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COVID-19 in pregnancy: creating an outpatient surveillance model in a public hospital system

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Abstract

Objectives: We describe a standardized, scalable outpatient surveillance model for pregnant women with COVID-19 with several objectives: (1) to identify and track known, presumed, and suspected COVID-positive pregnant patients both during their acute illness and after recovery, (2) to regularly assess patient symptoms and escalate care for those with worsening disease while reducing unnecessary hospital exposure for others, (3) to educate affected patients on warning symptoms, hygiene, and quarantine recommendations, and (4) to cohort patient care, isolating stable infected patients at home and later within the same physical clinic area upon their return to prenatal care.

Methods: Pregnant women in an urban public hospital system with presumed or confirmed COVID-19 were added to a list in our electronic medical record as they came to the attention of providers. They received a series of phone calls based on their illness severity and were periodically assessed until deemed stable.

Results: A total of 83 patients were followed between March 19 and May 31, 2020. Seven (8%) were asymptomatic, 62 (75%) had mild disease, 11 (13%) had severe disease, and three (4%) had critical illness.

Conclusions: We encourage others to develop and utilize outpatient surveillance systems to facilitate appropriate care and to optimize maternal and fetal well-being.

Keywords: antenatal care; COVID-19; pregnancy.

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Introduction

The novel coronavirus SARS-CoV-2 and its associated disease COVID-19 were first reported in Wuhan, China in December 2019. Clinical presentation of pregnant women with COVID-19 ranges from asymptomatic or mild disease, to severe disease with pneumonia, to critical illness and respiratory distress requiring mechanical ventilation. One recent study estimated that in pregnant women infected with SARS-CoV-2 80% had mild disease, 15% severe disease, and 5% critical disease [1], and another study noted the widespread prevalence of asymptomatic infection among term pregnant patients in a high-prevalence area [2].

During the COVID-19 pandemic, the city of New York has had more cases than any other urban area in the United States, with more than 200,000 cases of COVID-19 infection and approximately 21,500 confirmed and probable deaths as of May 31, 2020 [3]. Patient populations that have been historically underserved by the health care system, including racial and ethnic minorities, immigrant groups, and low-income populations have had worse outcomes in New York City during this pandemic, with higher rates of infection and higher rates of serious illness and death [4, 5].

Our institution is a long-standing public hospital located in downtown Manhattan. It is the regional perinatal center for the largest public hospital system in the country with 11 public hospitals located in four of the five boroughs of New York City, all of which provide inpatient obstetric care. It is also home to the Center for Global Health care Special Pathogens Preparedness [6]. As a safety net hospital, our institution has historically provided care for vulnerable populations, the same groups known to be at higher risk of contracting COVID-19.

As the COVID-19 pandemic began, we anticipated that our hospital would care for many patients affected; both in direct admissions as well as transfers from referring network hospitals, and that a portion of these patients would be pregnant. Given the paucity of data available regarding the clinical course and outcomes of pregnant women with COVID-19, we aimed to establish a model to facilitate care for these patients as they moved through different hospital settings, including the emergency room, inpatient care, and outpatient clinics. Our goals with this care model were: (1) to identify and track all known, presumed, and suspected COVID-positive pregnant patients both during their acute illness and after recovery, (2) to regularly assess patient symptoms and escalate care for those with worsening disease while reducing unnecessary hospital exposure for others, (3) to educate affected patients on warning symptoms, hygiene precautions, and quarantine recommendations, and (4) to cohort patient care, isolating stable infected patients initially at home and later within the same physical clinic area upon their initial return to prenatal care.

Materials and methods

This research has been complied with all the relevant national regulations, institutional policies, and in accordance the tenets of the Helsinki Declaration, and has been approved by our Institutional Review Board.

This care model took approximately one week to design and implement. We began by creating a shared patient list in our centralized electronic medical record (EMR). This allowed multiple providers to access the full list, read and update patient information in real time, and schedule and order appropriate follow up visits and tests, all while remaining in compliance with health insurance portability and accountability act (HIPAA) standards. While we initially enrolled patients we encountered in the inpatient labor and delivery setting, we also reached out to colleagues in other point-of-entry sites including the emergency department and outpatient prenatal clinics. Emergency department physicians were asked to contact the obstetrics team with new presumed or confirmed positive cases among pregnant patients, and physicians and certified nurse midwives (CNMs) in the office were asked to add patients to the shared list. It is understood that once a patient is added to the "COVID List," her care is then coordinated by a dedicated smaller group led by a Maternal-Fetal Medicine (MFM) attending. In this sense, the "COVID List" is similar to a "Beta List" that is used by many women's health institutions to track abnormal pregnancies such as ectopic pregnancies.

Once added to the "COVID List," patients' care proceeds through a standardized approach, which involves a summary review, administration of a symptoms-based questionnaire, counseling, and a resulting triage for subsequent care.

The initial call occurs within one day of the patient being placed on the "COVID List" by an attending, physician trainee, or CNM. During this call, we confirm clinical details related to disease course including symptom onset, testing, imaging, obstetric history, and comorbidities (as these are thought to influence disease severity in non-pregnant groups) [7]. The telephone questionnaire inquiring about current symptoms is then administered (Figure 1). We designed our questionnaire template with the expectation that our patients have access only to a thermometer, no home pulse oximetry or other monitoring devices, and would be conducted with audio only, as our institution and patient population do not have uniform access to video capabilities. Our questionnaire reflects guidelines set out by the American College of Obstetricians and Gynecology (ACOG) [8] and Royal College of Obstetricians and Gynecologists (RCOG) [9], as well as regular updates with input from our internal MFMs in conferring with colleagues at other institutions or in different specialties [10]. After reviewing the questionnaire, patients receive guidance on hand hygiene and isolation protocols, and are educated on symptoms that could indicate worsening disease severity and prompt them to seek medical attention. A dedicated contact number, staffed by a trainee physician under MFM supervision, is given to all patients to field additional patient questions or concerns about their illness.

Upon completion of the call, the provider assigns the patient an illness severity based on current symptoms, comorbidities, and prior lab and imaging findings using the categories named in the I-PASS system, a mnemonic created to standardize patient handoffs and enhance patient safety. In the I-PASS system, a patient is assigned an illness severity of stable, watcher, or unstable based on their overall clinical picture [11]. We adopted these illness severity designations, which could change for an individual patient at any point, and used them to determine frequency of follow-up. A "stable" patient has no medical comorbidities and negative responses to all questions, and receives a follow-up call in four days. A "watcher" patient has no new or worsening shortness of breath, but has concerning imaging findings or comorbidities, and receives a follow-up call in one day. An "unstable" patient has worsening or new shortness of breath or any other positive screening symptom of respiratory compromise, and is instructed to present to labor and delivery triage immediately for evaluation (Figure 2). If an unstable patient is identified, the labor and delivery unit is notified and an isolation room is made available in anticipation of the patient's arrival. Those who are not accessible via telephone receive letters encouraging them to contact their providers.

To structure this outpatient monitoring system and schedule future encounters, we created new dedicated televisit clinic panels for these calls. This ensures accurate scheduling, billing, and documentation, and helped keep this process organized especially during high volume surges of COVID-19 patients.

In order to be removed from the "COVID List," we use criteria based on the CDC's guidelines for discontinuing isolation [12]. Patients have to be at least 14 days from symptom onset or three days since last fever, whichever is longer, and symptoms must be improving. When these criteria are met, they are removed from the list and a follow-up in-person appointment is scheduled.

A new clinic panel was created for these in-person follow-up appointments, purposefully timed on a day with lighter clinic flow. The goal of this separate clinic is to cohort the patients with recent COVID-19 infections, reducing their interaction with non-infected patients as well as staff. Adequate personal protective equipment including masks, face shields, gowns, and gloves are available to all providers participating in the clinic; patients are also masked on

OB COVID-19 Telephone Encounter

In brief, patient is a G__P__ at GA___ being followed:
***for positive COVID-19 test on ___ [date].
***as a person under investigation (PUI) due to ___ [symptoms] as documented on ___ [date].

This pregnancy is complicated by ___. She ___ [does or does not have] hypertension, diabetes, asthma, HIV, chronic lung disease, chronic liver disease, chronic kidney disease, or a blood dyscrasia and is not on immunosuppressive therapy.

Her symptoms of ___ began on ___ [date].
Her initial fever was ___ F on ___ [date].

Today she reports: ___ [symptoms]

Normal fetal movement: ___ [yes/no]
Contractions/abdominal pain: ___ [yes/no]
Leakage of vaginal fluid: ___ [yes/no]
Vaginal bleeding: ___ [yes/no]

ACOG COVID-19 Questionnaire:

- Difficulty breathing or shortness of breath?
- Difficulty completing a sentence without gasping for air, or needing to stop to catch her breath frequently when walking across the room?
- Does patient sound short of breath on the phone?
- Can the patient hold her breath for 25 seconds?
- Coughing more than 1 teaspoon of blood?
- New pain or pressure in chest (other than pain with coughing)?
- Unable to keep liquids down?
- Dizziness when standing?
- Less responsive or confused when talking?
- During conversation, was patient was answering questions appropriately?

Fever Assessment:

- Patient's most recent fever? ___ [temp] on ___ [date]
- Persistent fever (Fever >101.0F more than 48hrs after initial fever?) ___ [yes/no]

Assessment/plan: ___ year old G__P__ at GA___ with ***positive COVID-19 test on ***/being followed as a PUI.

Plan:

OPTION 1: no comorbidities, screens negative to all questions – STABLE

Patient screens negative for all warning signs, and as such counseled should remain at home. She confirmed she is able to care for herself and anyone else she is responsible for at home. She was educated on maintaining adequate hydration, hand washing, social distancing and quarantine, monitoring for the above new symptoms, and obstetric warning signs. Provided patient with 24/7 physician on-call number and instructed her to call with any questions/concerns.

Will call her again in 4 days

OR

She now meets criteria for discharge from OB Covid list (given 14 days from beginning of symptoms and/or 72 hours afebrile without antipyretics (whichever is LONGER)) and clinically stable as deemed by telephone check-in. Will schedule patient for COVID Cohort Clinic follow up appointment

OPTION 2: 1 or more comorbidities AND/OR screens positive to mild/improving shortness of breath only AND/OR concerning imaging - WATCHER

Patient has a comorbidity of ___ OR screens positive for mild shortness of breath that is ___ [stable/improving]. She screens negative for all other warning signs, and as such counseled should remain at home. She confirmed she is able to care for herself and anyone else she is responsible for at home. She was educated on maintaining adequate hydration, hand washing, social distancing and quarantine, monitoring for the above new symptoms, and obstetric warning signs. Provided patient with 24/7 physician on-call number and instructed her to call with any questions/concerns.

Will call her again in 1 day

OPTION 3: Patient screens positive to symptoms (other than shortness of breath) or has worsening or new shortness of breath - UNSTABLE

Patient screens positive for concerning symptoms, possibly warranting hospitalization. She was asked to present to labor and delivery triage now for assessment. I advised her to wear a mask or ask for one upon entry to the hospital and to proceed immediately to labor and delivery, and to let the front desk clerk know she is a COVID patient when she gets there. I have also informed the labor and delivery clerk that she is expected so she can be placed in isolation room for evaluation.

Figure 1: Template used by providers to call patients on the "COVID List".

arrival. At the time of these appointments, any lingering symptoms are assessed. Plans can also be made for any necessary nasopharyngeal swabs, such as testing prior to admission for delivery or scheduled cesarean section. Routine prenatal care (the same modified scheduled of routine care we are using for all prenatal visits in the COVID era) is resumed for recovered patients. We keep a separate list of these "COVID graduates" to easily identify and contact these patients should policies and protocols change, or important data later emerges on the long-term sequelae of COVID-19 infection in pregnancy.

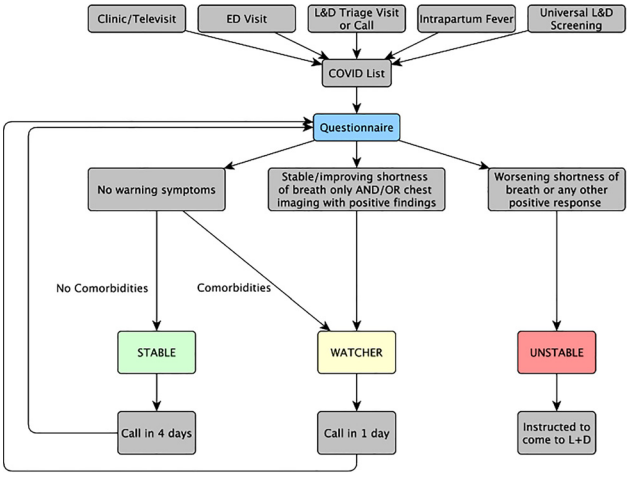

Figure 2: Flowchart demonstrating the entry of patients onto the "COVID List" and subsequent follow-up.

Results

A total of 97 patients were added to the "COVID List" between March 19, 2020 and May 31, 2020. Fourteen patients were added after already meeting criteria for removal from the list and thus did not require calls. The remaining 83 patients required anywhere from one to ten phone calls to facilitate appropriate care, averaging three to four calls each. Forty-two (51%) required use of an interpreter.

Of the 83 patients followed, 42 (51%) had a positive SARS-CoV-2 nasopharyngeal swab while 41 (49%) were presumed positive based on symptoms. Of those presumed positive by symptoms, 32 (78%) had no swab performed and nine (22%) had a negative swab. Ten patients (12%) became known to us after presenting to the emergency department, 37 (45%) from the prenatal clinic, and 23 (28%) after calling or presenting to labor and delivery triage with respiratory symptoms. 11 (13%) were diagnosed on labor and delivery either via universal screening or development of symptoms such as fever in labor. Two patients (2%) self-reported positive tests done elsewhere as outpatients.

During their illness course, seven patients were assigned an illness severity of unstable and directed to present for evaluation following a routine call, five of whom did. Two of those patients did not appreciate their own significant clinical deterioration. Two additional patients presented on their own accord in between calls. Of those seven who presented, six (86%) were admitted due to need for oxygen supplementation.

Of our cohort, seven patients (8%) were asymptomatic and incidentally positive, 62 (75%) had mild disease, 11 (13%) had severe disease, and three (4%) had critical illness. Common comorbidities included asthma, pre-gestational or gestational diabetes, and chronic hypertension. Seven (50%) of those with severe or critical disease had comorbidities while only 22 (32%) of those with asymptomatic or mild disease had comorbidities. There were no maternal or fetal deaths. There was one neonatal death due to a congenital disorder unrelated to COVID-19.

Discussion

We believe there are several strengths of this outpatient model of care for patients with documented or presumed SARS-CoV-2 infection in pregnancy. It provides a standardized, scalable care model to achieve our four goals of tracking, triaging, educating, and isolating COVID-19 patients.

The early creation of a standardized, shareable approach to care for outpatient COVID-19 patients has been an important asset during a time of great disruption in our department and the health care system generally. Our questionnaire templates, embedded in the EMR, allow for standardization of care across multiple hospital sites, clinical settings, and health care providers and these templates can be updated in real time with evolving knowledge and guidelines. By also using a shared centralized patient list, we minimize confusion during provider turnover. This is an important feature for large hospital systems with many staff, academic institutions with rotating trainees, or smaller systems where COVID-related sick leave depletes staffing levels. This model can also accommodate fluctuations ("surges") in the number of patients needing calls, as additional providers can seamlessly join the workflow. While institutions may vary in their EMRs and health care provider makeup, the overall model of a centralized, standardized list of at-risk patients is transferable to many settings.

Within this standardized model, we are able to use our hospital's EMR to easily capture and follow patients with known or suspected SARS-CoV-2 infection who present through any facet of our hospital system. Embedding the model within the EMR also allows for all providers to have access to the most recent patient information simultaneously. We purposefully have a low index of suspicion for triggering follow up; by including patients experiencing a variety of potential symptoms, we are able to match the wide range of presentations described with COVID-19 infection. We also do not exclude patients based on testing history or results, given the limited availability of testing in some areas and poor sensitivity of PCR testing.

By centering this care model within the EMR, we are able to track patients in a user-friendly and HIPAA

compliant manner, both during their acute illness and long-term. Extended follow up allows us the option to contact patients for clinical reasons, as testing guidelines change or new data emerges, or potentially for needed future research regarding the short and long-term effects of COVID-19 infection during pregnancy.

Patients with COVID-19 infection present with a broad range of symptoms and progress through the disease in variable and often unpredictable stages. Our model ensures prolonged, scheduled follow up for these patients, and the use of standardized questions and follow-up algorithms ensures that any concerning evolution of a patient's infection is not missed. This is important as in our experience; patients did not necessarily notice their own deterioration and would not have come in unless otherwise prompted. Further, the addition of the I-PASS classification triggers the team to more closely monitor patients with comorbidities who are at risk for potentially worse disease. After patients are systematically assessed in this way, a MFM specialist can provide individualized expertise to determine the appropriate next step in care. This facilitates timely maternal and fetal treatment and intervention.

While our care model focuses on patients already thought to be infected, it also recognizes the role providers have as stewards of community public health. By discussing warning signs as well as COVID-related public health safety information such a social distancing and hand hygiene when counseling patients, we increase knowledge within patient communities. This information is provided in patient's native language, with the opportunity for direct, one-on-one conversation with a health care provider and a clear method of contact in case of emergency.

This care model is designed to operate primarily remotely, with the option to escalate to inpatient care only when necessary. This decreases travel, which often involves public transit in urban settings, and potential exposure both for other community members as well as health care workers during a pandemic.

We encountered several difficulties with our model. First, some of our patients had incorrect or disconnected phone numbers listed in the chart, leading to inability to establish contact. As telehealth grows, this highlights the importance of ensuring patient contact information is up to date. In addition, our institution does not have the capability to perform HIPAA compliant video calls. Even if we had this technology, our patients may not have had the opportunity to utilize it given lack of access to stable Internet connections or smartphones. It was challenging to learn to adequately assess patients via only voice contact, without the valuable information that can be gleaned from a visual encounter. The ability to correctly triage patients may have been enhanced by additional technology.

This model was created for a large tertiary care center in New York City, but we believe it is applicable and adaptable to different settings around the country including suburban and rural areas. We encourage others to develop and utilize outpatient surveillance systems for pregnant women with COVID-19 in order to facilitate appropriate level of care and to optimize maternal and fetal well-being.

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Ethical approval: This research has been complied with all the relevant national regulations, institutional policies, and in accordance the tenets of the Helsinki Declaration, and has been approved by our Institutional Review Board.

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