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The First Patient with Severe COVID-19 in Washington DC, An Example of Early Community Spread of the Novel Virus

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Background:

SARS-CoV-2, also known as COVID-19, which began in Wuhan, China in late 2019 has spread across the world at an alarming rate. Initially, screening patients for the novel disease focused on exposure and recent travel to areas known to be have the disease. In this case, we present the first case of COVID-19 seen in the Washington, DC area with no known exposure or travel, indicating community spread far earlier than initially anticipated.

Case Presentation:

A 59-year-old man presented from the community after a syncopal episode, hypoxia and fever. He had no known exposures to patients with COVID-19, and no recent travel. He was admitted to the hospital and rapidly required increasing amounts of supplemental oxygen. COVID-19 testing was sent on hospital day 2 and returned positive on hospital day 3. The patient was maintained in a negative pressure room and given supportive care throughout his disease. He required neither non-invasive nor invasive mechanical ventilation.

Discussion:

This is the first known case of COVID-19 to present to a Washington DC hospital. It underscores the early community spread of the disease, rather than known exposures or travel. The speed of viral spread and the high infectivity rate suggest that the burden on the medical system seen in New York and Italy are likely to occur across the rest of the United States without continuation of the current social distancing practices being mandated in most states.

Keywords: Pneumonia, Severe Acute Respiratory Syndrome, X-Ray, COVID-19, Hydroxychloroquine

Introduction

On December 29th, 2019 four cases of pneumonia of unknown etiology were linked to the Huanan Seafood Wholesale Market in Wuhan, China.[1] The World Health Organization (WHO) was notified on December 31st, and the Seafood Wholesale Market was closed on January 1st 2020.[1] By then, the known number of infected individuals had increased to 47 people, many of whom had contact with the market. By January 11th, it had spread to 248 more people, most had no contact with the market.[1]

This disease was later demonstrated to be the result of infection by the novel coronavirus, SARS-CoV-2, later termed "Coronavirus disease 19" or "COVID-19".[2,3] Early in the outbreak, epidemiologic studies demonstrated a doubling time of 7.4 days (CI 4.2-14).[1]

On January 30, 2020, the WHO declared the outbreak a Public Health Emergency of International Concern (PHEIC). On the date of our patient's diagnosis, March 7, 2020, there were 435 confirmed cases of COVID-19 in the United States, with 19 deaths,[4] and a total of 106,

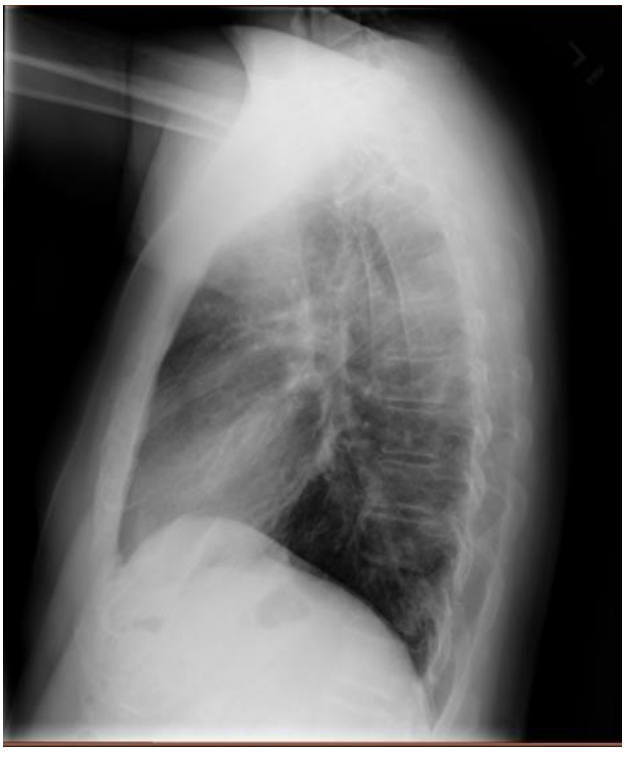
099 worldwide. As of April 5, 2020, there were 328,662 confirmed cases in the United States, with 9,365 deaths, and a total of 1,258,198 cases worldwide.[5] We present the first case identified in Washington District of Columbia on March 7, 2020.

Written informed consent for the case (including images, case history and data) was obtained from the patient for publication of this case report.

CASE

The patient is a 59-year-old male with a past medical history of non-insulin dependent type II diabetes mellitus, hyperlipidemia, and tobacco use (25 pack-years) who on March 03, 2020, presented to his urgent care clinic for one week of flu-like symptoms. He initially experienced a sore throat, which resolved spontaneously, followed by dyspnea, cough productive of clear sputum, myalgias, night sweats, and subjective fevers. At this initial urgent care visit, he was tachypneic at 24 breaths per minute and febrile at 38.0 C. Oxygen saturation (SpO2) on room air was 92%. He denied international travel and sick contacts. His complete blood count and basic metabolic panel were unremarkable. Rapid flu test was negative. Chest x-ray (images 1a-b) **Image 1a and 1b. 3/3/2020 CXR PA and Lateral** taken after approximately 7 days of symptoms. These images show mild hazy airspace opacities in the right upper and right lower lobe.

1A



1b

revealed right upper lobe and right lower lobe opacities consistent with pneumonia. He was advised to go to the emergency department due to hypoxia, but he declined. He was prescribed a 5-day course of oseltamivir (Tamiflu) and amoxicillin-clavulanic acid.

In the following two days, his symptoms worsened. In addition, he experienced decreased appetite and diarrhea. In the morning of March 05, 2020, he had a pre-syncopal episode while in the shower. He was once again referred to the emergency department.

In the emergency department, he was found to be hemodynamically stable. SpO2 was 92-93% on room air. He appeared fatigued and experienced rigors despite multiple blankets. Breathing was shallow and there were crackles heard in the right midlung and left lower lung fields. Within 4 hours from arrival, SpO2 decreased to 87%. He was placed on 3 liters of oxygen via nasal cannula with an adequate response to 96% SpO2. Repeat chest x-ray (images 2a-b)

Image2A

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Image 2B

Images 2a and 2b. 3/5/2020 CXR PA and Lateral taken in the setting of worsening dyspnea. These images show patchy airspace opacities in the right upper and right lower lobes, mildly worsened since study 2 days prior. There is a new fluffy airspace consolidation in the left midlung zone.

demonstrated worsening of pulmonary infiltrates and a new consolidation in the left midlung field. Total white blood cell count was 5,000 per microliter of blood. He was given a 1-liter bolus of lactated ringer's solution and started on oseltamivir, ceftriaxone,
and azithromycin. He was admitted to the hospital for acute hypoxic respiratory failure secondary to suspected multifocal community acquired pneumonia.

Upon further questioning, the patient revealed that he is a member of an Episcopal congregation that has many international patrons. During religious services, many members of the congregation share wine from the same cup. Considering the high likelihood of COVID-19 pneumonia, the patient was moved into a negative pressure isolation room. A respiratory viral panel was collected. On March 06, 2020 (hospital day 2), the respiratory viral panel returned negative for the more common upper respiratory tract infection viruses. The CDC was then contacted to arrange for COVID-19 testing. On March 7, 2020, the hospital received notification of a presumptive positive result for COVID-19.

The Infectious Disease team was consulted. Empiric antibiotics were continued. On March 07, 2020 (hospital day 3), the patient developed worsening hypoxia and was transferred to the intensive care unit. Repeat chest x-ray (image 3)

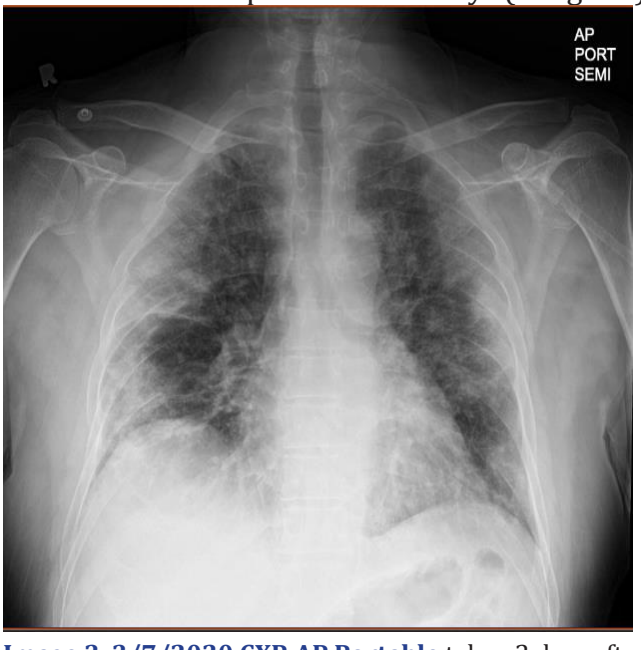

Image 3. 3/7/2020 CXR AP Portable taken 2 days after last image in setting of worsening hypoxia. This image shows widespread peripheral airspace opacities in both lungs consistent with a worsening multifocal pneumonia.

demonstrated worsening bilateral airspace disease. On March 08, 2020, the patient required 12 liters/min oxygen supplementation to maintain a SpO2 ranging from 93 to 95%. Chest x-ray (image 4) showed a slight worsening of airspace disease in the left upper lung. A request to Gilead pharmaceuticals for Remdesivir was denied.

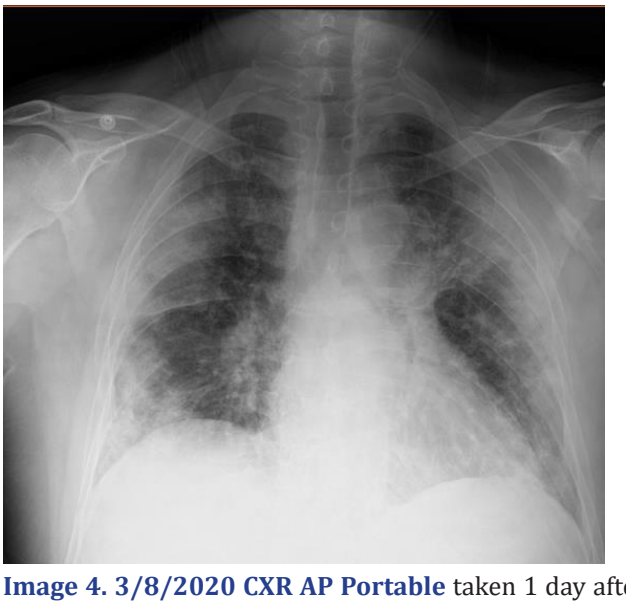

Image 4. 3/8/2020 CXR AP Portable taken 1 day after last image due to increasing oxygen requirements. This image re-demonstrates widespread peripheral airspace opacities in both lungs with slight worsening in the left upper lung.

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On the morning of March 11, 2020 (hospital day 7), the patient's respiratory status improved with a reduction in oxygen requirements to 5 liters nasal cannula. He completed 6 days of ceftriaxone and 5 days of azithromycin and oseltamivir. Myalgia, dyspnea, and productive cough improved yet, he continued to have headaches with intermittent fevers and persistent hypoxia, requiring 2 liters of oxygen via nasal cannula. On March 15, 2020 (hospital day 11), his temperature was 38.1 C. Repeat chest x-ray (image 5)

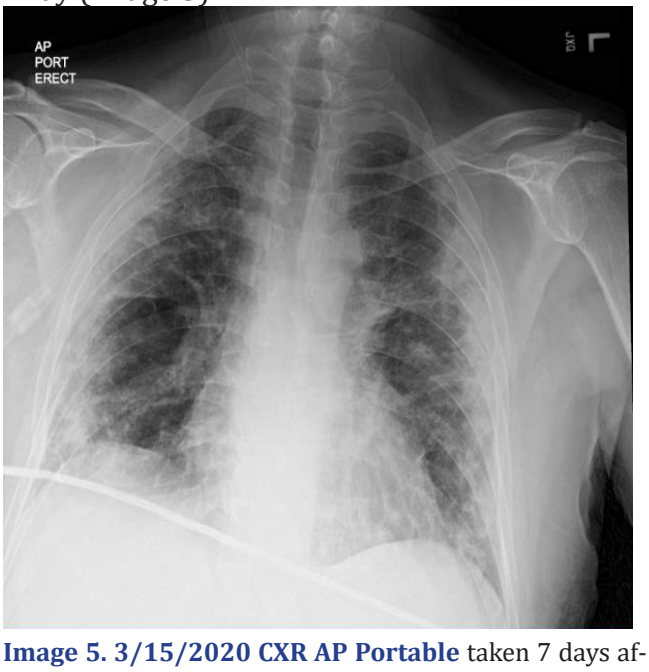

Image 5. 3/15/2020 CXR AP Portable taken 7 days after the last chest x-ray (image 4) due to persistent fevers despite improved oxygenation. This image shows a slight decreased density of airspace disease in the central portions of the lungs with residual airspace disease appearing mostly peripheral.

showed a slight decreased density of airspace disease in the central portions of the lungs with residual airspace disease appearing mostly peripheral. Labs were significant for elevated ferritin 2,129 milligrams per liter and CRP 193 nanograms per milliliter as well as elevated transaminases with aspartate aminotransferase of 92 units per liter and alanine aminotransferase of 121 units per liter (normal on admission). Complete blood count, basic metabolic panel and urinalysis were unremarkable. Antibiotics were deferred as his ongoing fevers were suspected to be due to COVID-19 alone however he subsequently developed a mild leukocytosis to 13.8k/uL. Two nasopharyngeal and oropharyngeal samples were sent on March 14 and 15, 2020. All were negative for SARS-CoV-2 RNA except for the oropharyngeal sample sent on March 15, 2020. He was started on a 5-day course of azithromycin and hydroxychloroquine on March 19, 2020 (hospital day 15).

On March 21, 2020 (hospital day 17), the patient complained of pleuritic chest pain and generalized malaise. Bilateral lower extremity duplex ultrasound was negative for deep vein thrombosis. CT abdomen, and pelvis were non-contributory. CT pulmonary angiogram was negative for pulmonary embolism yet demonstrated diffuse peripheral patchy consolidation and ground glass opacities involving all 5 lobes. The patient was last febrile (38.0 C) on March 21, 2020. By March 26, 2020, his oxygen requirements were reduced to 2 liters nasal cannula on exertion. He was discharged home on March 26, 2020 (hospital day 22) with home oxygen.

DISCUSSION

The clinical presentation of COVID-19 has varied from asymptomatic to respiratory failure and to multisystem organ failure. Incubation period falls between 2-14 days, with a mean of 5 days.[6] The most common symptoms at presentation are fever (88.5%), cough (68.6%), myalgia or fatigue (35.8%), expectoration (28.2%) and dyspnea (21.9%), less common symptoms include headache or dizziness (12.1%) diarrhea (4.8%), and nausea (3.9%).[7] Common laboratory abnormalities include lymphocytopenia (64.5%), increased CRP (44.3%), increased LDH (28.3%), and leukocytopenia (29.4%).[7] Current analysis of pulmonary imaging shows an early bilateral lung involvement with multifocal patchy opacities in up to 75% of individuals diagnosed with COVID-19.[8] Typically, these opacities are localized to the peripheral lung fields. Follow up imaging has revealed persistent opacities with minimal progression or even regression.[8] In terms of severity, the Chinese CDC reported that 81% of cases fit into mild disease (non-pneumonia or mild pneumonia) with symptoms of mild fever, dry cough, nasal congestion, malaise, headache, and/or myalgias. 14% of cases were considered severe (dyspnea, hypoxia, lung infiltrates >50% within 24 to 48 hours), and 5% were critical (respiratory failure, septic shock, and/or multiple organ dysfunction or failure).[9,10]

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This patient case is the first confirmed case of COVID-19 in Washington, District of Columbia. This case emphasizes three important features of COVID-19: (1) This is a local disease as evident by community spread, (2) the clinical course, specifically hypoxic respiratory failure, can progress over a matter of hours, and (3) the clinical course is long which will put significant strain on the healthcare system.

Community Spread

Prior to our patient's presentation, the CDC had recommended only screening those with recent travel to China or those in contact with suspected or confirmed COVID-19, neither of which our patient had. His symptoms, which included sore throat, cough, dyspnea, fever, and diarrhea, were nonspecific, making it difficult to distinguish COVID-19 from any of the more common viral respiratory infections. All members of the same Episcopalian congregation as our patient have been asked to undergo home quarantine for 14 days.

Prior coronavirus outbreaks, such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), were effectively controlled with isolation, quarantine, and public health measures. Using these measures, most secondary transmissions of SARS and MERS were in a hospitalized setting, whereas for COVID-19, most of its spread currently is through close contacts.[10] Given the wide spectrum of symptoms associated with COVID-19, identification and isolation of those affected has been difficult to achieve. In addition, this delay in diagnosing COVID-19 allows for increasing difficulty in tracing close contacts and creates the potential for superspreading, which was seen in both MERS and SARS.[11] However, with community contact already prevalent both in the United States as well as many other countries worldwide, more extreme public health measures must be taken including social isolation, mass quarantine (as seen in Italy and China), and cancellation of mass gatherings such as conferences and religious gatherings.[12]

Several retrospective analyses have been performed on the data from China. Li et al. studied confirmed cases that had been reported by January 22, 2020. The mean time from illness onset to first medical visit was 5.8 days.[1] The mean time from first symptoms to hospital admission was 12.5 days.[1] Based on these data, it is apparent that many patients, after initially presenting to a medical provider with symptoms, were not admitted to a hospital immediately, likely increasing the rate of community spread. After the first medical visit, most patients progressed to dyspnea and other severe complications which led to admission almost 2 weeks after symptom onset. Unlike SARS and MERS, patients with COVID-19 have high viral loads while asymptomatic, and there are known cases related to asymptomatic carriers.[13-15] It is unclear how many asymptomatic carriers, or patients with mild disease were present during the initial outbreak.

Mortality and Rapid Deterioration

In patients admitted for COVID-19, estimates of mortality are inconsistent, with fatality rate ranging from 0.29%16 to 7%.[7] A metanalysis of 8 studies with 1560 cases of COVID-19 showed a fatality rate of 5%.[7] Of those patients who died, 31.5% had one or more of the following characteristics: advanced age (>60 years), cancer, other underlying diseases, or major infections.[7] In a retrospective study, incidence of cardiovascular comorbidities and of diabetes was at least 2x higher in ICU or severe cases than in non-severe cases,[17] and patients with diabetes or coronary artery disease had a higher mortality rate.[18] In another retrospective analysis of 191 patients discharged or deceased by January 31, 2020, older age, lymphopenia, leukocytosis, elevated ALT, LDH, Troponin, D-dimer, ferritin, IL-6, creatinine, procalcitonin were all independently associated with death.[18] Specifically for D-dimer, a level > 1.0 ug/mL was associated with a fatal outcome.[18] Compared to survivors, non-survivors had lower lymphocyte count at presentation.[18] The most common complications among survivors and non-survivors were sepsis (59% vs 100%), respiratory failure (54% vs 98%), acute respiratory distress syndrome (ARDS) (31% vs 93%), septic shock (20% vs 70%) and heart failure (23% vs 52%). Furthermore, 31 out of 32 patients who underwent invasive mechanical ventilation did not survive.[18]

A particularly concerning complication of severe COVID-19 pneumonia is the rapid deterioration in respiratory status, commonly to ARDS. The median time from admission to

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ARDS in Wuhan was 2 days.[19] A case series of critically ill patients with severe COVID-19 pneumonia in Kirkland, Washington, found that 53% of patients requiring mechanical ventilation developed severe ARDS by 72 hours.[20] While in the emergency department on March 5, 2020, our patient had an oxygen desaturation from SpO2 of 92% to 87% in just a matter of four hours. Fortunately, he did not progress to severe respiratory failure and was spared the need for mechanical ventilation. At most, our patient required 12 liters of oxygen that was delivered via high flow nasal cannula (HFNC). Whether HFNC or noninvasive mechanical ventilation should be avoided because of the potential of producing aerosols remains controversial.[21]

Strain on Healthcare Systems

Current data on healthcare burden related to COVID-19 are lacking. Our patient was admitted to the hospital for a total of 22 days. The mean hospital length of stay among 201 patients in Wuhan was 13 days.[19] The termination of transmission-based precautions must be continued until there is resolution of fever, improvement in respiratory symptoms, and negative results of a molecular assay for detection of SARS-CoV-2 RNA from at least two consecutive nasopharyngeal swab specimens collected ≥24 hours apart.[22] Discharging to a nursing facility may be more difficult as the facility must be able to adhere to infection prevention and control recommendations.

In the retrospective analysis by Zhou et al., the median viral shedding time for survivors was 20.0 days (95% confidence interval 17-24).[18] There was a wide range of viral shedding, however; from 8-37 days.[18] Consequently, patients should be regularly screened after discharge to determine when they can be removed from quarantine.

There is no argument regarding the global lack of preparedness for this novel viral pandemic. There has been a national shortage of personal protective equipment (i.e. respirators, gloves, face shields, gowns) in hospitals across the United States. This issue has led to requests to private businesses or persons with excess supply of face masks to donate for healthcare provider use. Of grave importance, there is a significant gap between national strategic reserves of mechanical ventilators and the estimated ventilators needed for U.S. patients with COVID-19.[23] Due to the high mortality rate of those requiring intubation for COVID-19 pneumonia, high risk to health care personal, and low resources, hospitals in the U.S. are now considering a universal Do-Not-Resuscitate order for critically ill patients with confirmed COVID-19.[24]

CONCLUSION

We present the first case of severe COVID-19 pneumonia in Washington, D.C. This case is an example of the community spread, rapid deterioration of respiratory status, and strain on our healthcare systems due to the novel coronavirus pandemic. As of today, our current focus is on prevention of viral spread with physical distancing, closure of heavily populated areas and businesses, and government-orders for nonessential workers to stay at home. The daily number of new cases have yet to respond to said measures in the United States, where the number of confirmed COVID-19 cases has now surpassed that of China.[4] Despite current measures, serious concerns exist on how hospitals will be able to meet the demands of a potential disaster surge.

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