

Considerations and Recommendations for Obstetric Anesthesia Care During COVID-19 Pandemic - Saudi Anesthesia Society Guidelines

ABSTRACT

Introduction: Severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) emerged in Wuhan, China late 2019 and became a pandemic causing coronavirus disease 2019 (COVID-19). Despite its lower mortality rate compared to the other coronaviruses, it has a higher human-to-human transmission rate. Anesthesiologists may benefit from a review of the current evidence related to the obstetric patient with COVID-19.

Methods: We reviewed the literature for relevant articles as well as experts' opinions from related medical societies' websites.

Conclusion: There are several anesthetic considerations in the care of pregnant women with COVID-19 due to their unique physiological changes. We provide considerations and recommendations for departmental and institutional leadership as well as the obstetric anesthesia providers. These recommendations may apply and can be edited, for future droplet or airborne based pandemics. The rapidly evolving literature makes it important to get updates directly from the relevant medical societies' websites.

Key words: COVID-19; coronavirus; obstetric anesthesia; SARS CoV-2

Severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) emerged in Wuhan, China late 2019. It resulted in an acute respiratory illness epidemic.^[1] On February 11 of 2020, the World Health Organization (WHO) termed this illness coronavirus disease 2019 (COVID-19)^[2] and declared it a pandemic a month later.^[3] By the time this article was submitted, 1.5 million individuals were affected globally with nearly 100 thousand fatalities.^[4]


SARS CoV-2 became a world health concern that required unprecedented public health strategies around the globe. Compared to the previous zoonotic coronaviruses, MERS-CoV, and SARS CoV, this virus has a remarkably higher human-to-human transmission rate,^[5] and a lower mortality rate.^[6,7] Nevertheless, the fatality numbers from SARS CoV-2 to date dwarfed ones from the other two.^[4]

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While elective procedures can be postponed during the pandemic to limit exposure and preserve personal protective equipment (PPE), obstetric patients will continue to present to health care centers. Current evidence on COVID-19 and whether the obstetric population is at higher risk or not is insufficient. Yet, the American college of obstetricians and gynecologists (ACOG) considered them at higher risk based on the previously reported higher morbidity and mortality in pregnant women with SARS CoV and influenza virus.^[8] A large amount of evidence on COVID-19 is rapidly growing but only a few are related to obstetric anesthesia care.

Objectives

To present the unique obstetric anesthesia considerations and recommendations during the COVID-19 pandemic and highlight the current evidence and experts' opinion aiming to:

1. Prevent the spread of the disease in this population
2. Protect healthcare workers from acquiring the infection
3. Help administrations and leadership of obstetric services to prepare for the pandemic.

Methods

We searched the databases (PubMed and Embase) for publications on COVID-19 that are relevant to the obstetric anesthesia practice to the date this article was submitted for publication. We also reviewed information on the latest relevant considerations, recommendations, and guidance from the relevant medical societies' websites. Those included the World Health Organization, the United States Center for Disease Control and Prevention (CDC), The Royal College of Obstetricians, the American College of Obstetricians and Gynecologists (ACOG), the American Society of Anesthesiologists (ASA), the Anesthesia Patient Safety Foundation (APSF), the Society of Obstetric Anesthesia and Perinatology (SOAP), and the Saudi Anesthesia Society (SAS) [Table 1].

Results, Considerations, and Recommendations

Recommendations for Obstetrics Departments and Institutional Leaderships

Surge planning

We recommend forming an institutional multidisciplinary obstetric COVID-19 committee to lay out clinical pathways and procedures for dealing with suspected and confirmed COVID-19 patients.

Prior to a capacity surge crisis at your institution, efforts should be made to develop a surge plan. Consider collaborating with other hospitals in your area that offer

obstetric care to form a network for channeling scheduled cesarean deliveries to centers not in a moderate to crisis level surge. Once a crisis level surge is determined by the institution, clear communication with the emergency dispatch system is needed to route parturients to other centers in the area if possible Table 2.

Manpower

Health care-worker protection should take the highest priority. One infected health care worker will spread to others in close contact (patients, co-workers, and family members). That may lead to a significant shortage, reduce the manpower able to care for other patients, and overwhelm institutions' capacity.

Table 1: An overview of the article

Recommendations for obstetric departments and institutional leaderships	
	Surge planning
	Manpower
	Structural and functional modifications
	Access control
Recommendations for anesthesia providers working in labor and delivery units	
	General and clinical judgement considerations
	Equipment
	Labor analgesia
	Non-neuraxial
	Neuraxial
	Cesarean delivery
	Neuraxial anesthesia for cesarean delivery
	General anesthesia and airway management
	The fetus and neonate
	Medications

Table 2: Recommendations for obstetrics departments and institutional leaderships

Surge planning	Multidisciplinary committee to plan clinical care and surge plans Collaborate with other hospitals with OB services Effective communication with the emergency dispatch system
Manpower	Protect the healthcare worker, save more lives Consider giving non-clinical duties to the pregnant healthcare worker beyond 28 weeks of gestation Create two teams that alternate weekly Resource anesthesia providers to serve the OB anesthesia plan Early recruitment of volunteers
Modifications	Consider quick modifications to increase capacity and provide isolation measures HEPA Filters
Access control	Screening at the hospital and L&D unit Develop a new and stringent visitor policy Preadmission phone screening for scheduled admissions Keep a provider logbook at the doors of all patient clinical locations for easier tracking of potentially infected personnel

The royal college of obstetricians advised health care workers who are pregnant beyond 28 weeks of gestation to avoid contact with suspected or confirmed COVID-19 patients if at all possible, and take nonclinical assignments if necessary.^[9]

It is expected that the care of confirmed or suspected COVID-19 patients would be time-intensive mostly because of the infection control protocols. The staffing situation may be significantly affected by a small number of suspected or confirmed patients. The need to limit exposure to other health care workers and prevent the spread of the disease to other patients may worsen the staffing situation even further.

The median incubation period of COVID-19 is 4–6 days.^[1,10,11] For institutions not in a capacity surge, it is advised that health care workers in obstetric units are divided into two teams alternating clinical work on a weekly basis and abstaining from coming in close contact with each other. That may help ensure that the unit can be run if individuals from one team contracted the disease which could jeopardize that team. Since many institutions, even ones not in a surge situation, are not performing elective procedures during the pandemic, anesthesia departments should consider resourcing their manpower to meet the obstetric anesthesia dual team plan. We recommend the early recruitment of volunteers from other departments, health care institutions, and medical schools to ensure their availability upon request. Train all obstetric care workers and volunteers on the appropriate use of PPE and run simulation scenarios of elective, emergency, and transfer situations if possible.

Structural and functional modifications

Hospitals and health care systems are advised to consider quick modifications to increase their capacity and control infections. Modifications such as quick construction to create more isolation areas of clinical care, screening tents outside the hospital, negative pressure systems, and installing high-efficiency particulate air (HEPA) filters.

Access control

Develop and apply access control protocols for the hospital and labor and delivery units. That may include screening everyone at the door for fever, cough, contact with a confirmed patient, and history of recent travel. A new visitor policy should be stringent. We recommend pre-admission screening by phone for all patients scheduled to present for clinical care.

Keeping a logbook at the door of all patients' clinical care areas for health care workers to write their names down may help the infection control team to track back the exposed individuals if an undiagnosed patient was confirmed to be COVID-19 positive.

Recommendations for Anesthesia Providers Working in Labor and Delivery Units

General and clinical judgment considerations

The time of proper donning and doffing PPE is not negligible. Even minutes can be very valuable in terms of fetal outcomes during an obstetric emergency. Being proactive by communicating with the obstetric team to anticipate potential urgent or emergent obstetric conditions is crucial.

Anticipating the need for airway instrumentation in the parturient with COVID-19, and having a low threshold for it, can help minimize emergent airway management. This, in turn, may help reduce the chance of exposure to the provider. Balance the risks of premature delivery against maternal respiratory decompensation when a pregnant COVID-19 patient is in ARDS.

For the acute resuscitation of adults with COVID-19 and shock, Surviving Sepsis Campaign (SSC) guidelines recommended against using hydroxyethyl starches (HES). That was due to the increased risk of renal replacement therapy and blood transfusion when HES was used prior to the SARS CoV-2 pandemic.^[12] We recommend against HES use in the resuscitation of obstetric COVID-19 patients in shock. The current evidence on the use of HES as preload or co-load when performing neuraxial anesthesia for the parturient with COVID-19 is insufficient.

The SCC guidelines also advised that small tidal volumes (4–8 cc/kg of ideal body weight) be used in mechanically ventilated adults with COVID-19 and ARDS) over higher tidal volumes.^[12] Respiratory rate must be increased to match the higher minute ventilation of pregnancy. The arterial partial pressure of carbon dioxide may be more reliable than capnography in that case due to insufficient sampling time.

A meta-analysis study showed that COVID-19 patients with thrombocytopenia are at increased risk of severe disease and mortality.^[13] On the other hand, the incidence of thrombocytopenia in pregnancy at the time of delivery is around 5%.^[14] We recommend close monitoring and the use of additional markers to detect worsening clinical conditions in pregnant patients with thrombocytopenia.

Equipment

Anesthesia workplaces are difficult to effectively disinfect, particularly the anesthesia machines and supply carts.^[15] Consider dedicating one or more machines and carts for suspected and confirmed COVID-19 cases and handle them with meticulous disinfection measures. Keep carts outside the room while in use if possible. Environmental disinfection should take place between cases and at the end

of the day. The anesthesia patient safety foundation (APSF) recently updated its guidelines of decontamination during the COVID-19 pandemic.^[15] Effective hand hygiene before and after coming in contact with the anesthesia machine and equipment is crucial. Consider using disposable plastic covers for the anesthesia machine and other working surfaces. If possible, use disposable or single-patient use monitoring equipment (e.g., pulse oximeter, BP cuff, etc.). Prior to entering the operating room, prepare all the required infection-control equipment (HEPA filter, closed suction system, plastic drape, etc.).

Labor analgesia

Non-neuraxial

Consider suspending the nitrous oxide service in the labor and delivery unit for concerns of aerosolization even with asymptomatic patients. Data are insufficient as to the safety of this setting according to the SOAP recommendations related to COVID-19.^[16] Existing protocols for patient-controlled analgesia (PCA) in labor and delivery units can be continued.

Neuraxial

A COVID-19 diagnosis is not a contraindication to neuraxial anesthesia or analgesia.^[17] Early neuraxial analgesia may be considered to avoid airway manipulation when emergency cesarean delivery is indicated.^[18] Use the checklist in Table 3.

Before

If the labor and delivery room does not have a dedicated anesthesia cart, consider leaving the non-dedicated cart outside the room. All health care workers are advised to wear surgical masks even when caring for asymptomatic patients during this pandemic. To decrease cross-contamination,

all patients should wear surgical masks at all times. All paperwork must be left outside the room and filled out after the doffing of PPE.

During and after

To limit the number of providers dealing with a confirmed or potential COVID-19 patient, it is reasonable to have the most senior provider perform the procedure with one nurse to assist. A positioning table can be utilized for position support instead of a health care worker. We suggest having an assistant outside the room to hand over equipment if needed. After careful doffing, dispose of equipment, drugs, and PPE as per institutional guidance.

Cesarean delivery

Plan a route for all scheduled cesarean deliveries from the hospital door, or patient room, to the operating room bypassing the preoperative holding area if possible. Perform team huddles before the procedure to discuss the plan and delegate roles. All health care workers should wear at least surgical masks with asymptomatic patients. Neuraxial anesthesia for cesarean delivery would have a lesser effect on respiratory dynamics compared to general anesthesia.^[18]

Neuraxial anesthesia for cesarean delivery

Converting from neuraxial to general anesthesia is always a possibility. Thus, when attempting neuraxial anesthesia for suspected or confirmed COVID-19 patients, the anesthesia provider is advised to wear an N95 or respirator if available.

Use your clinical judgment in choosing between spinal and epidural anesthesia by weighing the risk of hypotension-induced nausea and vomiting against the risk of potentially having to instrument the airway if conversion to general anesthesia is needed. If time allows, a combined-spinal epidural (CSE) technique with a lower spinal dose and titration of the epidural catheter to effect is an acceptable option as well.^[17,19]

General anesthesia and airway management

Preinduction

Although COVID-19 requires contact and droplet precautions, they should be upgraded to airborne when performing aerosol-generating procedures like tracheal intubation.^[20] Thus, it is important to limit the number of personnel in the room and assign the most experienced provider to secure the airway. We recommend wearing double gloves when intubating the patient.^[21] One benefit is the extra layer of protection and the other is that the outer glove can be used as a sheath for the laryngoscope blade after use. The use of disposable monitors and equipment is recommended to reduce the risk of cross-contamination.

Table 3: This table can be used as a checklist for labor neuraxial analgesia

Before	During	After
<ul style="list-style-type: none"> Use a dedicated neuraxial cart and leave it outside the L&D room. Use a pre-made epidural kit to take inside the room. Hand hygiene and PPE. All patients should wear a surgical mask. All health care workers should wear surgical masks even with asymptomatic patients. Use an N95 mask when performing an aerosol-generating procedure. Leave all the paperwork and personal belongings outside the room. 	<ul style="list-style-type: none"> The most senior anesthesia provider to perform the procedure. One nurse to assist. Utilize a positioning table if available. Minimize the time of position adjustment and support by assisting staff. One assistant outside to provide any extra requirements. 	<ul style="list-style-type: none"> Careful doffing of PPE. Dispose of all equipment, drugs, and PPE according to the unit policies. Meticulous hand hygiene. Fill the paperwork.

Induction, intubation, and maintenance

Rapid sequence induction is recommended in the obstetric population to minimize the risk of aspiration and the need for manual mask ventilation in COVID-19 patients.^[22] Connect a HEPA or HMEF filter to the Y piece on the patient's side before pre-oxygenation.^[21] Apply and maintain a properly sealed face mask while pre-oxygenating. Ensure sufficient depth of anesthesia and paralysis on induction to avoid coughing during intubation. If modified rapid sequence induction was deemed necessary, apply smaller tidal volumes during manual mask ventilation.

Consider video-laryngoscopy to improve intubating conditions, keep a reasonable distance between the provider and patient's faces, and decrease procedure time. Avoid all unnecessary disconnections of breathing circuits. If you need to disconnect, clamp the endotracheal tube (ETT). If extensions are needed, attach them before induction.

Extubation and transfer

Extubation is perhaps a more critical event than intubation due to the higher chances of coughing and spreading the virus. As mentioned above, nonessential personnel should leave the room and airborne precaution should be followed during extubation.^[20] The routine use of prophylactic antiemetics may help minimize environmental contamination from vomiting. Some experts recommend IV lidocaine before extubation to suppress the airway reflexes.^[23] Immediate and proper disposal of the endotracheal, suction and oro-gastric tubes to decrease environmental contamination. PPE should be doffed and disposed of properly in medical waste bins. Follow the guidelines to disinfect non-disposable equipment, surfaces and the operating rooms.^[15]

During transport, intubated patients should have an HMEF filter between the self-inflating bag and the patient at all times. Non-intubated patients should wear a surgical mask at all times. Health care workers are advised not to touch environmental surfaces, such as doorknobs and elevator buttons, during transport; this should be done by an accompanying helper or security officer. Team debriefing is an important tool for detecting system defects and enhancing team performance.

The Fetus and Neonate

The current evidence does not support the vertical transmission of the virus antenatally or via breast milk.^[24] Experts advise the precautionary measures of suctioning and wiping the neonate's mouth and nose and separate it from the mother until she tests negative for COVID-19.^[8,9,17,19]

Nevertheless, separation of the mother and neonate should not be taken lightly due to the potentially detrimental effects of the lack of bonding and breast milk.

Medications

Nonsteroidal anti-inflammatory drugs (NSAIDs): The current evidence is not robust, and further studies are ongoing, as to whether NSAIDs may cause harm to the COVID-19 patient.^[25] The authors of this article believe that the benefit may not outweigh the potential risk of NSAIDs used in the mother with suspected or confirmed COVID-19. Its use may continue for asymptomatic non-suspected cases.

Hydroxychloroquine (HCQ): HCQ is being used and studied further for its potential benefit in attenuating the progression of COVID-19 to severe levels.^[26] The combination of HCQ and azithromycin, currently used for the treatment of COVID-19 patients, can prolong the QT interval.^[27] While pregnancy shortens the QT segment, they may still be at risk for the detrimental consequences of a prolonged QT interval when multiple medications that cause it are combined. Serial electrocardiograms are recommended for that reason.

Conclusion

During the COVID-19 pandemic, obstetric patients will continue to present to hospitals for delivery. They have unique physiological changes and the evidence of COVID-19 and pregnancy in the literature is growing but is not yet sufficient. We reviewed the literature and professional medical societies' experts' opinions to shed the light on considerations and recommendations in obstetric anesthesia care during the COVID-19 pandemic. Obstetric anesthesia providers should be part of an obstetric multidisciplinary team to develop surge plans. Updates should be obtained directly from the relevant medical societies.

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Conflicts of interest

There are no conflicts of interest.

References

- Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, *et al.* Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020.
- World Health Organization. Novel coronavirus (2019-ncov) situation report - 22 [Situation Report]. 2020. Available from: <https://apps.who.int/iris/bitstream/handle/10665/330991/nCoVsitrep11Feb2020-eng.pdf?sequence=1&isAllowed=y>. [Last updated on 2020 Feb 11].
- World Health Organization. Who director-general's opening remarks at the media briefing on covid-19-11 march 2020 [Media Briefing]. 2020. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-oncovid-19>. [Last updated on 2020 Mar 11].
- World Health Organization. Coronavirus disease 2019 (COVID-19) who situation report 81 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200410-sitrep-81-covid-19.pdf?sfvrsn=ca96eb84_2. [Last updated on 2020 Apr 01].
- Peng PWH, Ho PL, Hota SS. Outbreak of a new coronavirus: What anaesthetists should know. *Br J Anaesth* 2020. pii: S0007-0912(20)30098-2. doi: 10.1016/j.bja.2020.02.008.
- Del Rio C, Malani PN. 2019 Novel coronavirus-important information for clinicians. *JAMA* 2020. doi: 10.1001/jama.2020.1490.
- Paules CI, Marston HD, Fauci AS. Coronavirus infections-more than just the common cold. *JAMA* 2020. doi: 10.1001/jama.2020.0757.
- The American College of Obstetricians and Gynecologists. Novel coronavirus 2019 (COVID-19) 2020. Available from: <https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2020/03/novel-coronavirus-2019>. [Last updated on 2020 Mar 12].
- Royal College of Obstetricians and Gynaecologists. Coronavirus (COVID-19) infection in pregnancy 2020. Available from: <https://www.rcog.org.uk/globalassets/documents/guidelines/2020-04-03-coronavirus-covid-19-infection-in-pregnancy.pdf>. [Last updated on 2020 Apr 02].
- Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *Int J Antimicrob Agents* 2020;55:105924.
- Lauer SA, Grantz KH, Bi Q, Jones FK, Zheng Q, Meredith HR, *et al.* The incubation period of coronavirus disease 2019 (COVID-19) from publicly reported confirmed cases: Estimation and application. *Ann Intern Med* 2020. doi: 10.7326/M20-0504.
- Alhazzani W, Moller MH, Arabi YM, Loeb M, Gong MN, Fan E, *et al.* Surviving sepsis campaign: Guidelines on the management of critically ill adults with Coronavirus Disease 2019 (COVID-19). *Intensive Care Med* 2020. doi: 10.1097/CCM.0000000000004363.
- Lippi G, Plebani M, Henry BM. Thrombocytopenia is associated with severe coronavirus disease 2019 (COVID-19) infections: A meta-analysis. *Clin Chim Acta* 2020;506:145-8.
- Reese JA, Peck JD, McIntosh JJ, Vesely SK, George JN. Platelet counts in women with normal pregnancies: A systematic review. *Am J Hematol* 2017;92:1224-32.
- The Anesthesia Patient Safety Foundation. Faq on anesthesia machine use, protection, and decontamination during the COVID-19 pandemic 2020. Available from: <https://www.apsf.org/faq-on-anesthesia-machine-use-protection-and-decontamination-during-the-covid-19-pandemic/>. [Last updated on 2020 Apr 01].
- The Society of Obstetric Anesthesia and Perinatology. Interim considerations for obstetric anesthesia care related to covid19 [Scientific Society Guidance Article]. 2020. Available from: https://soap.org/wp-content/uploads/2020/03/SOAP_COVID-19_Obstetric_Anesthesia_Care_032320.pdf. [Last updated 2020 Mar 23].
- Zhang Y, Chen R, Wang J, Gong Y, Zhou Q, Cheng HH, *et al.* Anaesthetic management and clinical outcomes of parturients with COVID-19: A multicentre, retrospective, propensity score matched cohort study. *medRxiv* 2020. doi: 10.1101/2020.03.24.20042176.
- Lie SA, Wong SW, Wong LT, Wong TGL, Chong SY. Practical considerations for performing regional anesthesia: Lessons learned from the COVID-19 pandemic. *Can J Anaesth* 2020. doi: 10.1007/s12630-020-01637-0.
- Chen R, Zhang Y, Huang L, Cheng BH, Xia ZY, Meng QT. Safety and efficacy of different anesthetic regimens for parturients with COVID-19 undergoing Cesarean delivery: A case series of 17 patients. *Can J Anaesth* 2020. doi: 10.1007/s12630-020-01630-7.
- Center of Disease Control and Prevention. Interim infection prevention and control recommendations for patients with suspected or confirmed coronavirus disease 2019 (covid-19) in healthcare settings 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html>. [Last updated on 2020 Apr 01].
- Bowdle A, Munoz-Price LS. Preventing infection of patients and healthcare workers should be the new normal in the era of novel coronavirus epidemics. *Anesthesiology* 2020. doi: 10.1097/ALN.0000000000003295.
- Kim HJ, Ko JS, Kim TY. Recommendations for anesthesia in patients suspected of COVID-19 coronavirus infection. *Korean J Anesthesiol* 2020;73:89-91.
- Aminnejad R, Salimi A, Saeidi M. Lidocaine during intubation and extubation in patients with coronavirus disease (COVID-19). *Can J Anaesth* 2020. doi: 10.1007/s12630-020-01627-2.
- Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, *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;395:809-15.
- Little P. Non-steroidal anti-inflammatory drugs and COVID-19. *BMJ* 2020;368:m1185.
- Zhou D, Dai SM, Tong Q. COVID-19: A recommendation to examine the effect of hydroxychloroquine in preventing infection and progression. *J Antimicrob Chemother* 2020. doi: 10.1093/jac/dkaa114.
- Gabriels J, Saleh M, Chang D, Epstein LM. Inpatient use of mobile continuous telemetry for COVID-19 patients treated with hydroxychloroquine and azithromycin. *HeartRhythm Case Reports* 2020. doi: 10.1016/j.hrcr.2020.03.017.