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COVID-19 reinfection in a patient with a serious mental illness within a long-term inpatient psychiatric care hospital

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Abstract

There is an increasing number of case reports of COVID-19 reinfection. The mechanism of reinfection is poorly understood and evolving. Prevention of the transmission of severe acute respiratory syndrome coronavirus 2 for those with a serious mental illness (SMI) living in a congregate setting presents unique challenges. In this case report, we describe an individual with an SMI in a long-term inpatient psychiatric care hospital who was initially diagnosed in June 2020 with COVID-19 infection via a polymerase chain reaction test. Approximately 6 months later, the patient presented with a COVID-19 reinfection and more severe COVID-like symptoms.

Keywords: COVID-19, SARS-CoV-2, reinfection, antibody, immunity, schizophrenia, inpatient, psychiatry, long-term, hospital, congregate setting, serious mental illness, SMI

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Background

COVID-19 was initially reported in December 2019 in Wuhan City, China.[1] This disease, caused by a novel virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), rapidly spread throughout the world, eventually reaching the United States. Due to the widespread infectivity and contagion rate of the virus, the World Health Organization declared it a pandemic on March 11, 2020.[2] As of August 25, 2021, SARS-CoV-2 has become a worldwide health threat infecting more than 213 million people globally and resulting in more than 4.4 million deaths.[3] The most recent data showed that, as of March 2021, an estimated 35% of the COVID-19–related deaths reported in the United States came from long-term care facilities.[4] A COVID-19 infection typically presents with symptoms such as fever, chills, cough, and myalgias.[5] These symptoms can become serious for high-risk groups such as older adults, individuals with certain comorbidities, and those with disabilities.[6] Patients with a serious mental illness (SMI) may be considered a high-risk group if they have trouble understanding information, difficulty practicing infection preventive measures, or reside in congregate living settings. In addition, patients with an SMI are more likely to develop chronic health conditions, such as cardiovascular disease, which increases the risk for severe COVID-19 illness.[7,8] It is also suggested that having a diagnosis of a schizophrenia spectrum disorder may place patients at an increased risk of mortality when diagnosed with SARS-CoV-2.[9] The Centers for Disease Control and Prevention (CDC)[10] acknowledges COVID-19 reinfections, stating that cases of reinfection have been reported but remain rare. The first cases of possible reinfection by SARS-CoV-2 were reported in April 2020,[11]

TABLE 1: Laboratory characteristics in 2020

	June 29	August 15	December 8	December 10	December 28
COVID-19 nasal PCR test	Positive	Negative	Positive	...	...
D-dimer high sensitivity 500	...	...	579.0 ng/mL FEU	...	...
COVID-19 IgG	...	...	...	...	Reactive
SARS-CoV-2 antibody total	...	...	...	Nonreactive	Reactive

FEU = fibrinogen equivalent units; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

and few SARS-CoV-2 reinfection cases have been documented since.[12-16] Here, we report a recurrence of a SARS-CoV-2 infection in a patient with an SMI residing in a long-term inpatient psychiatric care hospital.

In a psychiatric care facility, there are unique challenges encountered when aiming to minimize SARS-CoV-2 transmission among those with an SMI. The National Institute of Mental Health[17] defines an SMI as a mental, behavioral, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities. There may be individuals with an SMI who lack capacity to follow recommended infection control procedures, such as proper hand washing, social distancing, and safe and effective wearing of face masks due to risk of self-injurious behavior or exemption.[18] The CDC recognizes mask exemptions for persons with a disability who cannot safely wear a mask or who are unable to place or remove a mask. It may also be difficult to segregate or isolate patients due to lack of additional space and staff required to accommodate the specialized needs of these individuals. As a result, those residing in a psychiatric congregate setting may be more vulnerable to SARS-CoV-2 exposure even when all the aforementioned precautions are taken.

Case Report

A 35-year-old White male not yet vaccinated for COVID-19 tested positive for COVID-19 via a nasal PCR test on June 29, 2020 (Table 1). His past psychiatric history was significant for schizophrenia treated with clozapine, generalized anxiety disorder treated with duloxetine and clonazepam, panic disorder, and stimulant-use disorder. Medical comorbidities were remarkable for metabolic syndrome, morbid obesity, constipation, and dorsalgia. This patient did not have any known immunological disorders nor was he taking any immunosuppressive medications although clozapine is thought to have an immunosuppressive impact.[19-22] He resided in a long-term inpatient psychiatric care hospital on a unit housing up to 18 patients. Face masks were provided to the patients but not enforced due to the CDC's mask exemption recommendation.[6] The hospital implemented precautions to prevent transmission, and these included testing and isolating all new admissions, prohibiting visitors, daily temperature monitoring for staff, and a mask requirement for all employees.

The patient's initial complaints were a dry cough, sore throat, and mild myalgias. After testing positive for SARS-CoV-2, he was transferred to the hospital's designated COVID-19 quarantine unit and received dexamethasone, albuterol, and over-the-counter medications and supplements (Table 2). His oxygen saturation was consistently above 90%, and he was able to ambulate independently on room air without labored breathing. Resolution of symptoms occurred 14 days after onset. A papular vesicular rash developed on his scalp and torso 14 days following COVID-19 diagnosis and resolved after 2 weeks. On August 15, 2020, 2 months after his recovery, a repeat COVID-19 nasal PCR test was administered with a negative result. No antibody testing was performed at that time.

On November 10, 2020, prior to the patient's second COVID-19 diagnosis, the patient was transferred to a new unit. At that time, the unit was COVID-naive. Per nursing reports, this patient wore his mask appropriately while on the unit; however, most of the other patients did not wear masks routinely. Hospital-wide efforts were made to prevent commingling of patients between units; however, unit staff may have rotated throughout the hospital.

On December 7, 2020, this patient presented with tachycardia, lower extremity myalgias, and diaphoresis. The following day, a COVID-19 nasal PCR test was administered with a positive result. He was transferred to the same designated COVID-19 quarantine unit. A SARS-CoV-2 antibody test was performed during this time, and it resulted as nonreactive. On day 8, a slightly elevated D-dimer of 579 ng/mL fibrinogen-equivalent units was noted, indicating the patient may be in a COVID-associated prothrombotic state; anticoagulation was not initiated.[23] The patient remained symptomatic throughout a 12-day period with chills, congestion, lethargy, and a lingering fever with a maximum recorded temperature of 104.7°F on day 9 despite administration of acetaminophen. Medications ordered during this course of illness are listed in Table 2. Oxygen saturation levels remained above

TABLE 2: Medications prescribed during the course of COVID-19 illness

Medication	Dosage
June 2020: Initial infection	
Acetaminophen tablet	650 mg PO every 4 h PRN
Albuterol 90 mcg/actuation	2 puffs via inhalation every 4 h PRN
Ascorbic acid tablet	1000 mg PO BID
Benzocaine-menthol 15 mg-3.6 mg lozenge	1 lozenge PO every 2 h PRN
Dexamethasone tablet	6 mg PO once daily
Guaifenesin-dextromethorphan 200 mg-20 mg/10 mL syrup	10 mL PO every 6 h PRN
Zinc sulfate capsule	220 mg PO once daily
December 2020: Reinfection	
Acetaminophen tablet	650 mg PO every 4 h PRN
Albuterol 90 mcg/actuation	2 puffs via inhalation every 4 h PRN
Ascorbic acid tablet	500 mg PO BID
Benzocaine-menthol lozenge	1 lozenge PO every 2 h PRN
Dexamethasone tablet	6 mg PO once daily
Guaifenesin-dextromethorphan 200 mg-20 mg/10 mL syrup	10 mL PO every 6 h PRN
Ibuprofen tablet	400 mg PO BID PRN
Insulin glulisine 100 units/mL	Sliding scale PRN
N-acetylcysteine capsule	600 mg PO BID
Pseudoephedrine tablet	30 mg PO TID
Sodium chloride 0.65% nasal spray	2 sprays in each nostril QID 2 sprays in each nostril every 4 h PRN
Zinc sulfate capsule	220 mg PO once daily

BID = twice daily; PO = by mouth; PRN = as needed; QID = 4 times daily; TID = 3 times daily.

90% while ambulating on room air. Fourteen days after initial symptoms, the patient was afebrile and returned to his home unit. Twenty days following symptom onset, he tested reactive for both IgG and total SARS-CoV-2 antibodies. In January 2021, the patient received the first dose of the Moderna COVID-19 vaccine followed by the second recommended dose 28 days later in February 2021.

Discussion

The human body has 2 defense mechanisms against nonself pathogens, innate and adaptive immunity.[24] Innate immunity refers to a nonspecific response that becomes active within hours of an invading pathogen's appearance in the body. Adaptive immunity, activated by virus exposure and involving the harmonizing of T and B cell responses, is responsible for long-lasting immunity to viruses.[25] Infected patients with SARS-CoV-2 likely have detectable antibodies 10 to 14 days after symptom onset. Two studies published[26,27] in *Science Immunology* regarding SARS-CoV-2 reinfections reveal the body's long-lasting immunity to the virus may not be predictable. Data from the 2 studies suggest that individuals who survive a SARS-CoV-2 infection produce protective antibodies against the virus, and they persist for at least 90 to 120 days. Length of antibody retention may be dependent on multiple factors, including severity of illness.[28] Patients who recover from a mild form of COVID-19 may develop very low or undetectable levels of antibodies. It is unknown if this patient developed SARS-CoV-2 antibodies following the initial infection as an antibody test was not performed until after the reinfection. Similar to other case reports,[14-16] this patient was observed to have a worsened symptom severity during his reinfection although he did not require medical hospitalization.

Ensuring those with an SMI who are living in a long-term care facility have access to COVID-19 vaccinations will aid in preventing COVID-19.[5] Preliminary data has shown Moderna's and Pfizer's COVID-19 vaccines are highly effective in preventing COVID-19 (94.1% and 95%, respectively) after receiving both doses.[29,30] There have been no studies to date of people with an SMI with respect to their opinions of SARS-CoV-2 vaccination; however, data from our hospital, which services an SMI population, showed 173 of 218 (79.4%) of the patients received the first dose of the Moderna vaccine when it became available in January 2021. In total, 172 of 218 (78.9%) received the second dose of the vaccine with 1 refusal of the second dose secondary to the patient responding to internal stimuli. Prior to vaccine adminis-

tration, consent forms were completed by the patient or guardian in conjunction with the social work department. Vaccine education was provided by pharmacy, medical, and nursing staff.

Conclusion

Longevity of adaptive immunity after SARS-CoV-2 infections appears variable. Emerging data suggests the role of the body's adaptive immune system may not provide long-term protection against the SARS-CoV-2 virus, and the severity of illness may play a factor. We report here a not yet vaccinated male patient with schizophrenia residing in a long-term inpatient psychiatric care hospital with 2 episodes of COVID-19 infection separated by a symptom-free period of approximately 6 months.

To the best of our knowledge, there are no case reports of COVID-19 reinfection in the psychiatric health care setting. This case report serves to remind clinicians of the potential for COVID-19 reinfection in this environment. Considerations include differing capacities of patients to understand the risks of exposure, mask-wearing safety, significance of hand washing, maintaining distance from others, and importance of COVID-19 vaccination in a congregate setting.

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