


Article 8

COVID-19 Preparedness in a Neonatal Unit at a Tertiary Hospital in Johannesburg, South Africa

Robin T. Sagers , Tanusha D. Ramdin , Rossella M. Bandini  and Daynia E. Ballot 

Department of Paediatrics and Child Health, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg, South Africa

**Correspondence to: Robin T. Sagers, Division of Neonatology, Department of Paediatrics and Child Health, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Charlotte Maxeke Johannesburg Academic Hospital, Parktown, Johannesburg, South Africa. Telephone number: +27 11 488 3278, robin.sagers@wits.ac.za*

ABSTRACT

Background: The novel coronavirus disease 2019 (COVID-19) pandemic has spread to South Africa and poses an infection risk in pregnant women and their newborns, as well as health-care workers and other patients.

Objective: To discuss the implementation of international and local recommendations, and any additional actions undertaken at our Neonatal Unit in order to prepare for COVID-19.

Discussion: Standard precautions in order to prepare a facility and its personnel to safely care for COVID-19 patients as outlined by the World Health Organization procedures have been implemented. Further actions undertaken in our Neonatal Unit included the creation of standard operating procedures, increased communication between neonatal and obstetric teams, limiting staff exposure, the creation of disposable resuscitation boxes to attend deliveries, reallocation of a triage area in the high care ward to an isolation area for sick newborns of suspected or confirmed maternal COVID-19 cases, staff training on personal protective equipment procedures and initiation of an online resources portal for neonatal staff.

Conclusion: A rational approach to suspected cases and infection control in-line with local and international guidelines as well as ongoing education should diminish anxiety amongst health-care professionals and provide the best possible care to patients. South Africa is a low-to-middle income country, and the lack of resources available means we cannot increase our capacity, staffing numbers or available equipment. Yet, we must be as prepared, adaptable and efficient as possible to maximize the resources and equipment we have available to us.

Key words: COVID-19 preparedness, Neonatal Unit, South Africa

INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) has spread rapidly across the world, with the first case being confirmed in South Africa on 5 March 2020. As of 8 April 2020, there were 1845 confirmed cases in South Africa, with 18 deaths.⁽¹⁾ With the increase in the number of COVID-19 cases, one can expect the rise to be reflected in the pregnant population subgroup.⁽²⁾ This poses an infection risk to the foetus, newborn, health-care workers and other patients in obstetric and neonatal units.

Pregnant women have a relatively immunocompromised status and physiological adaptive changes during pregnancy that could cause them to be more susceptible to COVID-19 infection than the general population.^(3,4) Pregnant women are more likely to have complications following viral pneumonia and even progress to severe illness.^(3,5)

There are some concerns about the intrauterine vertical transmission potential of SARS-CoV-2 and its effect on newborns.^(6,7) Currently, there is no reliable evidence that SARS-CoV-2 can be transmitted transplacentally from mother to newborn.^(4,8–10) In mothers with COVID-19, analysis of amniotic fluid, placental tissue, umbilical cord blood and breast milk has shown no trace of SARS-CoV-2. However, this is based on a number of small studies from China in women who developed mild COVID-19 pneumonia in late pregnancy, in which the majority were delivered via caesarean section.^(2,6,7,11) It is unknown whether vaginal birth or uterine contraction increases the risk of mother to child transmission.^(4,7,11) Similarly, the effects of the virus on the foetus in the first and second trimester or in patients with moderate-to-severe infection is unknown.^(2,4,7) In one study in Wuhan, one newborn tested positive in

36 h of life – there is uncertainty if the newborn acquired the disease postnatally or perinatally.(12)

Infection with COVID-19 can range from asymptomatic to severe respiratory distress in newborns and children, though the evidence is still very limited.(8,13) Fortunately, children without underlying comorbidities seem to have milder disease.(8) Respiratory distress, vomiting feeds, cough and fever were present in newborns diagnosed with COVID-19.(8) Perinatal COVID-19 infection may have adverse effects on newborns, causing problems such as foetal distress and premature labour.(6) Close cooperation between obstetric and neonatal departments is encouraged in order to deliver well-prepared and safe resuscitation for newborns in the delivery room.(6)

The Neonatal Unit at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) consists of a 14-bed combined Paediatric and Neonatal Intensive Care Unit (PNICU), a 35-bed high-care ward (which offers Continuous positive airways pressure (CPAP) but not mechanical ventilation), a 40-bed low-care ward (including Kangaroo Mother Care) and a labour ward nursery with 10 beds. The hospital has approximately 9000 births annually and is the referral centre for a number of other regional hospitals, midwife-obstetric units and local clinics. CMJAH has also been identified as one of the hospitals designated for managing COVID-19 cases.(14) As such it is important that all areas in the labour ward, caesarean-section theatre and neonatal unit are adequately prepared. This article discusses the implementation of international and local recommendations as well as any additional actions the Neonatal Unit has undertaken in preparedness for COVID-19.

RECOMMENDATIONS AND ACTIONS

General

There are several procedures that should be put in place in order to prepare a facility and its personnel to safely care for COVID-19 patients.(15–17) Standard precautions include signage at the entrance, strict hand hygiene, daily cleaning and disinfection of the environment, and the provision of gloves, masks and goggles for all medical staff.(18) The WHO provides a guideline about the rational use of personal protective equipment (PPE) for all personnel in a clinical environment.(19) Furthermore, screening of mothers and testing of those with high likelihood of infection is imperative in limiting the spread within the institution.

Since COVID-19 is highly contagious and outbreaks can occur even within units, enhanced health education and effective prevention control measures must be taken, and health-care workers need to stay vigilant against COVID-19 infection themselves.(6,11) Staff in all areas have been trained about the use of PPE and correct donning and doffing techniques. Video resources have been created by other departments within the hospital to enhance this.

Delivery room

In order to minimize staff exposure, and therefore infection, only essential staff should be present in the delivery room/theatre.(20,21) From the neonatal team, only a senior registrar or consultant should attend deliveries of suspected or confirmed COVID-19 mothers in order to limit the number of staff involved.(21,22) Routinely, there used to be a “bottom up” approach where an intern would attend first and call for a registrar or consultant’s help if required. Now the opposite approach should be taken.

To avoid taking a complete resuscitation trolley into a potentially contaminated environment, disposable resuscitation boxes were created using standard A4 paper boxes. These contain PPE as well as a full array of airway equipment, bag–valve–mask resuscitator and commonly used resuscitation drugs. A checklist of necessary equipment was created, and the boxes were sealed ready for use once all the items were included. The birth attendant should open the box outside the delivery room/theatre, don the PPE, carry the box into the room, perform the resuscitation as required, then discard of all items that cannot be safely sterilized. If additional equipment is required, then a staff member outside the room can pass items in.(21)

As attendance at birth may involve resuscitation of the newborn, the appropriate PPE should include an N95 mask (or equivalent), gowns, gloves, eye protection and an apron.(8,17,19–21,23) No transmission events have been reported in doctors and midwives who were wearing a full set of PPE during delivery procedures of COVID-19 mothers.(11)

Neonatal unit

Actions undertaken in the CMJAH Neonatal Unit were the creation of “standard operating procedures for COVID-19 in the neonatal setting”;(22) increased communication between the neonatal and obstetric teams via messaging services; the reallocation of a triage area in the high-care ward to an isolation area for sick newborns of suspected or confirmed maternal COVID-19 cases; the training of staff on the correct donning and doffing of PPE; and the creation of an online resource portal for neonatal consultants and fellows.

The Standard Operating Procedures specify how to deal with examination, treatment and transfer of newborns born to women with suspected or confirmed COVID-19. These newborns should be carefully examined by neonatologists and monitored closely, and careful attention should be paid to prevent infection in these newborns.(4,6–8,10,13) Newborns should be transferred in a closed transport incubator,(20,22,24) and all procedures and investigations should be carried out in a single room with a minimal number of staff present.(6,22,25) Potentially aerosol generating procedures (such as taking nasal swabs, intubating

or suctioning) should be accompanied by full PPE and the necessary precautions.(17,19)

Mother and newborn (including testing, separation and feeding)

Testing all admitted newborns for COVID-19 is not necessary.(25) According to the South African Department of Health guidelines, well newborns should not be tested for COVID-19, irrespective of maternal COVID-19 result.(24) If the newborn is well and the mother can care for the newborn, the newborn should room-in with the mother.(26) In the event that the mother is unable to care for the well newborn, the newborn should await discharge in a closed incubator and be discharged as soon as possible to a suitable caregiver.(21,23,24)

Newborns of COVID-19 positive mothers who require admission to the neonatal unit should be tested immediately and considered infectious for at least 14 days after symptom resolution. The newborn should be isolated in a single room for the duration, nursed with full precautions, and treated for any viral respiratory infection as well as other pathology.(18,21,22,24) While this is ideal, each clinical setting should consider its capacity and adopt a flexible and variable approach to admitting patients such as designated isolation areas or cohorting of patients.(21,25) COVID-19 positive mothers and fathers are not allowed to visit their newborn in the neonatal unit.(20–24) While we understand that this will be difficult for new parents, early identification and isolation are imperative for COVID-19 control.(9)

There is currently no evidence to suggest that breastmilk from infected mothers poses a risk of infection towards the newborn.(3,7,23) Hence, breastfeeding (or expressed breastmilk), donor breastmilk (if the mother is unable to express) or formula feeding is permissible.(21,26) Current national maternal and neonatal guidelines advise that well newborns can be breastfed by mothers with suspected or confirmed COVID-19 if the mother is well enough to do so.(24) Mothers should be advised regarding hand washing and wearing a mask while handling the newborn.(20,21,24,26) If the newborn is admitted, then the newborn should not have any visitors but feeding is encouraged with expressed breastmilk with precautions.(21,24) Guidelines may be further updated as new evidence emerges.

Other actions

In a neonatal intensive care unit or neonatal unit, a virus outbreak will bring psychological stress to the patient's parents and other family members; therefore, social workers and psychologists should be involved.(18,26) CMJAH has social workers and psychologists available to patients. Health-care workers should be cognizant of the strain this situation places on families and must refer appropriately.

At the same time, health-care workers may be under tremendous psychological pressure due to overwork, shortage of medical resources, patients' poor outcomes or other stressful experiences.(18) Already, nurses have been hesitant to nurse a child in the PNICU with suspected COVID-19 due to fear of becoming infected themselves and efficacy of PPE. Staff have been encouraged to take care of themselves mentally and physically and should seek psychological support via staff clinics or elsewhere.

The literature and scientific landscape relating to COVID-19 is changing every day, and medical service providers should continually update their knowledge and skills on prevention and control of the COVID-19 outbreak.(18) The volume of information available in academia and the media has become overwhelming. To ease this burden, an online resource portal was created to house reputable articles, guidelines and protocols from journals and neonatal units around the world. We update the portal every 3 days using the WHO database, LitCovid and PubMed amongst others, and information pertaining to COVID-19 and treatment in general paediatrics and specifically newborns is included.

CONCLUSIONS

The Neonatal Unit at CMJAH stands ready to attend to the first newborns of suspected or confirmed mothers of the growing COVID-19 pandemic. While staff anxiety levels are high (regarding nursing potential cases, transmission to health-care workers and availability of PPE), clear protocols and communication of the protocols is vital in allaying fears. A rational approach to suspected cases and infection control in-line with local and international guidelines, as well as ongoing education, should diminish anxiety amongst health-care workers.(27) Ongoing refinement of protocols and procedures is warranted as the extent of the pandemic in our setting unfolds and the available literature changes. These should happen concurrently while still delivering appropriate care to the current and future patients within the unit. South Africa is a low-to-middle income country, and the lack of resources available means we cannot increase our capacity, staffing numbers or available equipment. Since our "usual" patient load will not decrease, we must be as prepared, adaptable and efficient as possible.

REFERENCES

1. South African Department of Health. Press release: update on COVID-19 (08th April 2020) [Internet]. 2020. Available from: <<https://sacoronavirus.co.za/2020/04/08/update-on-covid-19-08th-april-2020/>>.
2. Yu N, Li W, Kang Q, et al. Clinical features and obstetric and neonatal outcomes of pregnant patients with COVID-19 in Wuhan, China: a retrospective, single-centre,

- descriptive study. *Lancet Infect Dis* [Internet]. 2020; 3099(20):1–6. Available from: <[http://dx.doi.org/10.1016/S1473-3099\(20\)30176-6](http://dx.doi.org/10.1016/S1473-3099(20)30176-6)>.
3. Wang S, Guo L, Chen L, et al. A case report of neonatal COVID-19 infection in China. *Clin Infect Dis* [Internet]. 2020. Available from: <<http://dx.doi.org/10.1093/cid/ciaa225>>.
 4. Luo Y, Yin K. Management of pregnant women infected with COVID-19. *Lancet Infect Dis* [Internet]. 2020; 0(0): 2019–2020. Available from: <<https://linkinghub.elsevier.com/retrieve/pii/S1473309920301912>>.
 5. Chui ML, Shell FW, Tse NL, et al. A case-controlled study comparing clinical course and outcomes of pregnant and non-pregnant women with severe acute respiratory syndrome. *BJOG Int J Obstet Gynaecol* [Internet]. 2004; 111(8):771–774. Available from: <<http://dx.doi.org/10.1111/j.1471-0528.2004.00199.x>>.
 6. Zhu H, Wang L, Fang C, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. *Transl Pediatr* [Internet]. 2020; 1(9):51–60. Available from: <<http://dx.doi.org/10.21037/tp.2020.02.06>>.
 7. 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* [Internet]. 2020. Available from: <[http://dx.doi.org/10.1016/S0140-6736\(20\)30360-3](http://dx.doi.org/10.1016/S0140-6736(20)30360-3)>.
 8. Lu Q, Shi Y. Coronavirus disease (COVID-19) and neonate: what neonatologist need to know. *J Med Virol* [Internet]. 2020:1–4. Available from: <<http://dx.doi.org/10.1002/jmv.25740>>.
 9. Fan C, Lei D, Fang C, et al. Perinatal transmission of COVID-19 associated SARS-CoV-2: should we worry? *Clin Infect Dis* [Internet]. 2020. Online 17. Available from: <<http://dx.doi.org/10.1093/cid/ciaa226>>.
 10. De Luca D. Managing neonates with respiratory failure due to SARS-CoV-2. *Lancet Child Adolesc Heal* [Internet]. 2020; 4(4):e8. Available from: <[http://dx.doi.org/10.1016/S2352-4642\(20\)30073-0](http://dx.doi.org/10.1016/S2352-4642(20)30073-0)>.
 11. Li N, Han L, Peng M, et al. Maternal and neonatal outcomes of pregnant women with COVID-19 pneumonia: a case-control study. *medRxiv* [Internet]. 2020. Available from: <<http://dx.doi.org/10.1101/2020.03.10.20033605>>.
 12. Wang S, Guo L, Chen L, et al. A case report of neonatal COVID-19 infection in China. *Clin Infect Dis* 2020; available from <<http://dx.doi.org/10.1093/cid/ciaa225>>.
 13. 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; 23(77):E1–E3.
 14. South African Government. Hospitals and centres of disease control – coronavirus COVID-19 [Internet]. 2020. Available from: <<https://www.gov.za/Coronavirus/hospitals>>.
 15. World Health Organization. Critical preparedness, readiness and response actions for COVID-19. 2020:1–3. Available from: <<https://www.who.int/publications-detail/critical-preparedness-readiness-and-response-actions-for-covid-19>>.
 16. CDC. Steps healthcare facilities can take now to prepare for coronavirus disease 2019 (COVID-19) [Internet]. Available from: <<https://www.cdc.gov/coronavirus/2019-ncov/hcp/steps-to-prepare.html>>.
 17. South African Department of Health. Clinical management of suspected or confirmed COVID-19 disease –Version 3; 2020. Available from: <https://www.nicd.ac.za/wp-content/uploads/2020/03/Clinical-Management-of-COVID-19-disease_Version-3_27March2020.pdf>.
 18. Wang J, Qi H, Bao L, Li F, Shi Y. A contingency plan for the management of the 2019 novel coronavirus outbreak in neonatal intensive care units. *Lancet Child Adolesc Heal* [Internet]. 2020; 4(4):258–259. Available from: <[http://dx.doi.org/10.1016/S2352-4642\(20\)30040-7](http://dx.doi.org/10.1016/S2352-4642(20)30040-7)>.
 19. WHO. Rational use of personal protective equipment for coronavirus disease (COVID-19): interim guidance. Geneva: World Health Organization; 2020. Available from: <https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-eng.pdf> Accessed 23rd Mar 2020> [accessed 23.05.20].
 20. Chandrasekharan P, Vento MSM, Trevisanuto D, et al. Neonatal resuscitation and postresuscitation care of infants born to mothers with suspected or confirmed SARS-CoV-2 infection. *Am J Perinatol* [Internet]. 2020; 1(212). Available from: <<https://doi.org/10.1055/s-0040-1709688>>.
 21. Royal College of Paediatrics and Child Health. COVID-19 – guidance for neonatal settings; 2020. Available from: <<https://www.rcpch.ac.uk/sites/default/files/generated-pdf/document/COVID-19---guidance-for-neonatal-settings.pdf>>.
 22. Ramdin T. Standard operating procedures for COVID 19 in the neonatal setting at the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) – Version 1; 2020.
 23. Puopolo KM, Hudak ML, Kimberlin DW, Cummings J. American Academy of Pediatrics initial guidance: management of infants born to mothers with COVID-19; 2020. Available from: <<https://downloads.aap.org/AAP/PDF/COVID-19-Initial-Newborn-Guidance.pdf>>.
 24. South African Department of Health. Neonatal algorithm for mother positive or suspected COVID-19; March 2020.
 25. Wang J, Shi Y. Managing neonates with respiratory failure due to SARS-CoV-2 – Authors’ reply. *Lancet Child Adolesc Heal* [Internet]. 2020; 4(4):e9. Available from: <[http://dx.doi.org/10.1016/S2352-4642\(20\)30072-9](http://dx.doi.org/10.1016/S2352-4642(20)30072-9)>.
 26. WHO. Clinical management of severe acute respiratory infection (SARI) when COVID-19 infection is suspected: interim guidance; 2020. Available from: <[https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-\(ncov\)-infection-is-suspected](https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected)>.
 27. Stacey S, Richards GA. Coronavirus epidemic: a South African perspective. *Wits J Clin Med* [Internet]. 2020; 2(1):1–4. Available from: <<http://dx.doi.org/10.18772/26180197.2020.v2n1a0>>.