Screening all pregnant women admitted to labor and delivery for the virus responsible for coronavirus disease 2019

OBJECTIVE: The coronavirus disease 2019 (COVID-19) pandemic sharply escalated in the United States in March and April of 2020. General medical and obstetrical guidelines for managing suspected or confirmed COVID-19 cases mostly rely on maternal symptoms or close proximity to positive contacts to trigger testing and subsequently diagnose COVID-19.[1] However, it has become apparent that most cases of COVID-19 are the result of viral dissemination from asymptomatic individuals.[2] Persons who may unknowingly spread COVID-19 are often young and healthy, which fits the demographic of many obstetrical patients. Because medical staff have been urged to conserve limited personal protective equipment (PPE) for suspected or confirmed cases,[3] the risk of COVID-19 transmission to frontline healthcare workers from asymptomatic carriers has increased. Similarly, the risk of COVID-19 transmission from mother to her infant or to other obstetrical patients on a shared antepartum or postpartum unit has also increased. Therefore, we proposed that routine testing for COVID-19 should be performed in all obstetrical patients admitted to labor and delivery (L&D) unit, regardless of maternal symptomatology, allowing for appropriate triage, adequate obstetrical and neonatal management, and safe patient transport within overcrowded hospitals.

At the time of this writing, COVID-19 testing has been recommended only for patients presenting with symptoms and those in close proximity to laboratory-confirmed positive patients.[4] The Society for Maternal-Fetal Medicine in conjunction with the Centers for Disease Control and Prevention (CDC) have advised not to prioritize testing of asymptomatic patients.[5] This may lead to unrecognized viral transmission and incorrect use of PPE.

The primary objective of this study was to determine the accuracy of maternal symptomatology in predicting COVID-19 as confirmed by rapid laboratory testing. Secondary objectives were the rate of neonatal COVID-19 and the effect of routine maternal testing on the use of PPE compared with its use based on symptom-driven testing.

STUDY DESIGN: This was a retrospective cohort study of all obstetrical patients admitted to L&D from March 30, to April 12, 2020. Routine COVID-19 testing was implemented during this time period. Testing was performed in all admitted patients, regardless of indication for admission or presence of symptoms. Institutional review board approval was obtained in addition to approval by a COVID-19–specific research committee within our institution. The study was performed at the NYU Winthrop Hospital of the NYU Langone Health System; our hospital performs approximately 4800 deliveries per year.

All women were asked about symptoms (fever, cough, shortness of breath). The presence of 1 or more of the aforementioned symptoms was used to determine whether the patient was symptomatic. Sampling was performed by a resident physician or a physician assistant in appropriate PPE using a nasal swab in a negative-pressure room with closed doors. Each nasopharyngeal swab was collected in the GeneXpert Nasopharyngeal Sample Collection Kit for Viruses (Cepheid, Sunnyvale, CA) and transferred to the laboratory. Within the negative-pressure fume hood, 30 mL of viral culture media from the collection kit was transferred into the Xpert Xpress SARS-CoV-2 cartridge (Cepheid, Sunnyvale, CA). The cartridge was subsequently placed in Cepheid's equipment for polymerase chain reaction (Cepheid, Sunnyvale, CA).[6] Polymerase chain reaction test takes approximately 45 minutes. The result was scored as "positive" or "negative." Viral testing was also performed in all neonates born to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)–positive mothers. Results were used in clinical management to triage patients, guide PPE use, and oversee the appropriate maternal and/or neonatal cohorting of patients. The accuracy of maternal symptomatology to predict COVID-19 was tested by constructing a 2×2 table and calculating sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio (sensitivity divided by 1 minus specificity), and negative likelihood ratio (1 minus sensitivity divided by specificity).

RESULTS: A total of 161 patients underwent routine COVID-19 testing upon admission to L&D. Age ranged from 15 to 42 years with a mean age of 31 years. There were 70 nulliparous women (43.4%) and 91 multiparous women (56.6%); 47.2% of women were white, 23.0% were Hispanic, 16.8% were African American, and 13.0% were Asian or Indian.

Of the 161 patients assessed, 32 (19.9%) received COVID-19–positive results, 11 (34%) of whom were symptomatic and 21 (66%) asymptomatic (Table). The sensitivity, specificity, positive predictive value, and negative predictive value of maternal symptoms to predict COVID-19 were 34.4% (11/32), 96.1% (124/129), 68.7% (11/16), and 85.5% (124/145), respectively. The positive and negative likelihood ratios were 8.8 (34.4/3.9) and 0.68 (65.6/96.1), respectively. A total of 29 neonates of COVID-19–positive mothers were tested and

TABLE
Accuracy of maternal symptoms in predicting coronavirus disease 2019 infection

	Positive COVID-19	Negative COVID-19	Total
Symptomatic	11	5	16
Asymptomatic	21	124	145
Total	32	129	161

Sensitivity=11/32 (34.4%); specificity=124/129 (96.1%); positive predictive value=11/16 (68.7%); negative predictive value=124/145 (85.5%); positive likelihood ratio=8.8; negative likelihood ration=0.68.

COVID-19, coronavirus disease 2019.

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they all received negative results (3 results were pending at the time of this writing).

To assess the effect of routine COVID-19 testing on PPE use, we hypothesized that in our sample of 161 patients, 21 additional patients would have required PPE use, as compared with a policy of screening based on maternal symptoms, because these 21 patients were asymptomatic but received positive results for the virus. However, there were 5 patients who reported symptoms but received negative results for COVID-19; thus, PPE use could have been avoided in these patient encounters. The overall effect in terms of PPE use with routine COVID-19 testing, as compared with screening based only by maternal symptomatology, was an increase by 10% (16/161). Of the 32 COVID-19–positive mothers, none of their neonates received positive results.

COMMENT: The results showed that 20% (32/161) of women admitted to L&D were positive for COVID-19; moreover, almost two-thirds (66%) of COVID-19–positive women were asymptomatic. All 29 neonates from COVID-19–positive mothers received negative results.

Routine testing for COVID-19 upon admission to L&D resulted in an overall increase in the use of PPE in approximately 10% of cases. This, however, focused the use of PPE on the right patient encounters.

The results of our study have several important clinical implications. This approach ensures that SARS-CoV-2–positive mothers are accurately identified and triaged. Clinicians can monitor the development of symptoms while these patients are admitted and can allocate inpatient resources appropriately (chest imaging, supplemental oxygen, infectious disease consults) if a mother's respiratory status changes secondary to COVID-19. On a system level, identifying COVID-19–positive mothers has a substantial effect on rooming postpartum patients with and/or near one another and in ensuring safe transfer among hospital units. The SARS-CoV-2 status of a patient allows for designated use of negative-pressure rooms and for appropriate cleaning of these spaces by environmental services after a patient is transported.

Identifying SARS-CoV-2–positive obstetrical patients also has important implications for neonatal care. The CDC currently recommends a shared decision-making process when it comes to possibly separating a newborn and a COVID-19–positive mother.[4] The fear of newborn separation may cause an expecting mother to minimize or even deny her symptoms. Routine SARS-CoV-2 testing would avoid these potential problems and ensure an open, evidence-based dialogue among patients and providers as they plan for postpartum transition using a shared decision-making model. Beyond the patient and hospital levels of care, identifying positive patients may have paramount effects at the population level. Women with evidence of a resolved infection may be eligible to donate their plasma to other patients with COVID-19 who are critically ill or could be approached as potential volunteers in protocols involving future vaccine development.

Routine SARS-CoV-2 testing for obstetrical patients would invariably require the use of more PPE. Inventory of equipment is already limited; hence this could pose a challenge to hospital supply systems. We are already encouraged to use PPE beyond the manufacturers' designated shelf life, and routine testing may heighten this problem.[3] Increased PPE demand would lead to greater production and distribution costs.

Strengths of this study included the timely nature of our findings as the COVID-19 pandemic ensues, death tolls reach record highs, and communities adopt methods of social distancing to flatten the disease curve. Our findings are applicable to the obstetrical population who, regardless of the COVID-19 pandemic, cannot safely avoid or delay contact with hospitals compared with other patient populations because pregnancy is finite. The limited number of patients in our study was a potential weakness. In addition, given that we only investigated obstetrical patients, our findings may not be generalizable to other populations within the medical community. In addition, our study is preliminary and ongoing; hence we do not have any data on pregnancy outcomes. Our results were similar to those reported in a Letter to the Editor in the *New England Journal of Medicine* published on April 13, 2020, reporting that 13.5% of patients during a 2-week time period in 1 institution were asymptomatic and positive for SARS-CoV-2[7]; this finding was very similar to the asymptomatic SARS-CoV-2–positive rate in our population of 13% (21/161).

Our results can be used as a guide to other L&D units in deciding whether all admitted obstetrical patients should be routinely tested for SARS-CoV-2, the virus responsible for COVID-19.

William S. Vintzileos, MD
Department of Obstetrics and Gynecology
NYU Winthrop Hospital
NYU Langone Health
NYU Long Island School of Medicine
259 1st Street
Mineola, NY
william.vintzileos@nyulangone.org

Jolene Muscat, MD
Eva Hoffmann, MD
Nicole S. John, MD
Rosanne Vertichio, MSN, RN
Anthony M. Vintzileos, MD
Department of Obstetrics and Gynecology
NYU Winthrop Hospital
NYU Langone Health
NYU Long Island School of Medicine
Mineola, NY

Duc Vo, MD
Department of Pathology
NYU Winthrop Hospital
NYU Langone Health
NYU Long Island School of Medicine
Mineola, NY

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This communication has been published in the middle of the COVID-19 pandemic and is available via expedited publication to assist patients and healthcare providers.

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