

Skin-to-Skin Contact (Kangaroo Care) During the COVID-19 Pandemic

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The purpose of this article is to convey clinical information about COVID-19 in neonates and provide evidence-based recommendations for use of skin-to-skin contact during the COVID-19 pandemic.

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ABSTRACT

Early recommendations to separate mothers from their newborns during the coronavirus disease 2019 (COVID-19) pandemic have created a detrimental separation practice. This article presents a review of the latest information regarding the (1) 3 modes of transmission of the virus to the neonate; (2) incidence, clinical signs, and severity of COVID-19 in the neonate; (3) factors to be considered to balance risk and benefits of separation and skin-to-skin contact (SSC) when conducting shared decision making; and (4) compendium of published SSC guidelines; and concludes with recommendations for safe practice of SSC to prevent and/or restrict COVID-19 infection in neonates.

Keywords: care guidelines; COVID-19; kangaroo care; recommendations; skin-to-skin contact; transmission; SSC

In late 2019, the novel coronavirus (SARS-CoV-2) disease, identified in China, became a pandemic,¹ extensively impacting residents of the United States beginning as early as February 2020. By February 22, 2021, there had been 28,181,128 confirmed cases of coronavirus disease 2019 (COVID-19) in the United States and 500,159 deaths.² Throughout the pandemic, concerns have been raised about pregnant women spreading the virus to the fetus in utero³ or to the newborn through the close contact associated with breastfeeding and skin-to-skin contact (SSC).⁴ Guidelines for SSC when caring for mothers and newborns who have been exposed to or have tested positive for COVID-19 have been globally developed by reliable professional organizations such as the Italian Pediatric Society,⁵ the Federation

of Societies of Gynecology, Obstetrics & Autonomous Communities of Spain,⁶ and the Royal College of Paediatrics and Child Health⁷ of the United Kingdom, and those have mostly remained unchanged. Notable changes in the United States were made by the end of May 2020 by the American Academy of Pediatrics⁸ and the Centers for Disease Control and Prevention (CDC),^{9,10} which changed their recommendations from separating mothers and infants throughout the COVID-19 pandemic, in early 2020, to using shared decision making between health personnel and parents about separation or nonseparation of parents from the newborn, even in COVID-19-positive women. While recommendations for adults have received wide attention in the United States and recommendations for breastfeeding have been

addressed in U.S. public health, medical, and nursing literature, guidelines for SSC with newborns during the current pandemic are not well known and often not even considered. This has led to the widespread belief that separating mothers and newborns¹¹ and avoiding SSC¹² are necessary for safe care of newborns. But separation and especially the lack of SSC, the natural milieu for the newborn to promote physiologic stability and adequate immunity to prevent and fight infections,¹³ are fraught with disadvantages that place the newborn at risk for unnecessary short- and long-term health problems. Skin-to-skin contact provides many advantages to the newborn that recommend its practice starting at birth for healthy newborns. First, serial Cochrane meta-analyses of more than 2,518 preterm and term newborns have shown that SSC started in the first week of life reduces neonatal mortality by 51 percent¹⁴ even in sick, low birth weight neonates,¹⁵ and reduces the number of severe illnesses as well as increases maternal satisfaction with her newborn's care.¹⁶ More recently, SSC started after birth stabilization of the newborn reduces mortality by 40 percent.⁴ Thus, SSC is known to save newborn lives.¹⁷ Second, SSC has also been found to significantly reduce preterm infant risk of nosocomial,^{14,18} lower respiratory tract,¹⁶ and other infections in 24–28 week very preterm infants.¹⁹ Third, just 20 minutes of SSC can reduce neonatal serum cortisol levels by 70 percent,²⁰ and other studies have clearly shown that SSC significantly reduces neonatal stress,^{21,22} which ultimately improves immune functioning and physiologic regulation²¹—even up to 10 years of age—after having SSC in the first 3 weeks of life.²³ Fourth, the accelerated brain maturation that 3 hours or more of SSC produces in preterm infants²⁴ and enhanced autonomic nervous system control in preterm infants who received SSC²³ can help with brain control of physiologic responses to infections,^{23,25} even in newborns with critical congenital heart disease.²⁵ Because our understanding of the COVID-19 virus is changing, it is important to assess emerging evidence regularly. The purpose of this article is to provide a point-in-time (after 1 year of COVID-19 experience) assessment related to benefits and risks of SSC during the pandemic that includes what is now known about modes of disease transmission, incidence and severity of the disease, risks associated with maternal–newborn separation and lack of SSC, documentation of the evidence supporting and opposing SSC during the pandemic, and concluding with evidence-based recommendations for safe SSC practice with hospitalized term and preterm newborns.

Generic to understanding what providing SSC during the COVID-19 pandemic entails, a clear definition of mothers and newborns being diagnosed with COVID-19 is needed (see Resources sidebar). Mothers are considered to be diagnosed with SARS-CoV-2 infection only if the reverse-transcription polymerase chain reaction (RT-PCR) from a nasopharyngeal/oropharyngeal swab is positive.²⁶ Newborns are considered to be diagnosed with SARS-CoV-2 infection if the RT-PCR from the neonate's nasopharyngeal and/or

oropharyngeal swab or blood from neonate or the umbilical cord, or amniotic fluid or tissue sample from the fetal side of the placenta, is positive for COVID-19.²⁶ Even before a diagnosis of COVID-19 has been made in either mother or newborn, and certainly after a diagnosis exists in either one, parents and health professionals must consider the benefits of SSC and risks caused by the lack of SSC to come to a decision as to whether or not to permit SSC in maternal–newborn dyads. Benefits and risks of lack of SSC for both mother and infant, both physiologic and psychologic, exist. The challenge for caregivers is weighing the uncertain but potentially grave risks of exposure of the infant through transmission of the virus²⁷ against risks associated with mother–infant separation and lack of SSC in the first days and weeks after birth.

RISK OF TRANSMISSION OF COVID-19 FROM MOTHER TO FETUS OR INFANT

Three routes of transmission of the SARS-CoV-2 virus to the infant exist: in utero, in the delivery room, and postdelivery during SSC and caregiving. In utero vertical transmission of the virus refers to transmission of the virus from the mother who is COVID-19 positive directly to the fetus in utero. The possibility of vertical transmission remains controversial, with studies producing conflicting findings. A systematic search of the literature identified 31 meta-analyses related to COVID-19 and its impact on the neonate. A total of 13 meta-analyses with publication dates or submission dates from February 2020 through October 2020 were reviewed, evaluating the possibility of vertical transmission. Seven of the 13 meta-analyses included preterm infants and the other 6 did not exclude preterm infants, but also did not identify how many preterm infants were included in the studies. All were meta-analyses of reports of case studies or systematic reviews of reports of case studies. These studies reported results on 100–1,185 COVID-19-positive pregnant women and their neonates. Seven studies identified no signs of vertical transmission or an extremely low possibility of vertical transmission.^{3,28–33} Although a small number of neonates were found to be positive for COVID-19, in each case the most probable route of the exposure was considered to be the postdelivery environment. In 2 studies, no signs of the COVID-19 virus were found in the amniotic fluid, cord blood, neonatal throat swab, or breast milk,²⁹ suggesting vertical transmission risk was minimal or nonexistent.³³ Five studies concluded that while vertical transmissions had not yet been established, the possibility could not be excluded.^{34–38} Raschetti and colleagues,³⁹ in a meta-analysis of 176 reports of neonatal COVID-19 infections, reported that while 70 percent of the infections could definitely be attributed to postpartum environmental exposure, 30 percent appeared to result from vertical or in utero exposure. Two trends in the articles are noteworthy: the limited quality of available data prevents accurate attribution of route of transmission, and new evidence strengthens the probability of vertical transmission during pregnancy.⁴⁰

In delivery room transmission, the newborns of COVID-19 mothers may be exposed to virus-containing maternal fluids and blood in the birth canal, or maternal stool of infected women during delivery.⁴¹ However, no definitive reports of viral transmission to the neonate during delivery exist.⁴² No difference in infant risk of exposure to the virus exists between vaginal and cesarean delivery.⁴³ Intrapartum exposure risk is considered low, so mode of delivery can be based on the clinical status of mother and fetus.⁴² Protection of infant and staff includes special precautions and rooms for cesarean delivery of a COVID-19-positive or suspected mother.⁴⁴

Postdelivery, the COVID-19 virus is primarily transmitted as an airborne virus through respiratory droplets and aerosols, and secondarily through touching surfaces contaminated by the airborne virus.¹² COVID-19 is highly contagious to children and newborns.⁵ Therefore, postpartum acquisition is the most common mode of infection in neonates and of most concern to caregivers. Person-to-person transmission is now known to occur via fomites, via droplets through close proximity aerosolization,⁴⁵ and through close contact within a 6-foot perimeter. The possibility of virus transmission through breast milk exists too. Initial studies did not find active SARS-CoV-2 virus in breast milk,^{29,46} but more recent studies have.^{47,48} Detectable virus (mRNA of SARS-CoV-2) generally appears by 10 days postbirth⁴⁷ in breast milk, and lactating women are advised to take a COVID-19 vaccine while lactating because “during lactation, it is unlikely that the vaccine lipid would enter the blood stream and reach breast tissue.”⁴⁹ In 2020, breastfeeding was allowed in women prior to vaccination, and in women who received vaccinations for COVID-19 in 2021,⁴⁹ but no guideline nor mention of SSC prior to vaccination or after COVID-19 vaccination was found in our literature review through January 2021. Because no data yet exist that COVID-19 has been detected on neonatal skin or maternal breast tissue that would be in joint contact during SSC, we believe that SSC can continue in vaccinated women too.

The possibility of vertical and intrapartum transmission must be considered in conjunction with the knowledge that the greatest risk of virus transmission between the dyad is in the postpartum environment through close physical proximity. Because newborns can become infected with COVID-19, COVID-19 incidence and COVID-19 severity in newborns are risk factors that need to be considered to provide safe care to the newborn.

INCIDENCE AND SEVERITY OF COVID-19 RISKS FOR INFANTS

The incidence of COVID-19 in neonates is considered to be low based on the limited data available. As of April 2, 2020, infants less than 1 year of age accounted for 15 percent of pediatric (birth through age 17) COVID-19 cases in the United States, and there had been 3 deaths among infants with laboratory-confirmed COVID-19 infections reported to

the CDC. By May 2020, 398 of 149,082 (0.003 percent) COVID-19 adult and pediatric cases were U.S. infants less than 1 year of age,⁵⁰ a percentage lower than the 15 percent reported earlier but one that was more comparable to the 0.004 percent (379 infants younger than 1 year of age cases out of 80,000 total infants up to 2 years of age cases) reported in China,⁵¹ and less than the 0.05 percent (58 of 1,141 infants up to 2 years of age) reported in June 2020 in India.⁵² The proportion of U.S. infant infections rose to 7.4 percent by December 2020.⁵³ Thus, global incidence is relatively comparable to U.S. incidence even though the proportion of infected neonates is relatively low. Risk to the neonate is still significant because COVID-19 is highly contagious and new variations of the virus due to mutations are even more so.

Despite the number of articles describing the impact of COVID-19, the severity of the disease and any sequelae in neonates and infants are not completely known. The most common symptoms of neonatal COVID-19 infections are respiratory and include fever, cough, mottling, dyspnea, hypoxia and desaturations, lethargy, respiratory distress, respiratory failure, tachycardia, and pneumonia.⁵² Reports of the severity of disease in neonates varies. Dhir and associates⁵² meta-analysis included 58 neonates positive for COVID-19. Of those infected, 50 percent were asymptomatic. Fifty percent were symptomatic, with respiratory symptoms being the primary manifestation in 70 percent of them. Twenty-three of the infants (approximately 40 percent) required intensive care for severe COVID-19. In contrast to Dhir’s study, in a large meta-analysis of a pediatric population including infants and neonates, over 90 percent of neonates with COVID-19 presented with asymptomatic-to-moderate disease.⁵ Comparably, Pettiroso and colleagues,³⁷ reviewing 60 existing studies, identified 1,287 COVID-19-positive pregnant women and 19 neonates with confirmed COVID-19 for an incidence of 0.014. Of these 19 neonates, 15 were asymptomatic and none required intensive care. However, De Rose and associates found the proportion of neonates and infants under 1 year of age with severe and critical disease was 10.6 percent compared to 7.3, 4.2, 4.1, and 3 percent, respectively, in children in the 1–5, 6–10, 11–15, and older than 15-age groups, suggesting that despite few neonates being positive for COVID-19 and the small percentage of those who develop severe disease, this population may be more vulnerable to severe disease than other pediatric populations.⁵

Data are still emerging on the incidence and severity of COVID-19 disease in neonates and all authors have identified the relatively poor quality of some of the data as a barrier to interpretation. Neonates have demonstrated low rates of infection and primarily asymptomatic or moderate disease presentation. However, severe disease and a small number of neonatal deaths have been documented. With the emergence of new and more contagious COVID-19 mutations, all precautions to prevent transmission must be taken. The risks associated with maternal/newborn separation and lack

of SSC must be considered too and be recognized as possibly varying depending on community resources (i.e., low-income vs high-income community).

RISKS OF MATERNAL/NEONATAL SEPARATION

During the COVID-19 pandemic, hospitals, of necessity, have strictly limited the access of families to hospitalized patients. While this has caused stress among some patients and families, it has been an important strategy for reducing the potential for increased virus exposure in the hospital. However, the impact of separating mothers and infants during the neonatal period is severe, making them a distinctly different patient population requiring specific strategies for infection control. For example, early separation disrupts breastfeeding and decreases the duration of breastfeeding. Infants who are not breastfed have 3.6 times the risk of pneumonia and hospitalization than infants who are breastfed exclusively for at least 4 months. Separation also disrupts SSC's role in colonization of the infant microbiome, which is needed for good health.¹⁷ Colonization occurs through skin transport of healthy maternal skin microbes to the infant's skin; this is a dermal mechanism by which SSC reduces infections in newborns.⁵⁴ The benefits of SSC during the neonatal period, such as increased oxygenation of the brain, improved sleep, reduction of infections due to improved immune system functioning, enhanced weight gain, enhanced breastfeeding outcomes, stronger attachment, and better physiology,⁵⁵ are well documented. The negative impact of unavailable SSC during COVID-19 has been recognized as well^{17,56} and is due in part to maternal-infant separation, which threatens newborn physiology and can contribute to neonatal death.^{17,57} The impact of maternal/infant separation, and loss of SSC affects both the mother and the infant physiologically and psychologically, and potentially leaves the infant more vulnerable to infection.

Risks for the Mother Due to Lack of Skin-to-Skin Contact

Several studies and reviews have documented the negative impact of the absence of SSC on the mother, including:

1. Maternal heart rate, salivary cortisol level, and stress scores are increased in the absence of SSC.¹⁷
2. Breast milk production is reduced with absence of SSC, resulting in minimal amounts of breast milk available to the infant, which in turn can distress mothers as well as reduce the immune protection that breast milk provides.⁵⁸
3. Protective effects of SSC on postpartum depression are minimized. With absence of SSC, mothers of preterm infants are known to have a 3–5 times greater incidence of postpartum depression than other mothers, but SSC has been found to have a protective effect on German mothers as measured by reduced incidence of postpartum depression.⁵⁹
4. Disruption of bonding and the attachment process occur in the absence of SSC.⁵⁶

5. Decreased confidence in maternal ability to care for the infant is found with the absence of SSC.⁵⁶

Risks for the Neonate Due to Lack of Skin-to-Skin Contact

These risks include:

1. Interruption of SSC disrupts newborn physiology. Newborns who are separated from their mothers and do not have SSC have higher heart rates, respiratory rates, and more anxiety than newborns who have SSC, in several international studies.¹⁶ Newborns who lack SSC also have less stable temperature, oxygen saturation, and glucose levels and have higher death rates than neonates who have SSC.^{15,56}
2. Newborns who do not have SSC have less sleep time and more crying, gain weight more slowly, and have longer hospital stays than newborns who receive SSC.⁵⁶
3. Lack of SSC immediately after birth makes the infant more vulnerable to severe respiratory infections, including COVID-19, in the first year of life.¹⁷
4. Lack of SSC can disrupt the provision of maternal milk to the newborn, disrupting the innate and specific immune protection that breastfeeding provides. Antibodies specific to maternal antigen exposure begin to appear in milk within 7 days, protecting the newborn from infection. Furthermore, human milk contains multiple oligosaccharides and innate immune factors that mitigate the impact of viral infections in the neonate.
5. Lack of SSC creates stress and anxiety in newborns due to a lack of SSC-induced central oxytocin release in the newborn's brain.⁵⁷ Stress and anxiety increase risk of infection.

Because of the benefits and risks of SSC to mothers and newborns and because health workers desire clinical guidelines to provide safe care, international and national professional organizations have developed and published policies and guidelines based on available knowledge throughout the first year of the COVID-19 pandemic in the United States. Guidelines specifically related to neonatal care were reviewed, and those which were relevant to the practice of SSC are discussed here.

EXISTING POLICIES AND GUIDELINES FOR SKIN-TO-SKIN CONTACT

The authors searched the (1) Medline, PubMed, Scopus, and CINAHL databases; (2) websites of professional health journals such as *Neonatology Today*, *Journal of Perinatology*, *Pediatrics*, *Pediatric Research*, *The Lancet*, and *New England Journal of Medicine*; (3) websites of professional organizations related to health and neonatal care (i.e., CDC, World Health Organization, Pan American Health Organization, UNICEF Children's Fund, American Academy of Pediatrics, American Nurses Association, Academy of Breastfeeding Medicine, National Perinatal Association of the United States and of the United Kingdom, United States Institute for Kangaroo Care, International Network of Kangaroo Mother Care, Union of European Neonatal and Perinatal Societies,

German Society of Perinatology and Neonatology, Royal College of Paediatrics in United Kingdom, Canadian Society of Pediatrics, Italian Society of Neonatology and Pediatrics, Association of Women's Health, Obstetric and Neonatal Nurses, the National Association of Neonatal Nurses [United States], The Academy of Neonatal Nursing [United States], the Association of Certified Nurse Midwives [United States]; (4) websites of newborn-related care such as the Healthy Newborn Network, NICU 99, Hot Topics in NICU, and so forth; and (5) hospital websites to find active hospital policies. Resources that were known to the authors and that were listed as references or additional reading resources (including Internet resources) or related documents were shared among at least 2 of the authors. Each author then wrote a summary of the resource's information/recommendation and discussed the summaries to reach consensus in interpretation of what was written and agreement that the recommendation is appropriate at this time. Clinicians will need to keep reading the evidence to be up-to-date on changes. One hundred thirty-nine published manuscripts about COVID-19 in neonates, including systematic reviews of the effects of COVID-19 and care in relation to antepartum, intrapartum, and postpartum care of women and their newborns, were reviewed. Seventy-three guidelines have been issued for the management of infants during the COVID-19 pandemic—for term and preterm, well and sick infants. Most (65) have addressed encouraging, supporting, allowing, initiating, and/or maintaining breastfeeding, and of these 65 pro-breastfeeding recommendations, 33 did not mention SSC at all. Among the 73 guidelines, prohibition of SSC was recommended in ten, physical separation of mother and newborn was recommended in 5 (by the American Academy of Pediatrics before April 2020 and by the CDC), and clear statements allowing SSC with COVID-19 positive and mothers who were “persons under investigation” (PUI) were in 29 guidelines—mostly international. Recommendations for SSC only appeared in guidelines that also addressed breastfeeding. Some guidelines addressed both separation and prohibition of SSC in the same document, so the total number across the recommendation categories exceeds the total number of guidelines reviewed. One guideline related that SSC might be allowed, and 2 other guidelines were about birth only, not addressing anything about care of the newborn more than 2 minutes postbirth. The Burnet Institute⁶ reported guidelines from 7 countries or international organizations that were counted as separate guidelines. In addition, the Cochrane group conducted a multinational analysis of clinical practice guidelines from 19 countries with more than 10,000 cases of COVID-19 in each country by April 10, 2020. Each was asked to respond to 14 questions about care of pregnant and newborn patients during the pandemic, based on collected guidelines reviewed by 2 obstetric and neonatal specialists in each country. Question #12 was “Is skin-to-skin contact between mother and baby contraindicated?” and #13 was “Is it recommended that otherwise well babies be separated from their mothers after birth?” Consensus

was considered to be reached if 80 percent of the countries responded similarly to the questions (i.e., where 80 percent of countries with a guideline that addressed the question made the same recommendation). Consensus was only reached in responses to 3 issues: (1) all pregnant women should wear a mask, (2) vaginal delivery should be allowed for all women, and (3) delayed cord clamping should be allowed. There was no consensus about allowing SSC to occur, nor about separating a healthy newborn from the mother. Fourteen of the 19 countries did not have any recommendations whatsoever about SSC per se, and recommendations from the remaining 5 countries were contradictory as for whom, where, and when SSC should be allowed.⁶⁰ The Cochrane data were not included in our review, but the contradictory SSC recommendations and omission of SSC altogether we found were similar to the Cochrane results. A compendium of published SSC guidelines for the COVID-19 pandemic is presented in Table 1.

Recommendations about SSC during the COVID-19 pandemic have changed considerably from early to late 2020. In March 2020, the Chinese⁸⁴ and CDC guidelines⁶² recommended immediate separation of mothers and newborns regardless of COVID-19 status. Thus, SSC and kangaroo mother care were not allowed due to separation; separation was recommended to protect neonates from infection in all U.S. mothers, including asymptomatic mothers. In contrast, early in the pandemic, the World Health Organization,⁸¹ the United Kingdom's Royal College of Obstetricians and Gynaecologists,⁸⁵ and the International Federation of Gynecology and Obstetrics⁷⁷ had recommended nonseparation of mother and newborn with the mother wearing a mask and cleansing her hands and body where the infant would be in contact. By April 2020, guidelines became sensitive to COVID-19 infection status in mothers, specifying COVID-19 positive or PUI (suspected of having been exposed to COVID-19 but being asymptomatic).²⁷ The guidelines about separating COVID-19-positive mothers from their newborns were still conflicting, and many U.S. hospitals “routinely separated all (COVID-19 positive, PUI, and noninfected) mothers from their newborns.”²⁷ More recently, as more data on neonatal risk became available, more organizations began to modify their guidelines to allow for SSC. Awareness of international and national guidelines related to the practice of SSC during the COVID-19 pandemic led us to develop specific recommendations to guide practice of SSC during the pandemic in the United States. Readers should be aware that the recommendations should be chosen based on resources in the community, but with the goal of including all recommendations in practice.

RECOMMENDATIONS FOR COVID-19 SAFE PRACTICES AROUND SKIN-TO-SKIN CONTACT

A list of recommendations for testing for COVID-19 in newborns receiving SSC, and for practice of SSC in hospitalized newborns and mothers without COVID-19,

TABLE 1 ■ Guidelines for Skin-to-Skin Contact between Mother and Neonate During the COVID-19 Pandemic

Source	Date	Content	KC/SSC: Yes, No, Maybe
Altendahl et al. ⁶¹ (United States)	Dec. 2020	These are American Academy of Pediatrics (AAP) guidelines appearing in the December 2020 issue of <i>NeoReviews</i> about transmission and safe care during the COVID-19 era.	Yes, prioritize (allow) SSC
Ashokka et al. ¹² (United States)	4-10-20	“Yet, babies born to COVID-19 mothers can acquire the infection post-delivery. Practices such as delayed cord clamping and skin-to-skin bonding between mothers and newborns are NOT recommended” (p.18).	No SSC, separate infants from mothers
Bartick ²⁷	3-31-20	“The initial days and hours after birth are vital for establishing breastfeeding, and part of that process involves mother and infant being in constant close physical proximity, especially skin-to-skin contact” (pp.2).	No recommendation to do SSC
Bolar ⁵⁶	April 2020	“Blanket policies separating premature infants from their parents come at their own health cost and should be used as a last resort”(p.1). An NICU mother wrote: “Premature babies require kangaroo care or skin-to-skin contact on a mother’s chest. It is a treatment no amount of money or resources can buy. Taking that away from parents and babies is akin to depriving patients of important medicine that can help them survive and thrive” (p. 1–2).	Yes SSC
Burnet Institute ⁶ 1. Federation of Societies of Gynecology, Obstetrics & Autonomous Communities of Spain 2. Royal College of Paediatrics and Child Health (United Kingdom) 3. IAWG (International) 4. United Nations Population Fund (International) 5. WHO (International) 6. WHO (International) 7. Ministry of Health and Indigenous Medical Services (Sri Lanka)	May 2020	1. To reduce the risk of vertical transmission, avoidance of skin-to-skin contact is recommended. 2. The benefits of extended parental contact, including SSC, are well documented. Asymptomatic mothers, while awaiting their COVID-19 results, should be allowed to provide SSC. 3. The benefits of early and uninterrupted SSC and prolonged kangaroo mother care...outweighs the potential risk of SARS-Cov-2 transmission. 4. All mothers and babies, regardless of their COVID-19, status need support to remain together to practice SSC or kangaroo mother care. 5. Mothers who are practicing SSC or kangaroo mother care should practice respiratory hygiene, use of a medical mask, perform hand hygiene before and after contact with the child, and routinely clean and disinfect the surfaces the mother has been in contact with. 6. Mothers and infants should be enabled to remain together and practice SSC or kangaroo mother care whether they or their infants have suspected, probable, or confirmed COVID-19 virus infection. 7. Wear a mask/cover the nose and mouth during a feeding and continue breastfeeding and kangaroo mother care for newborns.	1. No SSC (Spain) 2. Yes, do SSC for asymptomatic mothers (United Kingdom) 3. Yes, do SSC/ kangaroo mother care (International) 4. Yes, do SSC/ kangaroo mother care (International) 5. Yes, do SSC/ kangaroo mother care (International) 6. Yes, do SSC/ kangaroo mother care (International) 7. Yes, do SSC/ kangaroo mother care (Sri Lanka)
CDC ⁶² (United States)	3-31-20	“Consider temporarily separating the mother from her infant” until mother is no longer considered contagious.	No SSC when mother is contagious; separate dyad
CDC ⁹ (United States)	5-15-20	“Determination of whether to keep a mother with known or suspected COVID-19 and the infant together or separated after birth should be on a case-by-case basis, using shared decision-making between mother and clinical team” (p.1). “The many benefits of mother/infant skin-to-skin contact are well understood for mother-infant bonding, increased likelihood of breastfeeding, stabilization of glucose levels, and maintaining infant body temperature; and though transmission of SARS-CoV-2 after birth via contact with infectious respiratory secretions is a concern, the risk of transmission and the clinical severity of SARS-CoV-2 infection in infants are not clear. The determination of whether to keep a mother with known or suspected COVID-19 and the infant together or separated after birth should be on a case-by-case basis, using shared decision-making between mother and clinical team. If separation is not undertaken, other measures to reduce the risk of transmission from mother to infant could include the following, again, utilizing shared decision-making: using physical barriers (e.g., a curtain between mother and newborn) and keeping the newborn ≥6 feet away from the mother.	Maybe. Encourages SSC but says nonseparation should be shared decision-making in each case encourages separation and keeping mother and infant >6 ft from each other

TABLE 1 ■ Guidelines for Skin-to-Skin Contact between Mother and Neonate During the COVID-19 Pandemic (Continued)

Source	Date	Content	KC/SSC: Yes, No, Maybe
Healthy Newborn Network ⁶³	4-24-20	Asks “Can a mother/parent give skin-to-skin care/kangaroo care to a newborn during the COVID-19 pandemic?” And the answer was: <ul style="list-style-type: none"> • Close contact and early, exclusive breastfeeding helps a baby to thrive. • Kangaroo care is a method of care of preterm and low birth weight infants. • Community health care workers and hospital staff must encourage women to always take care of their babies safely, with good respiratory hygiene. • They must be encouraged to wash their hands before and after touching their baby and keep all surfaces clean and sanitized. • If mothers have a cough, in addition to hand hygiene they must be encouraged to use a mask. 	Implies yes, but no clear answer to the question they posed
Societa Italiana di Neonatologia ⁶⁴	7-6-20	Recommendations for keeping mother and newborn together and doing SSC in the delivery room—even with COVID-19-positive mother and COVID-19-negative baby	Yes, do SSC in delivery room unless mother/infant too sick Do SSC after delivery
Marim et al. ⁴²	5-13-20	“Early cord clamping and avoiding skin-to-skin contact following delivery are still suggested. (p.206).“Infants under investigation and symptomatic neonates should be cared for in an isolated room.” (p.207).	No SSC
Pereira et al. ⁶⁵ (Spain)	8-12-20	Case series of 22 COVID-19-positive mothers who breastfed and only 13 (59.1%) did SSC in delivery room for the following reasons: preterm infant, very sick mother, or no desire to breastfeed and do SSC. Relates that WHO and UNICEF support mother-baby contact. Relates that Italian Society of Neonatology, Spanish Society of Neonatology, and Union of European Neonatal and Perinatal Societies all recommend doing SSC at birth unless infant or mother is too sick to do so. Allowing SSC after delivery may help mother-infant bonding.	Yes, do SSC in the delivery room Do SSC after delivery
Puopolo et al., AAP ⁸	4-2-20	All children under 1 year of age at risk for severe COVID-19 disease. COVID-19 has been found in infants 2 days of age. Some evidence exists to suggest mother-to-fetus transmission. No evidence of impact and necessity of maternal/newborn separation. Neonate of COVID-19-positive or PUI mom is PUI. Virus remains in air for 3 hours. March 30, 2020 AAP recommendations were: No direct physical contact; no close (<6 ft) contact for long time; use gown, gloves, mask, face shields, or goggles for infant born to COVID mom; N95 mask for infant intubated, CPAP, tracheal suctioning, nasal cannula >2L/minute/kg, positive pressure ventilation, bag-mask ventilation because these treatments generate aerosols. Discuss with mom before birth. Put healthy newborns in rooms not associated with infants from COVID mothers. Wash newborn ASAP after birth to remove virus on skin. Keep all newborns 6 feet apart or in air-temp controlled incubators. Wash maternal breast before providing expressed breast milk only. If mother requests skin-to-skin contact with her infant, including direct breastfeeding, she should comply with strict preventive precautions, including use of mask, meticulous breast and hand hygiene ... consider formal documentation of maternal decisions regarding recommendations for separation.	Yes, do SSC Separation from mother throughout hospitalization recommended but can provide skin-to-skin contact, including direct breastfeeding Document maternal choice to do so.
Qiao for National Health Commission of China ⁶⁶	3-7-20	Chinese recommendations for care of parturient and newborn	No SSC Separate mother and newborn
Royal College of Midwives et al. ⁶⁷ (United Kingdom)	5-31-20	Separate mother and newborn at delivery and during hospitalization. Breastfeeding is not allowed unless mother is not COVID positive or being tested for COVID-19.	No SSC, separate dyad
Royal College of Paediatrics and Child Health ⁷ (United Kingdom)	6-24-20	“Isolate all infants but asymptomatic infants born to mothers awaiting COVID test results or moms who are COVID negative. Care and nursing is in incubator. “The benefits of extended parental contact, including skin-to-skin care and active involvement in their baby’s care, are well documented” (p.10), but no clear statement of doing or not doing SSC is made. “Asymptomatic mothers should be allowed to attend her baby in the nursery, whilst awaiting their SARS-CoV-2 screening test, and to provide skin-to-skin care” (p.11).	Yes, do SSC with asymptomatic mothers
Salvatore et al. ⁶⁸ (United States)	10-1-20	All neonates born between March 22 and May 17 were allowed to do SSC and breastfeed in the delivery room, but mothers had to wear masks and wash hands and breasts well. Infant kept in incubator in mother’s room. By day 7 of life no neonates had symptoms of COVID-19.	Yes, do SSC

TABLE 1 ■ Guidelines for Skin-to-Skin Contact between Mother and Neonate During the COVID-19 Pandemic (Continued)

Source	Date	Content	KC/SSC: Yes, No, Maybe
San Joaquin General Hospital ⁶⁹ (United States)	April 2020	For PUI or COVID-19-positive mother, “no SSC preferred, but if mother wants SSC at delivery her hands and chest will be washed with soapy water prior to SSC” (1) and if mother chooses strict isolation approach (as recommended by CDC, AAP, and ACOG), there is no SSC until mother has no symptoms and tests COVID negative 2 times 24 hours apart.	Yes, do SSC at delivery if mother chooses and is PUI or asymptomatic.
Sociedad Espanola de Neonatologia ⁷⁰ (Spain)	5-27-20	Section 4 states that there is no reason to delay initiation of SSC if mother is well. On page 8 it states, “if the mother is in good condition SSC can proceed.”	Yes, do SSC
Calvo et al. ⁷¹ Spanish Paediatric Association working group (Spain)	7-6-20	Recommendations for keeping mother and newborn together and doing SSC in the delivery room, even with COVID-19-positive mother and COVID-19-negative baby. Allowing mother-baby contact following delivery may facilitate mother-baby bonding.	Yes, do SSC unless mother or infant is too sick Do SSC in delivery room and following delivery
Society of Obstetricians and Gynecologists of Canada ^{72,73}	3-13-20 5-14-20 7-27-20 12-1-20	3-13-20: Intrapartally, “routine practices such as SSC (with mother wearing mask and having washed her hands) should continue” (p.5). Recommends breastfeeding in first hour of life with SSC (p.6). “If maternal choice is to bottle feed, SSC is still encouraged Skin-to-skin contact benefits both mother and newborn in postpartum” so do not separate (p.6). 12-1-20 “Routine practices such as skin-to-skin contact (with use of maternal mask and performance of hand-hygiene) and delayed cord clamping should continue” (p.8). “If maternal choice is to bottle feed, skin-to-skin contact is still encouraged. Patients should be educated about skin-to-skin contact benefits to both mother and newborn: (p.1) Decreased maternal anxiety in the immediate postpartum, (p.2) decreased depression for the first year postpartum, (p.3) increased uterine tone with decreased bleeding, (p.4) improved weight gain and sleep quality in the newborn. Given the significant mental health burden of both the pandemic and a diagnosis of COVID-19, prioritizing close contact for the mother-baby unit is of particular importance” (p.9).	Yes. do SSC with suspected or confirmed infection in mother
Stanojevic ⁷⁴	6-25-20	Application of COVID-19 guidelines to healthy term newborns	Maybe; recommendations are controversial, but natural processes should be preserved. Allow mother to decide if she wants to do SSC after thorough bathing of infant (p.443)
Stuebe for American Academy of Breastfeeding Medicine ¹⁷	Sept 2020	“Interruption of skin-to-skin care disrupts newborn physiology.... Isolation is a significance stressor ” because (1) in term infants placed skin-to-skin versus alone in a crib, separation increased stress activity by 176% ⁷⁵ ; (2) in mothers SSC reduces heart rate, cortisol levels, and stress ⁷⁶ ; (3) SSC is important for colonization of infant microbiome” (p.351).	Yes, do SSC
International Federation of OB/ GYNs ⁷⁷	3-20-2020	Allow SSC but have mother wear mask and cleanse hands and body where infant will be in contact.	Yes, do SSC
Tscherning et al. ⁷⁸ (France)	6-26-20	French article about importance of bonding and skin contact to infant. All mothers should do SSC unless too sick, but all must wear masks, wash body and hands, and even directly breastfeed.	Yes, do SSC
Union of European Neonatal and Perinatal Societies ⁷⁹	3-16-20	Recommendations for keeping mother and newborn together and doing SSC in the delivery room—even with COVID-19-positive mother and COVID-19-negative baby. Allowing mother-baby contact following delivery may facilitate mother-baby bonding.	Yes, do SSC starting in the delivery room even with COVID-19 positive mothers and continuing after delivery.
UNICEF ⁸⁰	March 2020	Recommends SSC for all mothers, even those who are COVID-19 positive	Yes, do SSC

TABLE 1 ■ Guidelines for Skin-to-Skin Contact between Mother and Neonate During the COVID-19 Pandemic (Continued)

Source	Date	Content	KC/SSC: Yes, No, Maybe
WHO ⁸¹ Q&A	3-19-20	Can I touch and hold my newborn if I have COVID-19? “Yes, close contact and early, exclusive breastfeeding helps a baby to thrive. You should be supported to hold your newborn skin-to-skin, breastfeed safely, with good respiratory hygiene, and share a room with your baby. You should wash your hands before and after touching your baby and keep all surfaces clean.” “Following delivery, should a baby still be immediately placed skin-to-skin and breastfed if mother is confirmed or suspected to have COVID-19? And the answer is yes. Immediate and continued skin-to-skin care, including kangaroo mother care, improves the temperature control of newborns and is associated with improved survival among newborn babies. Placing the newborn close to the mother also enables early initiation of breastfeeding which also reduces mortality. The numerous benefits of skin-to-skin contact and breastfeeding substantially outweigh the potential risks of transmission and illness associated with COVID-19.”	YES, do SSC
WHO ⁴	4-15-20	“Infants and mothers with suspected or confirmed COVID-19 should be enabled to remain together and practice skin-to-skin contact, kangaroo care, and to remain together and to practice rooming-in throughout day and night” (p.1).	Yes, do SSC
WHO ⁸²	5-7-20	In the breastfeeding guideline’s questions and answers section there is the following question about SSC: “Following delivery, should a baby still be immediately placed skin-to-skin and breastfed if the mother is confirmed or suspected to have COVID-19? Yes, immediate and continued skin-to-skin care, including kangaroo mother care, improves the temperature control of newborns and is associated with improved survival among newborn babies. Placing the newborn close to the mother also enables early initiation of breastfeeding which also reduces mortality. The numerous benefits of skin-to-skin contact and breastfeeding substantially outweigh the potential risks of transmission and illness associated with COVID-19.”	Yes, do SSC
WHO	6-23-20	“Early and uninterrupted skin-to-skin contact, rooming-in, and kangaroo mother care also significantly improve neonatal survival and reduce morbidity and are recommended by WHO” (p.1).	Yes, do SSC
WHO	9-2-20	“Close contact and early, exclusive breastfeeding helps a baby to thrive. You should be supported to breastfeed safely, with good respiratory hygiene. Hold your newborn skin-to-skin. You should wash your hands before and after touching your baby and keep all surfaces clean. Mothers with symptoms of COVID-19 are advised to wear a medical mask during any contact with the baby” (p.1).	Yes, do SSC
Wykoff ⁸³	5-21-20	“There is no reason why the infant should not have the benefits of delayed cord clamping and skin-to-skin contact after delivery” (p.1). Mothers and partners who are COVID-19 PUIs or who have confirmed COVID-19 should not enter the NICU.	Yes, allow SSC even during delayed cord clamping

Abbreviations: ACOG = American College of Obstetricians and Gynecologists; IAWG = Inter-Agency Working Group on Reproductive Health in Crises; PUI = person under investigation; SSC = skin-to-skin contact; UNICEF = United Nations Children’s Fund; WHO = World Health Organization.

suspected of a possible diagnosis of COVID-19, confirmed to be diagnosed with COVID-19 follow.

Recommendations for Hospitalized Preterm and Term Newborns Experiencing Skin-to-Skin Contact

Neonatal testing is recommended in the first 12–24 hours after birth, while earlier testing is likely to reflect maternal infection.⁴² A single swab that samples first the oropharynx and then the nasopharynx should be used for sample collecting, and rectal swab testing may be considered if available in centers, especially for sick infants requiring prolonged hospital care.⁸ Two consecutive negative tests 24 hours apart are considered as clearance of COVID-19.⁴²

Recommendations for Safe Practice of Skin-to-Skin Care During COVID-19 with COVID-19-Negative, Nonexposed Mother/Father

1. Nurse takes temperature of parents.
2. Nurse asks screening questions (any positive answer or any one sign of infection, parents are not allowed in NICU).
3. Parents wash their cellphones or put them in clean plastic bags.
4. Mother and father maintain social distancing with staff.
5. Mother and father and newborn do not congregate in any communal room.
6. Nurse has personal protective equipment (PPE) for parents.

7. Nurse conducts rapid COVID-19 testing if possible to monitor mother/father/visitor status.
8. Nurse allows SSC to occur in the delivery room per standard practice.
9. Mother and father limit visitors to infant to 1 person at a time. Father is the preferred person.

Recommendations for Skin-to-Skin Care with a Confirmed or Suspected COVID-19-Positive Mother or Father

1. Before SSC, mother/father wash their chest or breast areas with soap and water for 20 seconds because about 15 seconds of a soapy wash is needed to break the shell of the virus, rendering the virus inactive,⁸⁶ and to remove the virus from maternal/paternal skin.⁸
2. Mother/father wash their hands and forearms for 20 seconds with soap and water for the same reason given in recommendation #1. Hand washing must be done before donning and after removing masks.⁸⁶
3. Mother/father wear a U.S. National Institute for Occupational Safety and Health (NIOSH)-certified mask at all times when doing SSC because these masks effectively cease the spread of COVID-19 by filtering 95 percent of the COVID-19 aerosol particulates⁸⁷ that are 60–140 nm in size according to a Chinese study.⁸⁸ Mask wearing by the holder of the newborn is more important than ever during SSC because “the wearing of masks serves as a key strategy towards airborne disease prevention that cannot be easily substituted,” according to Chinese guidelines.⁸⁹
4. Mother/father wear a face shield if they are COVID-19 positive or suspected of being diagnosed with COVID-19 or of having been exposed to COVID-19.⁸ Face shields protect the eyes from receiving aerosolized virus and limit transmitting the COVID-19 virus by aerosolization, which occurs when a person breathes, talks, or flushes a toilet with infected excrement without closing the toilet’s lid, according to a multinational study group.⁹⁰ Anytime the mother or father is closer to any other person than 6 feet away, a face shield is recommended.
5. Mother/father wear clean gloves when handling the infant for placement in and removal from SSC and throughout all time spent in SSC. Risk of transmission of the COVID-19 infection is higher when people are indoors and when in close contact (now defined by the CDC as someone who is within 6 feet of an infected individual for a total of 15 minutes or more over a 24-hour period),⁹¹ but more than 15 minutes of SSC is recommended so infant brain maturation can occur. This happens when the infant experiences a full cycle of sleep that transpires over 60 minutes.²⁴
6. Nurse teaches mother/father to talk and/or sing softly and slowly when providing SSC because a 2019 study of healthy people found that some people exhale more

droplets when they talk or sing with their speaking volumes raised than when speaking or singing with a low voice.⁹²

7. Nurse and others should try not to surprise the mother/father at any time because a forceful exhalation response to surprise disseminates respiratory droplets that can remain in the air for hours.⁹²
8. Nurse should bathe the infant as soon as possible after birth before SSC begins to remove virus potentially present on the mother’s/father’s skin.
9. Nurse admits the infant to a single patient room, preferably with negative pressure if the infant is expected to receive aerosol-generating procedures that make the infant cry.
10. Mother/father wash their hands after touching objects touched by other people (door knob, incubator, counters, diaper/supply), and before and after SSC.
11. Nurse does not limit the frequency or the duration of SSC unless the mother/father or infant is medically or psychologically unable to provide SSC.
12. Mother and father limit contact with other people, and mother/father stay at least 6 feet apart from others, especially when holding their baby in SSC.

Recommendations for Rooming-In

The American Academy of Pediatrics, as of July 2020, recommends that infants can room-in with their mothers who are suspected of having or have tested positive for COVID-19, with the following precautions:

1. Mothers should maintain a reasonable distance from their infant when possible. This can be done by keeping the infant in an incubator. When providing care, the mother should wear a mask and use proper hand sanitation.
2. Health care workers should wear gowns, gloves, masks, and eye protection when caring for these infants. If care is being provided in a room with a COVID-19-positive mother, staff can choose to wear N95 masks if available.
3. Mothers who are acutely ill may temporarily separate from their infants or have a healthy caregiver care for the infant in the mother’s room.
4. Noninfected family members or significant others must wear a mask and use hand hygiene when caring for the infant.
5. It has been documented that despite separating infants from their mothers, some infants have developed COVID-19. Early separation will increase the infant’s contact with health care providers who may be infected with the virus. Therefore, separating infants from their parents may not provide them with significant protection, according to a Chinese report.⁹³

SHARED DECISION-MAKING PROCESS

Once the benefits, risks, and recommendations are discussed, health providers and parents should discuss parental

intent for SSC with their newborn. The decision of how to accommodate SSC during the COVID-19 pandemic should be made on a case-by-case basis and jointly by the parents and care provider. Factors to be considered include:

1. Hospital resources, including isolation rooms and sufficient protective equipment for families.
2. Education of the parents about the risks and benefits of parent/infant engagement and the protocols necessary for safe contact with the infant.
3. Health status of both parent and infant.
4. Assurance that SSC can be implemented safely in ways that are comfortable for the parents and protect the neonate from exposure to the virus.
5. Monitoring protocols to ensure that appropriate precautions are taken.

CONCLUSION

In conclusion, at the beginning of the pandemic there were many uncertainties and little evidence to guide recommendations. Perspectives have evolved over time due to experience and increasing knowledge of the virus. The degree of caution has been curtailed in regard to visitation, breastfeeding, and SSC as evidence shows that risk of transmission in the NICU setting is low.⁶⁸ The limited data at this point, January 16, 2021, do not indicate that SSC alone puts infants at high risk for severe illness from COVID-19 infection and do not identify the total number of neonatal cases of COVID-19 nor the full impact of COVID 19 on neonates. Further, no available data exist regarding molecular testing on neonates who were not separated from their asymptomatic COVID-19-positive mothers. Most infected neonates have mild clinical manifestations and the prognosis is good with recovery occurring within 1–2 weeks after onset.⁹⁴ However, vigilant observation for respiratory distress and pneumonia (which is on the rise³³) is needed for the early identification of those neonates who will have severe and sometimes fatal cases of COVID-19.⁹⁵

RESOURCES

- The ACOG and the Society for Maternal Fetal Medicine (SMFM) have developed an algorithm to aid practitioners in assessing and managing pregnant women with suspected or confirmed COVID-19.
- The Academy of Neonatal Nursing has established a COVID Update on its website <https://www.academyonline.org/page/Covid19>
- The American Nurses Association has a COVID-19 Resource Center (ana@resourcecenter.com).
- Find the Elsevier COVID-19 Resource Center the Elsevier Connect website <https://www.elsevier.com/connect/coronavirus-information-center>

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