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# Use of remdesivir for pregnant patients with severe novel coronavirus disease 2019



**INTRODUCTION:** Coronavirus disease 2019 (COVID-19) has resulted in hundreds of thousands of deaths worldwide.<sup>1</sup> The nucleoside analog remdesivir has shown preliminary efficacy in shortening the duration of moderate and severe COVID-19.<sup>2,3</sup> Data from a randomized controlled trial during the Ebola epidemic suggest safety of remdesivir in pregnancy<sup>4</sup>; however, pregnant women have largely been excluded from clinical trials for COVID-19 treatment options.<sup>5</sup> Here, we briefly describe the treatment of 3 pregnant patients hospitalized at our institution with confirmed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and imaging supportive of lower respiratory disease, who met the criteria for compassionate use protocol of remdesivir.

## CASES:

### Case A

A 25-year-old pregnant woman at 34 weeks of gestation presented with fever, tachycardia, and tachypnea. Chest x-ray (CXR) revealed patchy consolidations, and nasopharyngeal (NP) swab was positive for SARS-CoV-2 by real-time polymerase chain reaction (Table). On hospital day (HD) 2, the patient was transferred to the intensive care unit (ICU) for increasing oxygen requirement on nasal cannula. The patient received a total of 3 doses of remdesivir (Figure), after which additional doses were withheld because of the development of transaminitis. She was ultimately diagnosed with intrahepatic cholestasis of pregnancy (IHCP) in the setting of markedly elevated bile acids. The patient was discharged on HD 8 and underwent an uncomplicated vaginal delivery after scheduled induction at 37 weeks and 2 days of gestation for IHCP.

### Case B

A 28-year-old pregnant woman at 25 weeks of gestation was transferred to our ICU for COVID-19 pneumonia and acute hypoxic respiratory failure requiring bilevel-positive airway pressure ventilation. Remdesivir was initiated on HD 2, and she received 8 doses of remdesivir. By HD 9, the patient's supplemental oxygen requirement resolved, and she was discharged home.

### Case C

A 29-year-old pregnant woman at 25 weeks of gestation presented with 8 days of fever, headache, cough, and shortness of breath. She was tachypneic and tachycardic on admission. CXR revealed hazy opacities, and NP swab was positive for SARS-CoV-2. She developed hypoxia with oxygen saturation of 88% on ambient air and was placed on supplemental oxygen. A total of 2 doses of remdesivir were administered until clinical improvement, and she was discharged on HD 6.

**COMMENT:** As the COVID-19 pandemic continues and pregnant women remain at risk for adverse medical and obstetrical outcomes, having safe and effective therapies, such as remdesivir, is crucial for this population.<sup>6</sup> In our experience, all patients who were receiving supplemental oxygen had resolution of this requirement after initiation of remdesivir. However, a causal relationship cannot be concluded.

**TABLE**  
**Laboratory values of pregnant patients with severe COVID-19**

| Laboratory component<br>Reference range and units | Patient A |           |          | Patient B |           | Patient C |           |
|---|-----------|-----------|----------|-----------|-----------|-----------|-----------|
|   | Admission | Discharge | Delivery | Admission | Discharge | Admission | Discharge |
| WBC count (4.0–11.0 $10^3/\mu\text{L}$ )          | 11.0      | 6.2       | 9.4      | 7.8       | 8.5       | 6.6       | 8.0       |
| Lymphocyte (%)                                    | 7.5       | 28.8      | 23.2     | 8.8       | 21.9      | N/A       | N/A       |
| CRP (<0.50 mg/dL)                                 | 12.20     | N/A       | N/A      | 14.29     | 13.60     | N/A       | N/A       |
| Troponin (<0.017)                                 | <0.017    | N/A       | N/A      | <0.030    | N/A       | N/A       | N/A       |
| Hemoglobin (11.7–15.7 g/dL)                       | 12.4      | 12.4      | 12.0     | 11.2      | 11.4      | 10.9      | 11.0      |
| Creatinine (0.51–0.95 mg/dL)                      | 0.42      | 0.28      | 0.50     | 0.28      | 0.39      | 0.44      | 0.34      |
| AST (10–35 U/L)                                   | 33        | 457       | 19       | 26        | 16        | 21        | 28        |
| ALT (10–35 U/L)                                   | 18        | 432       | 23       | 16        | 14        | 16        | 19        |
| Total bilirubin (<1.20 mg/dL)                     | 0.50      | 0.40      | 0.30     | 0.50      | 0.20      | 0.40      | 0.30      |
| Alkaline phosphatase (35–105 U/L)                 | 135       | 143       | 116      | 77        | 86        | 77        | 83        |
| D-dimer (<0.50 ug/mL FEU)                         | 2.54      | N/A       | N/A      | 0.77      | 2.01      | 1.06      | N/A       |
| Ferritin (13.0–150.0 ng/mL)                       | 97.1      | N/A       | N/A      | 45.6      | 63.8      | 91.0      | N/A       |
| LDH (135–214 U/L)                                 | 416       | 688       | N/A      | 190       | 201       | N/A       | N/A       |
| Lactate (<2.0 mmol/L)                             | 1.9       | N/A       | N/A      | 0.8       | N/A       | 1.0       | N/A       |

ALT, alanine aminotransferase; AST, aspartate aminotransferase; COVID-19, coronavirus disease 2019; CRP, C-reactive protein; FEU, fibrinogen equivalent units; LDH, lactate dehydrogenase; N/A, not available; WBC, white blood cell.

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Case A underscores that the potential side effect of hepatitis with remdesivir use, which has been reported to be 6% to 8% in the nonpregnant population,<sup>2,3</sup> may overlap with pregnancy-related causes of transaminitis, including IHCP; pregnancies of case b and c ongoing at time of this publication. Although this case series is limited in its ability to make broad conclusions, remdesivir was well tolerated in pregnant women and possibly effective. Other than transaminitis, adverse effects of remdesivir were not seen.<sup>3</sup> Corticosteroids were not administered in our patients for maternal or fetal indications. However, recent data demonstrate that dexamethasone may improve outcomes in patients with COVID-19; thus, as indicated for fetal benefit, should be considered for pregnant women with COVID-19.<sup>7</sup>

In each case, the process to obtain remdesivir delayed treatment for our patients by 1 to 2 days. This research highlights the importance of including pregnant women in investigational trials and provision of rapid access to this drug, as pregnant women face increased risk for adverse outcomes in this pandemic.<sup>5</sup>

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**FIGURE**  
**Remdesivir dosing protocol**

#### Remdesivir dosing protocol

- Day 1: Loading dose of 200 mg intravenously (IV) as single dose
- Days 2–5\*: 100 mg IV daily

\*May extend for patients who do not demonstrate clinical improvement

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# Unintended consequences of the transition to telehealth for pregnancies complicated by opioid use disorder during the coronavirus disease 2019 pandemic



**OBJECTIVE:** In response to the coronavirus disease 2019 (COVID-19) pandemic, and to control viral spread among patients and staff, delivery of healthcare rapidly adjusted by reducing in-person patient interactions.<sup>1,2</sup> Worldwide and for a variety of specialties, healthcare protocols were tailored to allow for expansion of telehealth services. For vulnerable populations, such as pregnant women with opioid use disorder (OUD), this shift in practice represented an abrupt transition and compounded the significant barriers to care that already exist for this population.<sup>3,4</sup> Here, we report our experience with implementation of telehealth services for a cohort of pregnant women with OUD.

**STUDY DESIGN:** In our practice, maternal fetal medicine and addiction specialists care for pregnant women with OUD in a colocated office-based outpatient program. A major component of this program is weekly in-person psychotherapeutic/psychoeducational/supportive interventions group therapy. As part of our response to the COVID-19 pandemic, weekly group therapy services transitioned from in-person to virtual meetings between April 1, 2020 and May 26, 2020 to reduce potential COVID-19 exposure among patients and to comply with social distancing as recommended by the Centers for Disease Control and Prevention (CDC). Patients who received individual counseling sessions were also transitioned to virtual sessions. The group prenatal care model transitioned to individual care visits based on a department-developed

algorithm for providing prenatal care during the COVID-19 pandemic, considering the patient's gestational age and acuity of additional medical complications. Visits to obtain urine drug screens (UDS) and prescriptions for medication-assisted therapy (MAT) remained in-person and were adjusted from weekly to biweekly visits on the basis of patient compliance history and availability.

During the reopening phase (after May 27, 2020), a combined approach was adapted in which patients chose either in-person (limited to <10 patients per session in compliance with CDC recommendations for social distancing) or virtual group sessions. Patients attending group care visits in person received a temperature and symptom screen before arrival; visitors, including children, were not allowed to accompany the patient to any outpatient prenatal visit or ultrasound. For this study, patient data on group attendance, UDS results, emergency department (ED) and/or obstetrical triage visits, at-home assaults, overdoses, uptitration of MAT, and opiate craving scores were collected. The opiate craving score is based on a 10-point Likert craving score composed of 3 questions: (1) How much do you currently crave opiates? (2) In the past week, please rate how strong your desire to use opiates has been when something in the environment has reminded you of opiates. (3) Imagine yourself in the environment in which you previously used opiates. If you were in this environment today and if it were that time of