

Performing obstetrical ultrasound examinations in the era of Covid-19

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Worldwide, more than 62 million cases of Covid-19 have been diagnosed,¹ and many more people contract the virus on a daily basis. While some countries have been successful in slowing the spread of SARS-CoV-2, the virus that is responsible for the current epidemic, the threat of infection remains real. The incidence of SARS-CoV-2 has been rising exponentially in some countries, including in United States.² While there has been some thoughtful guidance from the Society of Maternal Fetal Medicine (SMFM) and the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) concerning the performance and timing of ultrasound examinations during pregnancy, safety issues remain, which have not been addressed by the Centers for Disease Control, (CDC), the World Health Organization (WHO), or the ultrasound community. In addition, public policy decisions, which should be based on the best scientific data available, have been affected by political messaging, and hospitals have crafted guidelines based, in part, on the availability of PPE. These factors have limited the ability of caregivers to protect themselves and others during this epidemic. Performing obstetrical ultrasound results in unique challenges that should be further addressed to keep caregivers and patients safe.

As the epidemic has progressed, our understanding of the transmission of SARS-CoV-2 has evolved. Current evidence suggests that while most virus is spread by droplet exposure, the virus can be aerosolized as well.³ This new understanding suggests that the “6 feet” suggestion by the CDC for distancing may not be enough. We also know that air currents can stream virus around structures, however, when an object is stationary, the virus is more likely to land on it. We are dependent on ventilation systems to remove viral particles from the air in our examination rooms. In addition, about coronavirus transmission can occur before people feel sick and approximately half of people who are infected in some populations are asymptomatic,⁴ so an effective screening policy, which has been suggested by SMFM and ISUOG, may not be effective, as many of us work in settings where screening decisions are made by the healthcare system. The bottom line is that no provider can really know who is potentially infectious at the current time and protections against droplet exposure may not be adequate.

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Several societies, including Society for Maternal Fetal Medicine (SMFM), International Society for Ultrasound in Obstetrics and Gynecology (ISUOG), and American Institute for Ultrasound in Medicine (AIUM) proposed guidelines early in the pandemic experience.

SMFM guidelines⁵ suggest:

- Delaying routine scans for Covid positive patients
- Minimize the number of ultrasound scans performed during routine pregnancy
- Remove clutter in ultrasound rooms
- Leave only 2 transducers per room
- Clean all surfaces each morning and afternoon
- Minimize the number of providers and learners in a location and do not rotate staff between sites
- Wear gloves for linen and do not shake it
- Postpone follow-up scans: 2 months for major anomalies and scans at 32 and 36 weeks for risk of IUGR
- Cancel or postpone routine fetal echoes
- Consider video clips to decrease the examination time
- No routine transvaginal cervical length scans
- Masks for patients and providers are suggested.

AIUM has suggested changes in the guidelines for cleaning of exam rooms, ultrasound machines, and transducers.⁶

ISUOG as well has suggested guidelines, which differ whether the patient has known SARS-CoV-2 or who have Travel, Occupation, Contact, and Cluster (TOCC) risks, symptoms, or suspected or probable Covid-19. These guidelines also suggest triage of obstetric ultrasound services based on known Covid status and rescheduling or delaying testing in patients who are symptomatic and/or positive for TOCC, anatomic surveys between 18 and 23 weeks, avoiding routine growth scans in the third trimester, and performing fetal echo depending on the urgency of the test. After recovery of Covid-19, growth scans every 4 weeks are suggested.⁷ ISUOG recommendations also suggest dedicated work clothes, gloves, gowns, and in some cases, goggles or face shields, N95 masks, and hair coverings.⁸

While these guidelines are excellent and comprehensive in many ways, they imply that the patient's Sars-Cov-2 status is known. In addition, ultrasound

units are unique and the unique circumstances of an obstetric ultrasound unit may not be appreciated by hospital administrators. While “social distancing” is suggested to decrease viral transmission, we cannot socially distance from our patients. Indeed, our faces may be within 24–40 inches from the patient during the scan when we employ good ergonomic practices, which include sitting close to the patient and having the table at the appropriate height. Patients often talk, laugh, and joke during obstetric ultrasound scans and they may be asked to inhale or hold their breath to complete some portions of it, which potentially results in aerosols.⁹ Patients demand that their partners and sometimes multiple family members including children to be present, which creates crowded waiting rooms and exam rooms, and their requests are supported by hospital administrators. The rooms are small and often have unknown ventilation turnover. Machine surfaces are touched regularly by the sonologist. Finally, pregnant patients are often motivated to come for ultrasound appointments despite feeling ill so that they can get “pictures” of the baby or find out the sex. In the author's experience, patients often arrive without masks or remove or wear their masks improperly in the waiting room and in the examination rooms despite reminders to keep them on. All of these factors place the sonographer at increased risk for contracting SARS-CoV-2.

We propose additional safety measures based on the latest information known about transmission to protect sonographers from inadvertent exposure to SARS-CoV-2. These measures include:

1. Set up the waiting room so that distancing is enforced by chair placement
Chairs should be placed where you want them. If 1 support person is allowed in the room, then chairs can be placed in groups of 2, with each group separated from other groups by more than 6 feet. If the waiting room is too small, patients can wait outside the unit and be called when they are ready to be seen. The patient should speak with the admitting personnel at a distance. Signs for where to stand while waiting can be placed on the floor. Plexiglass[®] can be used to separate the patients from the admitting personnel. The admitting clerk should make sure that the people in the waiting room keep their masks on at all times.

2. Universal masking

All patients and staff should wear a mask over their nose, mouth, and chin at all times in the ultrasound unit. Signage encouraging the appropriate wearing of masks is available from WHO.¹⁰ The CDC suggests providing patients with cloth masks if they arrive without one.¹¹ We found that enlisting the support of volunteers to make a supply of masks to provide to patients who arrived without one was helpful early in the pandemic.

While we may not be able to control the quality or the appropriate use of masks by patients, caregivers should use the best mask they have access to. If N95 masks are not available, options include surgical masks and homemade masks. Recent studies demonstrate that the efficiency of any mask can be improved by the addition of multiple layers of fabric and/or filters and by close fit of the mask to the face.¹² Cloth masks should be washed and N95 masks should be replaced since their efficacy decreases over time.¹³

Any mask can be made more efficient by the use of a face shield.¹⁴ Face shields are increasingly available, or can easily be made from easily available materials.¹⁵ Face shields should be cleaned daily both inside and outside and can be reused.

3. Dedicated work clothes

Dedicated work clothes should be considered as any droplets or aerosols produced in the examination room may fall onto the sonologist. If the hospital does not provide scrubs, uniforms can be washed daily. Many sonographers shower immediately on arriving home and change into clean clothes.

4. Keep the environment clean

Gel bottles, probes, the ultrasound machine, ultrasound table, and any barriers should be cleaned with agents effective against SARS-CoV-2 between each patient. Door knobs and room surfaces should be cleaned twice daily. Since cleaning products can change frequently due to supply chain issues, it is helpful to have a chart readily available with the available agents and the dwell time needed for effective use of the product. Guidance on a variety of agents effective against coronavirus for general cleaning can be found on the EPA website,¹⁶ and guidance for cleaning ultrasound machines found on the manufacturer's website.

Coronavirus lives on surfaces for variable lengths of time¹⁷ and at different temperatures.¹⁸ While transmission from fomites may not be an important source of infection, this is the reason for the recommendation for frequent hand washing and for never touching the face. In an ultrasound unit, the most commonly used materials include metal, plastic, and paper, which can have persistence of virus for 5 days, 2–3 days, and up to 5 days, respectively.¹⁷ There is no guidance for persistence on fabric. Gloves can be used for table paper and linen, which should be transferred to the appropriate bins without shaking. Food and beverages should not be consumed in any areas, which may become contaminated, including exam rooms and ultrasound work rooms. While eating lunch, staff members should be more than 6 feet apart from other staff members.

5. Learners in the ultrasound unit

Initially, in the pandemic, learners were excluded from the exam rooms. As the pandemic has stretched on, it is now recognized that this is not a feasible policy. To minimize learner exposure to staff and patients, the number of learners in our unit is regulated, and learners work in a team with a single, experienced sonographer. All staff members wear eye protection and masks. The presence of learners may be reassessed based on the activity of Sars-CoV-2 in the community.

6. Take ownership of the exam room

Patient history and counseling can be performed at a distance. Patients should be instructed to keep their masks on at all times, and sonographers can attempt to keep talking and laughing to a minimum. Rooms may be able to be arranged so that the patient's face points away from the sonographer if there is a separate monitor for the patient to view the scan (Figure 1). Ideally, only the patient is allowed in the examination room without children. If hospital policies mandate that a support person and/or children can attend the ultrasound examination, the visitor must sit in a dedicated chair more than 6 feet from the sonographer. We have found that placing tape on the floor where the visitor chair is to be positioned helps to prevent the chair from creeping closer to the sonographer (Figure 2).

7. Consider a barrier

While the effectiveness of barriers in ultrasound rooms has not been studied, inexpensive barriers may be considered. Unfortunately, Plexiglass® or similar clear plastic barriers are quite expensive. An alternative is a barrier made of a washable corrugated plastic, which is available in home supply stores and hung from the ceiling with large zip ties (Figure 3). These are available for less than 20 USD. To make them most effective and to minimize interference with the sonographer, the patient's buttocks should be positioned in the joint between the head of the exam table and the body of it, and the end of the barrier should extend to the joint in the exam table. A disadvantage is that the sonographer cannot see if the patient removes her mask.

8. Limit the number of scans

Guidelines proposed by SMFM and ISUOG (see above) offer reasonable guidance for limiting the

number of scans. In our unit, scans are limited to the first-trimester NT scan as well as bloodwork, or a first-trimester dating scan plus cell-free fetal DNA screening, an anatomic survey at 20–22 weeks of gestation to maximize the likelihood that the scan is able to be completed with serum screening at that time if not previously done, and a third-trimester growth scan to detect IUGR in patients where clinical sizing is not feasible. Additional scans are performed only if issues, including increased risk for growth restriction, vaginal bleeding, medical problems, and anomalies arise. We do not perform routine dating scans. Local guidelines are appropriate, and can take into consideration the burden of Covid in the population, and the feasibility of obtaining adequate scanning due to BMI constraints. If local protocols are changed, it may be helpful to keep a record of the protocols and the dates that

Figure 1. The ultrasound bed position was moved so that the patient faces away from the sonographer to view the examination on the auxiliary monitor



Figure 2. An inexpensive corrugated plastic barrier is hung from the ceiling with ties. The barrier is cleaned between patients with the same agents used for the plastic ultrasound table



they are in effect. If vital signs are done at the time of the ultrasound examination, and the chart reviewed to ensure that the patient has had appropriate screening bloodwork, this may allow increased safety for virtual visits with the patient's obstetrics provider.

9. Patients with Covid-19

Patients with known Covid-19 should have routine scans delayed. It is helpful to review the patient list a day prior to the appointment to see if anyone is Covid positive, or when the appointment is confirmed, ask the patient to call for further instructions if she has been diagnosed with Covid-19. This plan should also be communicated to obstetrics providers and residents who may be triaging phone calls.

Ideally, these patients should be scanned at the end of the day. A protocol is helpful to determine

if an individual patient really needs to be seen, and how she will be roomed with a minimum of interaction with the staff. In our unit, patients are escorted to ultrasound room when it is available, and full PPE is used for staff. The ultrasound machine, probe, and cord are covered. Clips and volumes for offline calculations should be considered to minimize scanning time and trainees should not participate in these scans. After the scan, the probes are cleaned with a high level disinfectant and the machine is cleaned according to manufacturer's recommendations. Handheld systems may be considered as they are easier to clean since only urgent cases are scanned.

Donning and doffing of PPE is not easy to do, and not typically performed by sonography staff. The CDC and the WHO do offer guidance, videos, and good infographics to help with this process.^{19, 20} It may be helpful to have staff specially trained in these procedures, or to have only the supervising physician or a dedicated staff member trained in donning and doffing PPE perform scans on Covid-19 positive patients. Ideally, the donning and doffing process should be witnessed by another person.

As physicians and ultrasound providers, we have an obligation to provide excellent care for our patients despite challenging working conditions, including the need to be in close contact with patients for extended periods of time, constraints imposed on us by hospital administrators, variable amounts of PPE, and adherence to masking in the community. These additional suggestions may not prevent all cases of transmission of Sars-CoV-2 to ultrasound providers but they may be helpful in preventing some cases of inadvertent transmission from asymptomatic or mildly symptomatic patients.

Figure 3. The chair for the patient's support person is positioned more than 6 feet from the sonographer. The chair position is marked on the floor to ensure that it remains positioned in the correct spot



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References

1. Covid-19 situation update worldwide. European Centre for Disease Prevention and Control website. <https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases>. Accessed November 29, 2020.
2. Coronavirus in the U.S.: Latest map and case count. The New York Times. <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>. Accessed November 29, 2020.
3. Scientific Brief: SARS-CoV-2 and potential airborne transmission. Centers for Disease Control and Prevention. <https://www.cdc.gov/coronavirus/2019-ncov/more/scientific-brief-sars-cov-2.html>. Accessed November 29, 2020.
4. Huff HV, Singh A. Asymptomatic transmission during the COVID-19 pandemic and implications for public health strategies [published online ahead of print May 28, 2020]. *Clin Infect Dis*. 2020;71(10):2752-2756. <https://doi.org/10.1093/cid/ciaa654>.
5. Ultrasound Covid 19 suggestions. The Society for Maternal-fetal Medicine. [https://s3.amazonaws.com/cdn.smfm.org/media/2550/Ultrasound_Covid19_Suggestions_10-20-20_\(final\).pdf](https://s3.amazonaws.com/cdn.smfm.org/media/2550/Ultrasound_Covid19_Suggestions_10-20-20_(final).pdf). Accessed November 29, 2020.
6. Guidelines for cleaning and preparing external- and internal-use ultrasound transducers and equipment between patients as well as safe handling and use of ultrasound coupling gel. American Institute of Ultrasound in Medicine. <https://www.aium.org/officialStatements/57>. Accessed November 29, 2020.
7. Abu-Rustum RS, Akolekar R, Sotiriadis A, et al. ISUOG consensus statement on organization of routine and specialist obstetric ultrasound services in context of COVID-19. *Ultrasound Obstet Gynecol*. 2020;55:863-870.
8. Abramowicz JS, Basseal JM, Brezinka C, et al. ISUOG safety committee position statement on use of personal protective equipment and hazard mitigation in relation to SARS-CoV-2 for practitioners undertaking obstetric and gynecological ultrasound. *Ultrasound Obstet Gynecol*. 2020;55:886-891.
9. Allen JG, Marr LC. Recognizing and controlling airborne transmission of SARS-CoV-2 in indoor environments. *Indoor Air*. 2020;30:557-558.
10. When and how to use masks. World Health Organization. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks>. Accessed November 28, 2020.
11. Healthcare facility guidance. Centers for Disease Control and Prevention. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-hcf.html#outpatient-ambulatory>. Accessed November 28, 2020.
12. Bhattacharjee S, Bahl P, Chughtai AA, MacIntyre CR. Last-resort strategies during mask shortages: optimal design features of cloth masks and decontamination of disposable masks during the COVID-19 pandemic. *BMJ Open Respir Res*. 2020;7:e000698.
13. Bergman MS, Viscusi DJ, Zhuang Z, Palmiero AJ, Powell JB, Shaffer RE. Impact of multiple consecutive donnings on filtering facepiece respirator fit. *Am J Infect Control*. 2012;40:375-380.
14. Li L, Niu M, Zhu Y. Assessing the effectiveness of using various face coverings to mitigate the transport of airborne particles produced by coughing indoors [published ahead of print December 4, 2020]. *Aerosol Science and Technol*. 2020. <https://doi.org/10.1080/02786826.2020.1846679>.
15. How to make a face shield in 2 minutes. David Price, MD. <https://www.youtube.com/watch?v=pd-sZAQLomg>. accessed November 29, 2020.
16. List N: Disinfectants for coronavirus (COVID-19). United States Environmental Protection Agency. <https://www.epa.gov/pesticide-registration/list-n-disinfectants-coronavirus-covid-19>. Accessed November 29, 2020.
17. Coronavirus and surfaces: How long does COVID-19 live on surfaces. WebMD. <https://www.webmd.com/lung/how-long-covid-19-lives-on-surfaces>. Accessed November 29, 2020.
18. Riddell S, Goldie S, Hill A, et al. The effect of temperature on persistence of SARS-CoV-2 on common surfaces. *Virology*. 2020;17:145.
19. Using PPE. Centers for Disease Control. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html>.
20. COVID-19: How to put on and remove personal protective equipment. World Health Organization. <https://openwho.org/courses/IPC-PPE-EN>