible, we also must consider possible transmission not only from the mother to the infant (horizontal transmission), but also from the infant to the healthcare workers caring for the neonate.

Specific proposal

Action planning and simulation

Creating an action plan manual for neonatal resuscitation in the delivery room is essential. The best possible strategy for the prevention of infection should be developed based on the currently available medical resources in each medical setting. The feasibility of implementing the strategy should be determined after conducting realistic simulation training, including transportation training, at the delivery site. In addition to simulation training during the acute/pandemic phase, ideal simulation training for neonatal resuscitation should also be conducted on a regular basis (i.e., at least once a year), in the wards that perform neonatal resuscitation.⁵ The training should confirm to the latest neonatal cardiopulmonary resuscitation (NCP) algorithm.⁶

Prenatal consultations and briefing for delivery

After establishing safe, mutual communication, the obstetric and neonatal team should discuss in advance optimal management, including both the timing and mode of delivery and resuscitation procedures. Moreover, neonatal staff should receive a detailed briefing. If a prenatal visit is required, and the infant exhibits a serious condition and/or is extremely pre-term, information on gestational age-based outcomes presented by each department can be discussed by telephone or video conference, to minimize exposure to healthcare providers.

Selection of members

The most important team in the delivery/operating room is the neonatal resuscitation team. The team should comprise experienced resuscitators equipped with the skills needed for infection control. The number of resuscitation staff members should be minimized, based on the expectation of the risk of resuscitation. If enough human resources are available, backup or transport staff should wait outside the delivery room and/or

resuscitation area. The backup team should provide enough coverage if help with the infant is needed.

Equipment

Since it is difficult to predict which infants will require intensive resuscitation and the infant's crying might generate aerosols, the neonatal team should wear personal protection equipment (PPE) such as N95 masks, goggles/face shields, gowns, and gloves, in addition to taking standard universal precaution.⁷ The proper wearing and removal PPE is critical, and all staff should practice in advance. Ordinary prescription vision-correction glasses cannot be substituted for goggles in this situation.

Settings

Based on the simulation test result, the most suitable delivery room and operating room (if possible, negative pressure rooms) should be available to manage mothers with suspected or confirmed COVID-19. Ideally, neonatal resuscitation should be performed in a separate area next to the delivery room or operating room. Alternatively, the infant warmer can be placed in the same room at least 2 m from the delivery table or behind a partition screen.⁸

Aerosol inducing procedures

There is no report on how far droplets can travel during crying. Speculative aerosol-generating procedures (AGPs) conducted during neonatal resuscitation, include suctioning, mask or laryngeal mask and bag ventilation, continuous positive airway pressure (CPAP) administration, tracheal intubation, chest compression, and drug administration (adrenaline and surfactant) via a tracheal tube. However, most of the information regarding the aerosol-generating potential of various procedures, and their roles in the transmission of respiratory diseases is speculative. Most data regarding risks to healthcare workers have been extrapolated from epidemiologic data collected during infection outbreaks. On the other hand, procedures involved in the initial steps of resuscitation, such as drying, positioning, and stimulation, except for suctioning, auscultation, attaching electrocardiogram monitoring electrodes or a pulse oximeter probe, and wrapping the infant in a polyethylene plastic bag or wrap to prevent hypothermia, are thought to be low-risk AGPs. Needle insertion in peripheral or umbilical vein or intraosseous needle insertion is also considered similarly low-risk AGPs.

Important points during resuscitation

Suction

Neonatal cardiopulmonary resuscitation guidelines do not recommend routine suctioning clear or meconium-stained amniotic fluid in either vigorous or non-vigorous infants, and no evidence has been presented to suggest that this

recommendation should be changed for infants born to mothers with COVID-19. On the other hand, if healthcare providers suspect that an infant's airway is obstructed with secretion, healthcare providers should not hesitate to perform suctioning.

Ventilation

There is a little evidence that CPAP/positive pressure ventilation (PPV) devices with face masks minimize aerosol generation in neonates. Face mask leakage has been reported to be 35% (14–67% interquartile range) when using the T-Piece device.⁹ The maximum dispersion distances of exhaled air leaked through the face and mask interface in the transverse plane during bag-mask ventilation were 10–20 mm in neonates¹⁰ and 40–99 mm in adults.¹¹ CPAP and PPV procedures in neonates appear to be safe compared to those in adults because the leaked exhaled gas from neonates is dispersed over a narrow horizontal area in a room with adequate ventilation and caregivers are wearing proper protection. However, bag and mask ventilation should be performed by an expert provider to reduce mask leakage. Despite limited evidence on its efficacy, it is desirable to use the smallest viral filter between the mask and bag. Healthcare providers should recognize that the use of filters may increase dead space and expiratory resistance and result in a decrease in tidal volume. If manual ventilation is required, the use of a supraglottic device, such as a laryngeal mask, is considered an alternative to a face mask because of its potential to reduce aerosol generation. The devices are easy to insert and can achieve sufficient seal pressure.¹²

Chest compressions

Chest compressions are usually performed in conjunction with mask and bag ventilation and are not a stand-alone technique for the infants in the delivery room. Because the combination of mask and bag ventilation and chest compression would increase the risk of mask leakage, early tracheal intubation should be considered, and the most skilled provider should be responsible for mask and bag ventilation.

Endotracheal intubation

The risk of viral transmission association with tracheal intubation and ventilation has not been evaluated in neonates. In a systematic review of adult based studies, tracheal intubation was associated with the highest risk of increased exposure to SARS-CoV-2 in healthcare providers,^{13,14} due to the short distance between the operator's face and the patient's mouth. During intubation, aerosols are released vertically and travel toward the operator's face, as opposed to horizontal diffusion during ventilation with a mask and bag. Endotracheal intubation should be performed by skilled staff who wear full PPE and use an appropriately sized tracheal tube to minimize air leakage. If healthcare staff have the resources to perform video laryngoscopy, this procedure may be considered instead of conventional laryngoscopy.

Open suction

Providers should keep in mind that open suctioning via an endotracheal tube during secretion cleaning or the administration of both a surfactant and epinephrine could generate aerosols.

Cord management

The risk of vertical transmission via fetal/neonatal blood is unknown. NCPR guidelines do not recommend delayed cord clamping in the term infants because of the risk of hyperbilirubinemia. On the other hand, one-time umbilical cord milking after cord cutting in preterm infants,¹⁵ which is recommended in Japan, should be performed on the resuscitation bed after immediately separation from the mother. Although the risk of viral transmission from the mother to the healthcare staff is relatively low, each institution should discuss the indication for umbilical cord milking in advance.

Early skin-to-skin contact

The World Health Organization recommends continuing immediate skin-to-skin contact and early and exclusive breastfeeding during the COVID-19 outbreak, as the benefits substantially outweigh the potential risks of transmission and illness associated with the disease.¹⁶ However, the separation of infants from COVID-19-positive mothers might be the safest approach at this moment in Japan, to prevent horizontal infection, although limited data are available.

Transport to the neonatal intensive unit (NICU) or neonatal nursery

After stabilization, if adequate human resources are available, the infants should be transported through a designated passage in a closed incubator by additional staff members waiting outside the resuscitation room. If possible, infants should remain isolated in an incubator in a negative pressure room until a negative polymerase chain reaction result is obtained. If a negative pressure room is not available, infants should be isolated in closed incubators placed from at least 2 m from the other incubators, or a partition panel or screen should be used. Healthcare staff should choose either the NICU or newborn nursery to care for infants based on their gestational age and its condition.

Conclusion

This clinical practice guideline has been developed by the NCPR Committee and is based on current international scientific literature. As of September 30, 2020, we have little experience with this situation in Japan. Our understanding of SARS-CoV-2 is incomplete, and new insights are being gathered day by day. In due time, the new guideline will be revised based on new evidence.

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Disclosure

The authors declare no conflicts of interest.

Author contributions

S.H., T.I., T.S., and I.K. conceived and designed the initial guidelines. S.I., M.T., and Y.K. advised the initial conception of these guidelines. S.H. wrote the manuscript. All authors read and approved the final manuscript.

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Appendix 1

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