

Maternal Mortality From Coronavirus Disease 2019 (COVID-19) in the United States

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Individual state maternal mortality review committees aim to comprehensively review all maternal deaths to not only evaluate the cause of death, but also to assess preventability and make recommendations for action to prevent future deaths. The maternal mortality review committee process remains critical during the coronavirus disease 2019 (COVID-19) pandemic. Maternal deaths due to COVID-19 have been reported in the United States. Some state maternal mortality review committees may choose to expedite review of these deaths in an effort to quickly provide clinicians with information intended to prevent other deaths during the ongoing pandemic. If states opt to pursue rapid review, entry of data into the Maternal Mortality Review Information Application system for submission to the Centers for Disease Control and Prevention will allow for aggregation nationally without duplication. It will be important to review not only deaths directly attributed to COVID-19, but also those that may be indirectly related to the

COVID-19 pandemic, such as those influenced by changes in care practices or delays in seeking care during the pandemic. Therefore, regardless of the timing of the review, maternal deaths that occur during the time of the COVID-19 pandemic must be evaluated within that framework to ensure that all factors contributing to the death are considered to better understand the context of each of these tragic events.

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Given the death toll from coronavirus disease 2019 (COVID-19), the disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), globally, it is not surprising that we are beginning to see reports of maternal deaths. With these reports come calls for action and questions about how these deaths should be reviewed, including whether review should be expedited, how deaths from COVID-19 will be reported, and how recommendations stemming from review of these cases could change the medical care of women with COVID-19. Ultimately, the goal of all maternal death review should be to prevent other deaths. Given this, how do we most efficiently review these cases to provide information to obstetricians and patients to reduce maternal morbidity and mortality? The answer requires consideration of current processes in place for maternal death review and how these can be flexed to optimize public health efforts. This commentary serves as a guide to maternal mortality review committees and public health officials as we begin to deliberate these important questions.

WHAT DO WE KNOW ABOUT COVID-19–RELATED MATERNAL DEATHS?

Initial reports from the United States are consistent with those from China, demonstrating that approximately 8% of pregnant or postpartum women with COVID-19 have severe disease and approximately 1% are critically ill.^{1,2} Data related specifically to maternal mortality from COVID-19 remain sparse.



Hantoushzadeh et al report seven cases of maternal mortality in Iran believed to result directly from COVID-19.³ Vallejo and Ilgan⁴ report the rapid deterioration and death of a 36-year-old woman in the United States initially presenting at 37 weeks of gestation with shortness of breath who quickly progressed to critical illness and then died after cesarean birth.

HOW ARE COVID-19-RELATED MATERNAL DEATHS BEING IDENTIFIED IN THE UNITED STATES?

We anticipate that the majority of COVID-19-related maternal deaths will be identified based on birth and death certificates through vital statistics processes already in place. In addition, there is a pregnancy checkbox on the current Centers for Disease Control and Prevention (CDC) COVID-19 reporting form.⁵ However, there are limitations to the checkbox, perhaps most prominently that completion of the form is not mandatory, and the individual completing the CDC form would need to be aware of the patient's pregnancy to check the box. These limitations could result in underestimation of the number of pregnant women with COVID-19, especially for those with early pregnancies, and would not detect women who were recently pregnant. On the other hand, there is an awareness that checkbox reporting can inflate maternal death rates, as previously noted based on the death certificate pregnancy checkbox.⁶⁻⁸ Caution must therefore be taken in reporting maternal death rates based on the CDC checkbox alone. Nonetheless, this checkbox method is likely to be helpful for initial surveillance and for ascertainment of cases to review.

WHAT IS THE ROLE OF MATERNAL MORTALITY REVIEW COMMITTEES IN COVID-19-RELATED DEATH REVIEW?

As state and jurisdictional maternal mortality review committees evaluate maternal deaths attributed to COVID-19, there are important considerations, including the timing of the reviews, assessing contributing factors unique to COVID-19, and addressing health disparities in COVID-19-related deaths. Efforts should be made to prevent delay in reviewing maternal deaths from other causes.

Maternal mortality review committees may consider collaborating with existing COVID-19 surveillance teams, creating a special taskforce to review maternal COVID-19 deaths, or adding additional review meetings to the established schedule to minimize delays in reviewing deaths from previous years. Outbreak investigations may be best served by

a small number of individuals with expertise in a particular disease, investigating cases in real-time identified through a variety of reporting mechanisms. Yet, the structured case-identification processes of an established maternal mortality review committee and diverse review committee composition are essential to ensuring consistency of data collection and thorough review to produce recommendations.

State maternal mortality review committees are trained to look at factors beyond patient medical characteristics, with the understanding that health care professional-, facility-, system-, and community-level factors, including social determinants of health, contribute to preventable maternal deaths.^{9,10} With respect to COVID-19-related death reviews, maternal mortality review committees should evaluate contributing factors, including 1) the context and location of the probable SARS-CoV-2 infection; 2) the availability and use of personal protective equipment for work-related infections; 3) the availability and timing of testing; and 4) the timeliness, location, and quality of medical care received. Consideration should be given to the stage of clinical knowledge, resources, public health practices, and local and national policies with respect to SARS-CoV-2 and COVID-19 at the time of death.

Importantly, state maternal mortality review committees are encouraged to be multidisciplinary, and this remains important when reviewing possible COVID-19-related maternal deaths. For example, underlying medical conditions such as hypertension, obesity, and diabetes have been identified as risk factors for death from COVID-19.¹¹ These medical conditions may be significant and could require additional subspecialist expertise when reviewing maternal deaths related to COVID-19.

Guidance from the National Center for Health Statistics emphasizes that cause of death should be determined from a number of sources, including available medical history, laboratory results, autopsy reports, and clinical judgment.¹² In some cases, the decedent may not have had SARS-CoV-2 testing, but there are multiple indications, such as close contact with an individual known to have tested positive for SARS-CoV-2 infection, symptoms of COVID-19, and progression to death from a respiratory illness, which could result in stating that death was due to "probable COVID-19."

On the other hand, the majority of pregnant women with test results positive for SARS-CoV-2 infection are asymptomatic¹³ and may have been identified only through universal testing.^{14,15} In these cases, the death may be in the setting of positive SARS-CoV-2 test results but completely unrelated to a COVID-19 diagnosis.



CONCERN FOR WIDENING HEALTH DISPARITIES IN MATERNAL MORTALITY DURING THE PANDEMIC

Coronavirus 2019 has disproportionately affected people of color and lower socioeconomic status.^{16–19} Similarly, geographic differences may become more pronounced with encouraged social isolation, decreased access to health care resources, and lack of available testing for SARS-CoV-2 infection in rural areas. Yancey reports striking disparities in death rates in Louisiana, with 70.5% of deaths occurring among black people, who represent only 32.2% of the state population. Similar findings were published for Michigan, where 33% of COVID-19 cases and 40% of deaths were among black people, who represent only 14% of the population.¹⁷ These reports are concerning for the possibility of the pandemic further widening the gap in maternal mortality rates between women of color and white women.

The remarkable inequities already experienced nationally in access to care, transportation, housing, and employment have only been accentuated by this pandemic.¹⁸ These complex factors must be considered in assessments of the contribution of health disparities to maternal deaths during the SARS-CoV-2 pandemic. Maternal mortality review committees should seek diversity in committee membership through inclusion of health equity experts and engagement of community members.

MATERNAL DEATHS INDIRECTLY RESULTING FROM HEALTH CARE CHANGES OR LATE PRESENTATION TO CARE DURING THE PANDEMIC

Recent publications raise concern that the current pandemic may have more far-reaching effects on maternal mortality than those deaths directly caused by COVID-19. In a time when emergency department volume is down nearly 50%, there is increasing evidence that patients with medical emergencies are avoiding the emergency department because of fears of contracting SARS-CoV-2 infection, leading to increased morbidity and mortality.²⁰

Using mortality data from the National Center for Health Statistics, excess deaths in the early weeks of the pandemic were estimated at nearly twice what was publicly attributed to COVID-19 at the time. These deaths are not necessarily attributable directly to COVID-19 but likely include individuals who were afraid to seek medical treatment.²¹ For example, the rate of primary intervention for myocardial infarction was significantly lower during the pandemic when compared with before the pandemic.²² Similar trends may be observed for pregnancy-related complications

Box 1. Recommendations for Review of Maternal Deaths During the Coronavirus Disease 2019 (COVID-19) Pandemic

Identify all potential pregnancy-associated deaths during 2020 using standard processes.²³

Consider identifying cases on a rolling basis to quickly ascertain possible COVID-19–related cases.

Consider adding case identification of possible maternal deaths through the pregnancy checkbox on the CDC COVID-19 reporting form.

Consider reviewing 2020 cases with a subcommittee of the existing MMRC or adding additional dates for full committee MMRC review rather than delaying other reviews.

Enter all COVID-19–related deaths in the CDC’s MMRIA system to allow for national aggregation of data.

Consider changes made at the health care professional, facility, systems, and community level in response to the pandemic when assessing preventability and recommendations for action.

COVID-19, coronavirus 2019; CDC, Centers for Disease Control and Prevention; MMRC, Maternal Mortality Review Committee; MMRIA, Maternal Mortality Review Information Application.

such as strokes from untreated severe hypertension or septic shock from peripartum infection. On the other hand, pregnancy-associated deaths such as motor vehicle crashes may decrease during this time as a result of compliance with stay-at-home orders.

Health care professionals and systems need to protect against maternal deaths from causes other than COVID-19, which may occur as a result of both the public and health care system response to the pandemic. Alterations in care practices, including the conversion to telehealth and spacing of visits, can lead to missed or delayed diagnoses, particularly of complications such as hypertensive disorders of pregnancy if women are not adequately equipped with home blood pressure monitors.

Universal screening for SARS-CoV-2 infection and triage of all fevers and respiratory symptoms as suspected COVID-19, especially if performed outside of obstetric units, may delay the recognition and treatment of potentially fatal complications such as pulmonary embolism, peripartum infections, or cardiomyopathy. Loss of family support during prenatal visits, triage, and within operating rooms can mean the loss of an advocate and witness to instruction and care and deterioration of shared decision making. Within our hospitals, diversion of attention toward COVID-19 and away from other clinical concerns may lead to a weakening of other safety practices surrounding indications



for labor induction or cesarean births. Therefore, safety indicators such as severe maternal morbidity should continue to be followed for all women during this crisis.

WHAT ARE THE NEXT STEPS FOR REVIEW OF MATERNAL DEATHS FROM COVID-19?

Specific recommendations for maternal death review by maternal mortality review committees during the pandemic are listed in Box 1. If a state maternal mortality review committee opts to expedite review of probable COVID-19 deaths, use of the standard CDC Maternal Mortality Review Information Application form will allow for national aggregation of these data, at least in the form of a case series, to inform opportunities for prevention. In-depth evaluation of cases in a multidisciplinary group is critical. Regardless of whether these cases are reviewed now or in the future, the context of the pandemic, including health care changes during this time, will need to be considered when evaluating preventability and recommendations for action.

REFERENCES

1. World Health Organization. Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19). Available at: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>. Retrieved May 21, 2020.
2. Breslin N, Baptiste C, Gyamfi-Bannerman C, Miller C, Martinez R, Bernstein K, et al. COVID-19 infection among asymptomatic and symptomatic pregnant women: two weeks of confirmed presentations to an affiliated pair of New York City hospitals. *Am J Obstet Gynecol MFM* 2020 [Epub ahead of print].
3. Hantoushzadeh S, Shamshirsaz AA, Aleyasin A, Seferovic MD, Aski SK, Arian SE, et al. Maternal death due to COVID-19 disease. *Am J Obstet Gynecol* 2020 [Epub ahead of print].
4. Vallejo V, Ilgan JG. A postpartum death due to coronavirus disease 2019 (COVID-19) in the United States. *Obstet Gynecol* 2020 [Epub ahead of print].
5. Centers for Disease Control and Prevention. Human infection with 2019 novel coronavirus case report form. Available at: <https://www.cdc.gov/coronavirus/2019-ncov/downloads/pui-form.pdf>. Retrieved May 21, 2020.
6. Baeva S, Saxton DL, Ruggiero K, Kormondy ML, Hollier LM, Hellerstedt J, et al. Identifying maternal deaths in Texas using an enhanced method. *Obstet Gynecol* 2018;131:762–9.
7. Davis NL, Hoyert DL, Goodman DA, Hirai AH, Callaghan WM. Contribution of maternal age and pregnancy checkbox on maternal mortality ratios in the United States, 1978–2012. *Am J Obstet Gynecol* 2017;217:352.e1–7.
8. Catalano A, Davis NL, Petersen EE, Harrison C, KIELTYKA L, You M, et al. Pregnant? Validity of the pregnancy checkbox on death certificates in four states, and characteristics associated with pregnancy checkbox errors. *Am J Obstet Gynecol* 2020; 222:269.e1–8.
9. CDC Foundation. Building U.S. capacity to review and prevent maternal deaths: report from nine maternal mortality review committees. Available at: <https://www.cdcfoundation.org/sites/default/files/files/ReportfromNineMMRCs.pdf>. Retrieved May 21, 2020.
10. Kramer M, Strahan A, Preslar J, Zaharatos J, St Pierre A, Grant JE, et al. Changing the conversation: applying a health equity framework to maternal mortality reviews. *Am J Obstet Gynecol* 2019;221:609.e1–9.
11. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA* 2020;323:2050–9.
12. National Center for Health Statistics. Guidance for certifying deaths due to coronavirus disease 2019 (COVID-19). Available at: <https://www.cdc.gov/nchs/data/nvss/vsrg/vsrg03-508.pdf>. Retrieved May 21, 2020.
13. Sutton D, Fuchs K, D’Alton M, Goffman D. Universal screening for SARS-CoV-2 in women admitted for delivery. *N Engl J Med* 2020;382:2163–4.
14. Miller ES, Grobman WA, Sakowicz A, Rosati J, Peaceman AM. Universal SARS-CoV-2 testing in pregnancy: clinical implications. *Obstet Gynecol* 2020 [Epub ahead of print].
15. Naqvi M, Burwick RM, Ozimek JA, Greene NH, Kilpatrick SJ, Wong MS. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) universal testing experience on a Los Angeles labor and delivery unit. *Obstet Gynecol* 2020 [Epub ahead of print].
16. Van Dorn A, Cooney RE, Sabin ML. COVID-19 exacerbating inequalities in the US. *Lancet* 2020;395:1243–4.
17. Yancey CW. COVID-19 and African Americans. *JAMA* 2020 [Epub ahead of print].
18. Williams DR, Cooper LA. COVID-19 and health equity—a new kind of “herd immunity.” *JAMA* 2020 May 11 [Epub ahead of print].
19. Chowkwanyun M, Reed A. Racial health disparities and COVID-19—caution and context. *N Engl J Med* 2020 [Epub ahead of print].
20. Wong LE, Hawkins JE, Langness S, Murrell KL, Iris P, Sammann A. Where are all the patients? Addressing COVID-19 fear to encourage sick patients to seek emergency care. Available at: <https://catalyst.nejm.org/doi/pdf/10.1056/CAT.20.0193>. Retrieved May 16, 2020.
21. Brown E, Tran AB, Reinhard B, Ulmanu M. U.S. deaths soared in early weeks of pandemic, far exceeding number attributed to covid-19. Available at: <https://www.washingtonpost.com/investigations/2020/04/27/covid-19-death-toll-undercounted/?arc404=true>. Retrieved April 27, 2020.
22. Garcia S, Albaghdadi MS, Meraj PM, Schmidt C, Garberich R, Jaffer FA, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. *J Am Coll Cardiol* 2020;75:2871–2.
23. Centers for Disease Control and Prevention. Reference guide for pregnancy-associated death identification. Available at: <https://reviewtoaction.org/sites/default/files/national-portal-material/Reference%20Guide%20for%20Pregnancy-Associated%20Death%20Identification.pdf>. Accessed May 29, 2020.

PEER REVIEW HISTORY

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