

Research Article

Absence of Unrecognized COVID-19 Community Infections in the Greater Chicago Area Using SARS-CoV-2 Reflex Testing, March 2020

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Abstract

We developed a SARS-CoV-2 test based on the CDC protocol to determine unrecognized transmission among patients without risk factors for COVID-19 infection. Hospitalized patients with negative respiratory virus tests received the SARS-CoV-2 test from March 12-22, 2020. We did not find any unrecognized COVID-19 infections with this method.

Keywords: COVID-19; PCR; Respiratory virus; Surveillance

Introduction

Severe Acute Respiratory Syndrome (SARS) CoV-2, the causative agent of COVID-19 illness, is a newly recognized coronavirus infection that emerged in Wuhan city, China in December 2019 with subsequent global spread [1,2]. The first reported COVID-19 case in the United States was in a traveler returning to Washington State from Wuhan city on January 20, 2020. The first case in the greater Chicago area was reported a few days later on January 24, 2020, also in a traveler from Wuhan city who subsequently infected her spouse on January 30, 2020 [3]. There were no further COVID-19 cases in Illinois throughout February 2020. As of May 7, 2020, the total number of cases in Illinois was 70,873 (18.7%) with 3,111 deaths [4].

On January 26, the Centers for Disease Control and Prevention (CDC) released a nucleic acid amplification test protocol for SARS-CoV-2 and shortly thereafter, we implemented our own laboratory-developed test based on the CDC protocol. An emergency use authorization was filed, and on March 12, 2020, we began testing patients for the SARS-CoV-2 virus in response to the identification of a third case in the Chicagoland area on March 1, 2020. Since we had limited initial SARS-CoV-2 testing capacity and were in the midst of the influenza season, we restricted SARS-

CoV-2 testing to patients who fulfilled the CDC definition for testing: fever and lower respiratory symptoms with a history of travel to China, South Korea, Iran, Italy and Japan or contact with a COVID-19 positive case in the previous 14 days [5]. In addition, we elected to perform reflex surveillance testing for SARS-CoV-2 in patients who were sick enough to be admitted to the hospital with influenza-like symptoms but had tested negative for a panel of common respiratory viruses. The goal was to determine if there was ongoing unrecognized community transmission of SARS-CoV-2 among patients without risk factors for COVID-19 infection.

Methods

Patient testing for SARS-CoV-2 began on March 12, 2020 at NorthShore University HealthSystem, a 4-hospital system with 850-bed capacity in the northern suburbs of Chicago. The test was performed using the CDC protocol with minor modifications: the oligonucleotides were synthesized independently (not issued by the CDC) and the samples were tested on the Roche LC480II (Roche Molecular Systems, Pleasanton, CA). Patients that were hospitalized with influenza-like illness were tested for common respiratory viruses using the VERIGENE[®] Respiratory Pathogens *Flex* Test (Luminex, Austin, TX) that detects influenza A and B, respiratory syncytial virus (RSV), rhinovirus, adenovirus, human metapneumovirus, and parainfluenza 1-4. If the respiratory virus

panel (RVP) was negative for all viruses then the sample was sent for SARS-CoV-2 reflex testing. This test protocol started on March 12 and continued through March 22, 2020 at which time, because of increasing number of COVID-19 cases, reflex testing was discontinued. The data was analyzed to determine the effectiveness of this testing strategy in identifying unrecognized cases of COVID-19 infection during the early part of the outbreak in the greater Chicago area. We queried our laboratory information system, SCC Soft Computer (Clearwater, Florida), for all patients tested for both RVP and SARS-CoV-2. All hospitalized patients with a paired sample were included for analysis. Clinical characteristics were determined by reviewing the patient electronic medical records (EPIC Systems, Madison, WI) for clinical diagnosis and the following symptoms at the time of sample collection: fever, cough, shortness of breath, travel to known COVID-19 positive areas, exposure to a COVID-19 positive contact and chronic medical conditions.

Results

There were a total of 169 patients who had both an RVP and SARS-CoV-2 reflex test performed between March 12 to 22, 2020. Thirty patients were excluded from the analysis as they were tested at an outpatient facility, discharged from the Emergency Department, or the SARS-CoV-2 test was intentionally ordered by the physician together with the RVP, leaving 139 patients for the final analysis. The demographics and clinical characteristics of the 139 patients are shown in Table 1. The first COVID-19 infection was diagnosed at our facility on March 8, 2020 and the number of positive tests for SARS-CoV-2 was less than 1% during the start of the study. Only one of the 139 patients tested positive for SARS-CoV-2. This patient was diagnosed with *Campylobacter* bacteremia and gastroenteritis as the cause of hospital admission. The patient had a negative CT chest for COVID-19 pneumonia, underwent repeat SARS-COV-2 testing two days later, and was negative; this likely represented a false positive test. Figure 1 describes the number of respiratory virus cases diagnosed at our healthcare system leading up to and including the investigation period. While the number of respiratory viruses identified using RVP was trending down, there still remained a large number of influenza and RSV cases circulating in the community, which justified our initial reflex testing approach. Because of gradually increasing numbers of SARS-CoV-2 cases, we discontinued reflex testing after March 22 and recommended direct SARS-CoV-2

testing.

Median (IQR) ^a	73 (58-82)
Age group (years)	
0-18	1
19 - 49	21
50-64	26
65-79	49
>80	42
Female sex-no. (%)	70 (50)
Admission diagnosis	No. (%)
Influenza-like illness (ILI)	101 (73)
Nausea, vomiting, diarrhoea	8 (6)
Dizziness	8 (6)
Chest pain	3 (2)
Acute mental status changes	7 (5)
Other diagnosis ^b	12 (9)
ILI Symptoms	No. (% with symptom)
Fever	66 (47)
Cough	74 (53)
Shortness of breath	68 (49)
Chronic disorders	No. (%)
Hypertension	37 (27)
Diabetes	34 (24)
Chronic Obstructive Pulmonary Disease	21 (15)
Coronary artery disease	42 (30)
Chronic kidney disease	19 (14)
Malignancy	19 (14)
Immunodeficiency	1 (.007)
Travel history to area with SARS-CoV-2	1
^a IQR: Interquartile Range.	
^b Other Diagnosis: sepsis (2), leg pain, broken G-tube, dehydration, neck swelling, hypertensive urgency, hypernatremia, uremic encephalopathy, pleural tumor, cellulitis, deep vein thrombosis.	

Table 1: Demographic features and clinical characteristics of patients tested for respiratory viruses including SARS-CoV-2 (N=139).

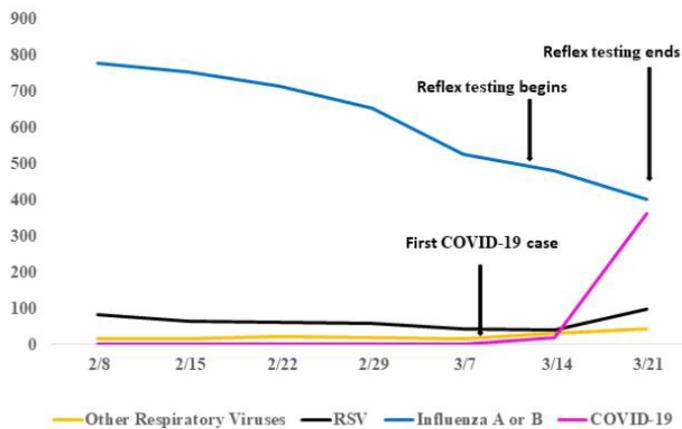


Figure 1: Number of Positive Respiratory Virus Tests at NorthShore University HealthSystem from February 8 to March 21, 2020.

Discussion

We did not find any unrecognized COVID-19 infections during the early part of the SARS-CoV-2 outbreak in our health system using reflex testing of negative RVP specimens, suggesting that the burden of disease was low in the Chicagoland area before March 22. In a study performed using pooled samples from the San Francisco Bay Area in California between January 1, 2020 and February 26, 2020 using patient samples that tested negative for routine respiratory viruses, the positivity rate for SARS-CoV-2 was only 0.07% (2/2888 samples) [6]. In another study done in Los Angeles county using remnant samples that were tested for influenza or RSV from March 2-18, 7/131 (5.3%) were positive for SARS-CoV-2 among patients with mild influenza-like illness [7]. Results of our reflex testing of samples submitted for routine respiratory virus testing did not yield any unsuspected SARS-CoV-2 cases in patients without CDC risk factors for COVID-19 infection. We suspect that the absence of any unrecognized infections during the

start of COVID-19 outbreak in the Chicagoland area was due to a high degree of clinical vigilance for COVID-19 symptoms and risk factors and the ready availability of an on-site SARS-CoV-2 test for rapid diagnosis. Additional surveillance data from the greater Chicago area hospitals are needed to verify the results of our findings. This study is limited in that it was performed for a brief period in a single healthcare system that serves 8% of the overall Chicagoland population. Nevertheless, our findings indicate that the availability of on-site testing capability for emerging viral outbreaks is beneficial and preferred for accurate diagnosis.

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