Universal Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2) Testing Uptake in the Labor and Delivery Unit

Implications for Health Equity

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OBJECTIVE: To understand severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) testing uptake in the labor and delivery unit and rationales for declining testing, and to institute a process to increase equitable testing uptake.

METHODS: We conducted a quality-improvement initiative from May 28–June 25, 2020, during the first 4 weeks of universal SARS-CoV-2 testing in the Barnes-Jewish Hospital labor and delivery unit. All consecutive patients presenting for delivery without coronavirus disease 2019 (COVID-19) symptoms were offered testing over four 1-week phases. Phase I documented the rate of testing uptake. Phase II recorded patients' reasons for declining testing. Phase III used phase II findings to create and implement shared decision-making tools. Phase IV offered each patient who declined nasopharyngeal testing an oropharyngeal alternative. The primary outcome was rate of SARS-CoV-2 testing uptake by phase.

RESULTS: Of 270 patients, 223 (83%) accepted testing and 47 (17%) declined. Maternal age and mode of delivery were similar between groups, whereas testing uptake was higher among nulliparous, White, Hispanic, or privately insured patients. There was a significant increase in the primary outcome of SARS-CoV-2 testing across phases I–IV, from 68% to 76% to 94% to 95%, respectively (Somers' D 0.45; 95% CI of association 0.30–0.59). The most commonly cited reason for declining testing was concern regarding testing discomfort. In subgroup analyses by race and insurance type, there was a significant increase in testing uptake across phases I–IV for Black patients (56%, 54%, 91%, 92%; Somers' D 0.36; 95% CI of association 0.28–0.64), White patients (76%, 93%, 96%, 100%; Somers' D 0.59; 95% CI of association 0.38–0.8), those with Medicaid insurance (60%, 64%, 88%, 92%; 95%; Somers' D 0.39; CI of association 0.22 to 0.56), and those with private insurance (77%, 96%, 97%, 100%; Somers' D 0.63; 95% CI of association 0.40–0.86).

CONCLUSION: Universal SARS-CoV-2 testing uptake significantly increased through a rapid-cycle improvement initiative. Aligning hospital policy with patient-centered approaches led to nearly universally acceptable testing.

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Early reports of asymptomatic severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) positivity rates in labor and delivery units with universal testing suggested rates as high as 14% and catastrophic health care worker exposures.[1–3] Many labor and delivery units, including our own, quickly adopted strict infection-control policies, including mandatory separation of patients who tested positive for SARS-CoV-2 infection from their newborns, strict visitor-limitation policies, and various testing strategies for patients admitted for delivery. The downstream con-

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sequences of testing, including newborn separation, quarantine, and potential stigma, fall most heavily on patients of color, who have been disproportionately affected by SARS-CoV-2.[4,5]

Before universally offering SARS-CoV-2 testing, Barnes-Jewish Hospital, an academic tertiary referral center serving a large proportion of high-acuity, low-income patients of color in St. Louis, reversed several early pandemic policies to reduce the downstream effect of a positive test result on families. This included keeping patients who tested positive for SARS-CoV-2 and their newborns together, removing quarantine requirements for asymptomatic patients with pending tests, and allowing at least one continuous visitor for patients with positive test results. Despite these efforts, many patients declined SARS-CoV-2 testing during the first week it was universally offered in the labor and delivery unit. Although elective surgeries can be cancelled if a patient declines preprocedural testing, obstetric care and childbirth constitute emergency services that generally cannot be forestalled, even if the patient declines strongly recommended practices, including universal SARS-CoV-2 testing. Thus, testing was universally offered, but uptake was voluntary.

We quickly realized that testing acceptability varied greatly across the patient population, with nearly one in two Black women declining. The objective of this study was to understand SARS-CoV-2 testing uptake and patients' rationale for declining testing, and to institute a process to increase equitable uptake of testing. The a priori hypothesis was that testing uptake would increase if patients' underlying concerns regarding testing were addressed through a rapid-cycle improvement process to improve universal acceptability.

METHODS

A cross-sectional quality-improvement study of pregnant patients admitted to Barnes-Jewish Hospital for delivery started on May 28, 2020. All pregnant patients scheduled for delivery were advised to undergo testing 3–5 days before admission, and patients presenting for unscheduled deliveries were offered testing on arrival. Pregnant patients who were symptomatic, including fever, cough, or shortness of breath, were excluded from the study because they were not part of the universal asymptomatic testing strategy. The Human Research Protection Office at Washington University in St. Louis deemed the study exempt from oversight as a quality-improvement initiative.

Universal asymptomatic SARS-CoV-2 testing in the labor and delivery unit began with clinical leadership requesting that clinicians initiate SARS-CoV-2 testing for all asymptomatic patients admitted for delivery. A high testing decline rate was noted in the first few days after universal testing was offered, with low testing acceptability noted among patients who were Black or had Medicaid insurance. This observation prompted conceptualization of a rapid-cycle quality-improvement initiative in 1-week phases, which are described in Table 1. The purpose of phase I was to determine the rate of testing decline. Phase II focused on understanding why patients declined testing. A drop-down phrase in the electronic medical record was created for clinicians to document that testing was offered. Patients who declined were asked whether they were willing to share "why" and were offered a standardized list of multiple choices, which were documented in the smart phrase pull down list (Table 1). Potential reasons for decline included concerns about testing discomfort, fear of testing positive, concerns about separation from newborn or family, lack of trust in the medical system, fear that a positive test result would adversely affect care, not believing they had SARS-CoV-2 infection, other, and unknown. In phase III, the research team developed and implemented shared decision-making tools for SARS-CoV-2 testing using both Matlock's principles of design and testing of tools for shared decision-making and patient feedback from phase II.[6] The resulting infographic and clinician script described that the rationale for testing was to protect the patient, family, and medical team from SARS-CoV-2 infection (Appendix 1, available online at http://links.lww.com/AOG/C59). Both tools provided reassurance to patients regarding the finding of a positive test result, including that newborn separation was not necessary unless intensive care was required on a different unit for either mother or newborn. Clinicians were advised to explicitly "recommend" rather than offer testing, and the infographic was given to the patient at the time testing was recommended. Finally, in phase IV, limited-supply oropharyngeal swabs were offered, as part of a hospital-wide initiative, to provide an alternate option for those declining testing with nasopharyngeal swabs. Nasopharyngeal swabs have greater sensitivity than oropharyngeal swabs, but oropharyngeal swabs are associated with less discomfort and are an acceptable alternative.[7]

The primary outcome was the rate of SARS-CoV-2 testing uptake by phase. Secondary outcomes included rationale for testing decline. The primary analysis was stratified by race (White or Black) and insurance type (private or Medicaid). Demographic

Table 1. Description of Study Phases During Universal Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Testing in the Labor and Delivery Unit

Phase	Dates	Description	Tool
I	May 28–June 3, 2020	Document whether the patient declined or accepted SARS-CoV-2 testing	None
II	June 4–10, 2020	Document rationale for declining SARS-CoV-2 testing from multiple-choice options	Potential responses included: 1. Concerned about discomfort during the test 2. Scared to test positive 3. Concerned I would be separated from baby or my loved ones or visitors 4. I don't trust the medical system 5. Scared it will negatively affect my health care and doctors and nurses would treat me differently 6. I don't think I have COVID-19 7. Other 8. Unknown
III	June 11–17, 2020	Develop and implement a shared decision-making infographic and script regarding testing	Infographic* Script*
IV	June 18–25, 2020	Expand SARS-CoV-2 testing to include an oropharyngeal swab as well as a nasopharyngeal swab	None

SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; COVID-19, coronavirus disease 2019.
* Documents included in Appendix 1 (http://links.lww.com/AOG/C59).

information was extracted from the electronic medical record. Race was collected from hospital administrative data, which are based on patient self-report at the time of hospital registration. Choices for race included Black or African American, White, Hispanic, Asian, Pacific Islander, American Indian or Alaska Native, unable to answer, and declined.

Data analysis was performed with descriptive and bivariate statistics with unpaired Student's t test or Mann-Whitney U test for continuous variables and χ^2 or Fisher exact test for categorical variables. Normality of distribution was tested with the Kolmogorov-Smirnov test. The Cochrane Armitage test for trend and Somers' D association were used to evaluate whether SARS CoV-2 testing uptake increased across study phases for the entire sample as well as by race and insurance type. These tests were selected to assess the association between a variable with two categories (testing acceptance or decline) and a variable with X number of ordered categories (phases I through IV). Further analyses with the test of proportions and Somers' D association were used to compare testing uptake between each consecutive phase (I vs II, II vs III, and III vs IV) overall and in subgroup analyses by race and insurance type. Rates of testing uptake and unadjusted relative risks and 95% CIs were calculated for testing uptake for Black compared with White patients and for those with private insurance compared with those with Medicaid insurance. The association of race and insurance type on testing uptake was assessed using multivariable logistic regression. Final models were adjusted for potential confounding variables, including nulliparity, race, and insurance type. The Hosmer-Lemeshow test was used to assess the goodness-of-fit of the final models. The Zhang method was used to estimate the adjusted relative risks (aRRs).[8] Statistical analysis was performed with STATA 12.

RESULTS

Of 289 patients delivering in the labor and delivery unit during the study period, 270 were offered asymptomatic universal testing. Thirteen of the unapproached patients had symptomatic coronavirus disease 2019 (COVID-19), three patients had tested positive months prior, and three patients had prolonged antepartum stays before delivery with no documentation that testing was offered in the chart. Age, mode of delivery, and gestational age at delivery were similar between the 223 (83%) tested patients and the 47 (17%) patients who declined over the four phases. Testing uptake was significantly higher among patients who were White, Hispanic, nulliparous, or had private insurance (Table 2). The 40 patients who

Table 2. Characteristics of Women Who Accepted or Declined Testing

	Accepted Testing (n=223)	Declined Testing (n=47)	*P*
Age (y)	28.8±6.3	27.3±6.1	.724
Race			**.003**
Black or African American	89 (40)	33 (70)	
White	97 (43)	10 (21)	
Hispanic	25 (11)	2 (4)	
Asian	8 (4)	1 (2)	
Pacific Islander	2 (1)	0 (0)	
American Indian or Alaska Native	1 (1)	0 (0)	
Unable to answer or declined	1 (0)	1 (1)	
Nulliparity	90 (40)	10 (21)	**.014**
Delivery mode			.309
Spontaneous vaginal	149 (69)	37 (79)	
Assisted vaginal	17 (8)	1 (2)	
Cesarean	54 (24)	8 (17)	
Classical cesarean	3 (1)	1 (2)	
Gestational age at delivery (wk)	38.0±3.0	38.0±3.0	.846
Preterm birth (less than 37 wk)	34 (15)	6 (13)	.664
Scheduled admission	115 (52)	20 (43)	.261
Insurance type			**<.001**
Private	112 (50)	9 (19)	
Medicaid	111 (50)	38 (81)	

Data are mean±SD or n (%) unless otherwise specified.
Bold indicates statistically significant results.
Percentages may not equal 100 owing to rounding.

declined in phases I and II were similar to the seven patients who declined in phases III and IV, except patients declining in phases I and II were significantly older (27.9 years±6.3 vs 24.0 years±2.4, *P*=.015).

In analysis of testing uptake over the entire study period, there was a significant increase in the primary outcome of SARS-CoV-2 testing uptake across all phases, which rose from 68% to 76% to 94% to 95% across the four phases, respectively (*P*<.001; Somers' D 0.45; 95% CI of association 0.30–0.59) (Fig. 1). Further exploration isolating each of the consecutive phases showed a significance difference only between phase II and phase III (76–94%; *P*<.001; Somers' D 0.34; 95% CI of association 0.14–0.54). The most commonly cited reasons for decline in phase II were concerns regarding testing discomfort (63%, 10/16), patients' confidence that they did not have SARS-CoV-2 infection (13%, 2/16), and unknown (19%, 3/16). The majority of declines in phase III continued to be due to concern for testing discomfort (75%, 3/4), which held true for phase IV with the introduction of oropharyngeal swabs (66%, 2/3 declined due to testing discomfort concerns).

In subgroup analyses of testing uptake across all phases by race, there was an increase in testing uptake for Black patients (56%, 54%, 91%, 92%; *P*<.001; Somers' D 0.36; 95% CI of association 0.28–0.64) and White patients (76%, 93%, 96%, 100%; *P*<.001; Somers' D 0.59; 95% CI of association 0.38–0.8) (Table 3). There was a statistically significant difference in testing uptake between Black and White patients overall only from phases I–IV (aRR 0.90; 95% CI 0.73–1.00) and in phase II (aRR 0.59; 95% CI 0.18–0.95) (Table 3). Subgroup analysis by

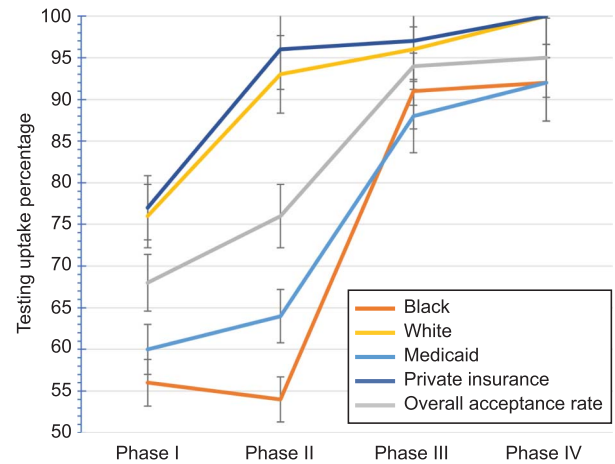

Fig. 1. Universal labor and delivery severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) testing: distribution of women who accepted testing overall and by race and insurance type.

Kernberg. Universal SARS-COV-2 Testing Uptake in the Labor and Delivery Unit. Obstet Gynecol 2020.

Table 3. Universal Labor and Delivery Unit Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Testing Uptake Overall and by Race and Insurance Type

Phase (Goal or Intervention)	Overall Uptake/ Total (%)	Testing Uptake by Race				Testing Uptake by Insurance Type			
		Black	White (Ref)	RR (95% CI)	aRR* (95% CI)	Medicaid	Private (Ref)	RR (95% CI)	aRR† (95% CI)
Overall, phases I–IV combined	223/270 (83)	89/122 (73)	97/107 (91)	**0.80 (0.71–0.91)**	**0.90 (0.73–1.00)**	111/149 (75)	112/121 (93)	**0.80 (0.72–0.90)**	**0.86 (0.67–0.98)**
I (testing uptake rate)	50/74 (68)	19/34 (56)	22/29 (76)	0.74 (0.51–1.06)	0.80 (0.43–1.10)	26/43 (60)	24/31 (77)	0.78 (0.57–1.06)	0.89 (0.51–1.17)
II (rationale for testing decline)	51/67 (76)	15/28 (54)	28/30 (93)	**0.54 (0.40–0.82)**	**0.59 (0.18–0.95)**	27/42 (64)	24/25 (96)	**0.67 (0.53–0.85)**	0.76 (0.21–1.01)
III (shared decision-making tools)	60/64 (94)	20/22 (91)	27/28 (96)	0.94 (0.81–1.10)	0.99 (0.49–1.04)	22/25 (88)	38/39 (97)	0.90 (0.77–1.05)	0.91 (0.42–1.01)
IV (oropharyngeal swabs offered)	62/65 (95)	35/38 (92)	20/20 (100)	0.92 (0.94–1.01)	—‡	36/39 (92)	26/26 (100)	0.92 (0.84–1.01)	—‡

Ref, referent; RR, relative risk; aRR, adjusted relative risk.
Data are n/column N (%) unless otherwise specified.
Bold indicates statistically significant results ($P<.05$).
Percentages may not equal 100 owing to rounding.
* Adjusted for insurance type and nulliparity.
† Adjusted for race and nulliparity.
‡ Could not be calculated owing to cell with a value of zero.

insurance type showed increased testing uptake across the four phases for patients with Medicaid insurance (60%, 64%, 88%, 92%; 95%; $P<.001$; Somers' D 0.39; CI of association 0.22 to 0.56) and patients with private insurance (77%, 96%, 97%, 100%; $P<.001$; Somers' D 0.63; 95% CI of association 0.40–0.86). There was a statistically significant difference between Medicaid insurance and private insurance overall from phases I–IV (aRR 0.86; 95% CI 0.67–0.98), but there were no statistically significant differences between them in each phase (Table 3).

DISCUSSION

In this rapid-cycle quality-improvement study of patients admitted for delivery, uptake of universal SARS-CoV-2 testing significantly increased with identification of patients' rationale for declining, introduction of shared decision-making tools, explicitly recommending testing, and offering oropharyngeal swabs as an alternative to testing with nasopharyngeal swabs. Higher rates of decline overall were seen among patients who were Black or who had Medicaid insurance, but the acceptability of universal testing significantly improved among all patients throughout the four-phased approach. It is possible that unmeasured factors, such as patient's awareness of the pandemic or rates of community spread, influenced study findings throughout the phases. This is suggested by the steepest slop in testing uptake occurring in phase II, before any intervention, among White patients and those with private insurance. The steepest slope among Black patients and those with Medicaid insurance did not occur until phase III, when shared decision-making tools were introduced and testing was explicitly "recommended" by the care team.

During the study period, the confirmed number of cases of SARS-CoV-2 infection in Missouri rose from 1,813 to 2,415, with the positivity rate ranging from 4.9% to 6.7% and an average of 14–33 new cases per day.[9] Labor and delivery units have substantial risk for inadvertent wide spread of disease given rapid patient turnover and unavoidable admissions. Universal testing is a potential strategy to mitigate this risk. However, solely instituting a testing policy is not synonymous with universal acceptance. Instead, universal testing and its downstream consequences may exacerbate known racial disparities in childbirth. Given the disproportionate effect of the COVID-19 pandemic on communities of color, patients of color are more likely to be separated from family and receive substandard care owing to restrictive hospital policies. Although universal SARS-CoV-2 testing has been a commonly reported strategy in labor and delivery units, this report uniquely addresses the rate of testing uptake, which has significant implications for the generalizability and the utility of any testing strategy (Dória M, Peixinho C, Laranjo M, Mesquita Varejão A, Silva PT. Covid-19 during pregnancy: a case series from an universally tested population from the north of Portugal [letter]. Eur J Obstet Gynecol Reprod Biol 2020;250:261–2.).[10,11] Rather than reporting expected concerns regarding the downstream effects of positive test results, most patients concerns were around the anticipated testing discomfort, which is much more easily addressed. Standardizing the discussion of testing using

a shared decision-making tool, giving reassurance regarding the brevity of test discomfort, offering an alternative oropharyngeal swab, and aligning the focus and commitment to dyad-centered care greatly improved the acceptability of testing overall and among subgroups.

These findings should be considered in the context of the following limitations. First, this real-world, rapid-cycle improvement study was not powered to see significant differences in subgroup analyses and is subject to type 2 errors. Second, the most common reason given for testing decline pertained to test discomfort, with no patients citing fear of separation or lack of trust. However, patients may have been reticent to report these concerns to health care workers who were ultimately charged with their care. Third, some patients declined to answer, but this was true for only three patients during the study. Fourth, the oropharyngeal swabs were not available in the hospital until phase IV of the study; therefore, the effect of this option was potentially blunted by phase III shared decision-making tools. Finally, it is likely that other unmeasured factors, such as increasing SARS-CoV-2 incidence and perceptions about SARS-CoV-2 infection varied between phases and influenced patients' decisions to undergo testing, independent of the interventions.

A universal testing strategy does not assure universal acceptability. Thoughtful consideration should be given to how the information will be used. This includes a commitment to family-centered policies and assurance that the patient's care will not be compromised by testing results. Aligning hospital policies and patient care with these values is essential to promoting a universal testing strategy that is also nearly universally acceptable.

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