LETTER TO THE EDITOR

Telehealth for COVID-19 in World Trade Center Responders: Meeting the Needs of This Unique Population

To the Editor:

On March 22, 2020, as cases of SARS-CoV-2 infection surged in New York City (NYC), Governor Andrew Cuomo issued an executive order closing all non-essential services in New York State.[1,2] Outpatient primary and specialty care clinics closed, and all elective, non-urgent visits and medical procedures were cancelled. Social isolation measures included quarantines, stay-at-home orders, travel restrictions, and school and non-essential business closures.[3] Emergency departments (EDs) in NYC began to fill with patients with COVID-19 symptoms, and many hospitals experienced significant surges of seriously ill patients requiring hospitalization and critical care. NYC became the epicenter of the pandemic with more than 23,112 COVID-19 cases and 365 deaths reported by March 27, 2020 (Fig. 1).[4]

To reduce the growing burden on health facilities, public health authorities and political leaders encouraged NYC residents to avoid seeking care in EDs or hospitals for mild to moderate illnesses (see Tweet, Fig. 1).[5] The repeated advisories to avoid EDs unless seriously ill and

increased fear of contracting the virus in healthcare settings inhibited many patients from seeking care. ED visits in some NYC hospitals fell by 50% despite the dramatic surge in COVID-19 cases.[6] Virtual care options such as telemedicine were uncommon in NYC before the pandemic and during the initial weeks of the surge were yet to be reliably established.[7] Dissuaded from seeking care unless critically ill, fearful of contracting the virus in healthcare settings, and with limited ability to contact usual providers, many New Yorkers did not have access to medical care during the early stage of this crisis.[7] Among these New Yorkers were those followed by the World Trade Center Health Program (WTCHP) at Mount Sinai Hospital in NYC, a federally funded clinic providing non-urgent care to first responders for illnesses related to exposure to dust at GZ following the 9/11 terrorist attacks.

Transition to Acute Care for COVID-19 Via Telehealth

On March 17, 2020, following lockdown orders, the Mount Sinai WTCHP ceased in-person clinic visits and began working rapidly to transition to virtual care. On March 21, the first Mount Sinai WTCHP patient reported shortness of breath and low fever. Unable to reach his private physician, he sent an electronic health record (EHR) message to his WTCHP provider seeking urgent care and advice. WTCHP clinicians worked together virtually to arrange for transfer to the ED. Given the unprecedented and uncertain nature of the pandemic and the possibility that this population had unique susceptibility to SARS-CoV-2 infection or progression to serious disease, it became clear that the WTCHP should prepare to respond to similar requests from patients with acute illnesses consistent with COVID-19 who were unable to access usual or urgent care. The circumstances necessitated a rapid and substantial reconfiguration of clinic services for WTCHP patients disconnected from usual care and concerned about SARS-CoV-2 exposure or infection. Program providers and clinic leadership felt a moral and ethical duty to rapidly pivot to acute services to fill the care gap and support patients during this unprecedented crisis. On March 23, the Mount Sinai WTCHP established a rapid response team—the WTC COVID Team—to serve

patients disconnected from usual sources of care and seeking support and/or treatment for COVID-19. We sought to: 1) rapidly respond to WTCHP patients seeking care for suspected or confirmed COVID-19; 2) monitor disease severity, risk of decompensation, and need for ED transfer via frequent patient assessments; 3) maintain patients at home to reduce disease spread and unburden hospitals; and 4) maximize virtual care platforms to assist in appropriate evaluation and triage.

METHODS

The WTC COVID Team comprised experienced WTCHP healthcare professionals with complementary skills: two physicians, one nurse practitioner, and a registered nurse. The team consulted as needed with the WTCHP pulmonologist and mental health providers, as well as a health system infectious disease specialist to discuss case management and coordinate care. To stay abreast of rapid developments, we engaged a research consultant to review and summarize relevant medical literature and local, state, and national government briefings.

Initially, WTCHP patients directly contacted program staff and providers seeking assistance for exposures or potential infections. Therefore, the first patients were self-referring. With the shift to telehealth, WTCHP providers began to refer patients with suspected COVID-19 infections to the WTC COVID Team for evaluation, care coordination, data capture, or ongoing management. We describe this experience and our recommendations for flexibly implementing new approaches to care to meet the unique needs of the WTCHP population.

Establishing Team Workflow

WTC COVID Team members committed to daily meetings, data capture and analysis, creation and use of uniform intake forms and EHR SmartSets, on-call evening and weekend duty, and care coordination as needed with providers, specialists, EDs, hospitals, pharmacies, or other medical suppliers. At other times, team members contacted each other as needed to discuss cases or collaborate on management decisions.

Developing Telehealth and Remote Patient Monitoring Capabilities

Actively managed patients were evaluated by the WTC COVID Team via real-time audio and/or video telemedicine visits and through asynchronous communication via

Address correspondence to: Emily Senay, MD, MPH, Icahn School of Medicine at Mount Sinai, Department of Environmental Medicine and Public Health, 17 E. 102nd, New York, NY 10029-6023 (Emily.senay@mssm.edu).
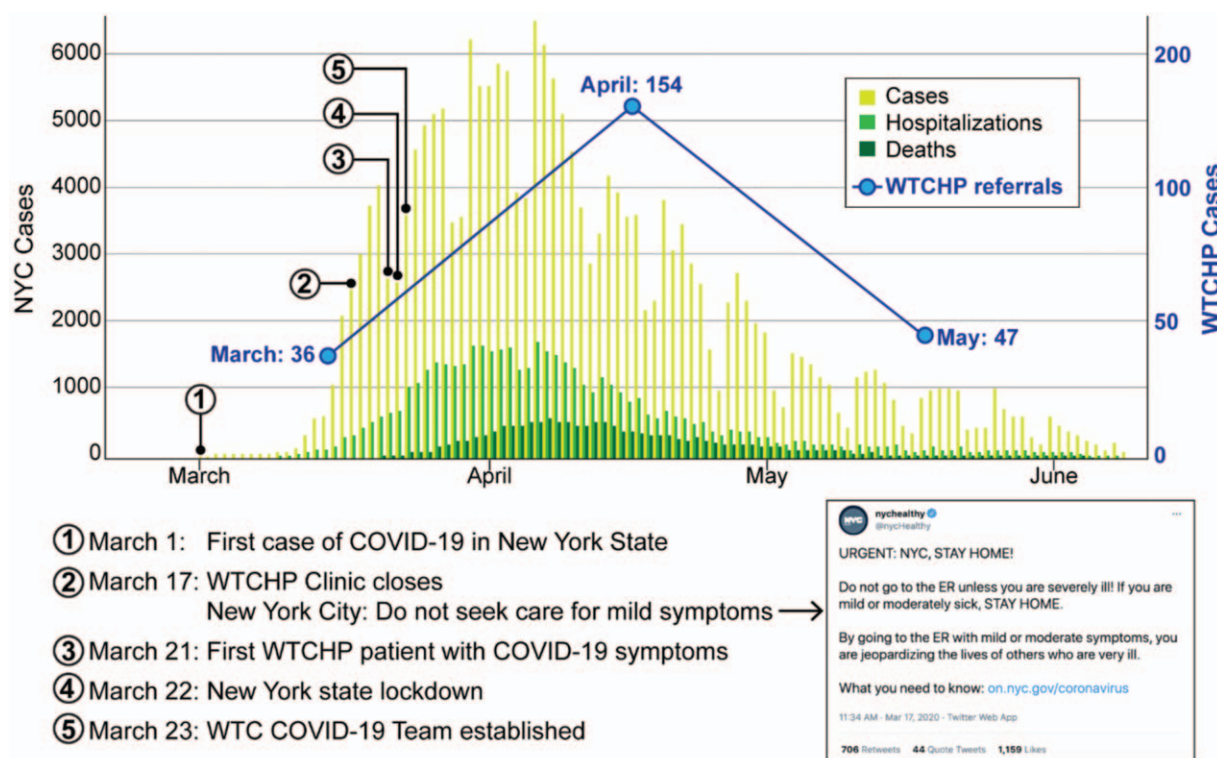
FIGURE 1. Timeline of COVID-19 in New York City and World Trade Center Health Program referrals.

the EHR patient portal. When available, home tools such as blood pressure monitors, thermometers, fitness trackers, or pulse oximeters were used in patient assessment. After pulse oximeters were no longer available in NYC, patients with iPhones were sometimes instructed to use oxygen saturation apps. Video physical exam techniques were also used to assess symptoms and acuity. Loosening of federal and state rules and regulations with respect to telehealth platforms were essential to provide telehealth access. The WTC COVID Team used both asynchronous telehealth platforms as well as real-time audio-only, or video via Facetime, HIPAA-compliant Zoom, MyChart, and Doximity Dialer.

Medical Management

Case definition evolved rapidly. Initial case definition and eligibility for SARS-CoV-2 testing in NYC were based on symptoms of cough and fever. However, many patients presented with a range of symptoms outside of the case definition (Table 1). As such, the WTC COVID Team moved away from reliance on testing or promulgated case definitions[8,9] when assessing a person under investigation (PUI) for ongoing management. Given limited and unreliable testing, and that patients tended to worsen during the second week after symptom onset, the WTC COVID Team decided to follow all PUIs for at least 2 weeks after symptom onset. Medical decision-making centered around safe ongoing management of patients in their homes versus transfer to the ED due to decompensation. Decision-making around need for ED transfer evolved over time and incorporated oxygen saturation <92% and/or other signs of decompensation (eg, change in mental status) and, when available, chest X-ray or CT findings consistent with poor outcome coupled with respiratory decompensation. Medication management was limited primarily to inhalers and oxygen therapy, as our specialists did not endorse unproven treatments such as hydroxychloroquine or antibiotic combinations.
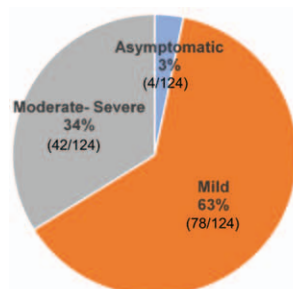
RESULTS

A total of 237 patients were referred to the WTC COVID Team between March 12 and May 31, 2020. Of the 237 patients referred to the WTC COVID Team, only those followed longitudinally via telehealth were considered actively managed ($n = 124$) (Fig. 2). Patients with moderate to severe symptoms received frequent telehealth encounters; training on use of home tools and therapies (eg, pulse oximeter, O_2

TABLE 1. Symptoms Reported by WTCHP Patients

Commonly Reported	Occasionally or Rarely Reported
Headache	Chest pain
Fever/chills	Congestion/sinusitis/rhinitis
Chest tightness	Dry mouth
Fatigue	Vertigo/dizziness
Loss of smell/taste	Hallucinations
Cough	
Sore throat	
Nasal congestion	
Shortness of breath	
Body/muscle aches	
Gastrointestinal distress (nausea/vomiting, diarrhea, loss of appetite, weight loss)	

WTCHP, World Trade Center Health Program.

	Asymptomatic	Mild	Moderate	Severe	Critical
Symptoms	None	Fever, cough, sore throat, malaise, headache, muscle pain, gastrointestinal symptoms such as diarrhea vomiting and loss of taste and sense of smell __without__ shortness of breath or dyspnea or abnormal imaging	Any symptom of mild illness or shortness of breath with exertion __Or__ Radiographic evidence of lower respiratory disease	Any symptom of moderate illness or shortness of breath at rest, or respiratory distress	Respiratory failure, septic shock, and/or multiple organ dysfunction or failure
Other Clinical Signs or criteria			— SpO2 > 94% on room air at sea level	— Respiratory rate ≥ 30 per minute — SpO2 ≤ 94% on room air at sea level or PaO2/FiO2 < 300 — Lung infiltrates of >50%	

FIGURE 2. Patient disposition/severity of Mount Sinai World Trade Center Health Program (WTCHP) patients referred to the WTC COVID Team and followed via telehealth (actively managed).[11,12] Two patients from moderate–severe group were transferred to the ED.

therapy, temperature, heart rate, blood pressure monitoring); counseling to be watchful for red-flag signs and symptoms (eg, shortness of breath, O_2 saturation < 94%); review of intake/output to assess fluid status; adjusting and reordering bronchodilators, steroid inhalers, and oxygen therapy when necessary; and ongoing reassurance and comfort. Although more than a third of patients were moderately to severely ill, there were no deaths of actively managed patients, and only two were transferred to the ED (one observed and discharged, one hospitalized and ultimately discharged). Patients overwhelming expressed gratitude for the program. Though there was no formal evaluation of the program, Table 2 represents a sample of unsolicited testimonials.

DISCUSSION

The rapid adoption of telehealth and remote monitoring capabilities shifted in-person, brick-and-mortar care to virtualized care everywhere for this especially vulnerable population during a time of critical risk. Perhaps the most important outcome of this shift was the reassurance and connection it provided this traumatized population in fear of abandonment during a life-threatening crisis. Our experience highlights the need for flexibility when delivering care during a crisis, and this may be particularly true for the uniquely at-risk population of WTC responders. It is important to understand that little was known about COVID-19 at the start of the pandemic, and the seamless use of telehealth and virtual care was weeks away when the WTC COVID Team was first established. Lessons learned include the need for a multidisciplinary team willing to collaborate, commit to acute care, and capable of incorporating rapidly changing clinical information into medical management.

Many of the hurdles experienced by the WTC COVID Team in caring for patients resulted from: 1) conflicting and rapidly changing local and national guidance; 2) limited and unreliable COVID-19 testing options; 3) dwindling home care supplies including availability of pulse oximeters, bronchodilators, and oxygen; and 4) limited ability for in-person patient assessment or imaging. Additional operational hurdles included: 1) transition to care via telemedicine and the learning curve associated with incorporating remote assessments using home tools and video physical examination; and 2) patient apprehension regarding safety in health facilities when imaging or transfer was necessary.

Our experience with this unique high-risk population is consistent with previous studies showing telehealth is a safe way to provide care, prevent disease spread, reduce unnecessary in-person visits, and preserve personal protective equipment.[10–16] Although we cannot know if our patient outcomes would have differed from in-person visits or no care, the favorable outcomes suggest that our rapid response telehealth care did prevent unnecessary ED transfers, facilitate transfers when necessary, improve clinical outcomes, and possibly save lives. Looking ahead, it will be important to explore in this population the frequency of post-acute Covid-19 Syndrome (PACS), systemic complications (eg, thrombotic, neurologic, cardiac), and the relationship to WTC-related conditions. We are reviewing ways to adapt our WTC COVID Team to help meet the needs of WTCHP patients with PACS.

This experience underscores the need for health systems to remain flexible to respond to unexpected challenges,

TABLE 2. WTCHP Telemedicine Patient Testimonials

Context	Testimonial
Conveyed to WTC COVID team by WTCHP provider	"My patient spoke so highly of you. How you were there for him when he had COVID. He stated you called him every day. Stated whenever he comes to WTC he is going to look for you. He stated he still feels fatigue and his short-term memory has decreased."
Transferred to ED; EHR message to provider	"I want to thank you, but more importantly I want to send guardian angels to protect you and your team during this crisis. I have become more appreciative of my support team and realize how lucky I am right now. God bless you my good doctor."
Conveyed to provider	Patient is fearful and upset as he lives alone and is very grateful for the calls.
Patient unable to reach primary care physician; conveyed to provider	Patient is very grateful for contact with the WTCHP as she cannot find care elsewhere.
Sick at home; conveyed to provider	Patient is very thankful for the team to help him ride it out at home.
Discharged from hospital, still sick, conveyed to provider	Patient is really, really appreciative of the calls from the team due to anxiety and poor health.
Exposed with severe COVID anxiety	"You are my lifeline."

Table 2 provides examples of testimonials from WTCHP patients who received telemedicine support. ED, emergency department; EHR, electronic health record; WTCHP, World Trade Center Health Program.

particularly to ensure continuity of care for unique or vulnerable populations. Health care delivery systems and providers are facing new challenges and growing demands as a result of the increasing frequency of disasters (eg, severe weather, pandemics). Health systems and providers must prepare to pivot from routine care to acute care provided everywhere to meet patient needs during disasters. Importantly, the opportunity to rethink systems in a broader sense should not be lost as the pandemic recedes—we must resist the urge to fall back on old habits. Frequent virtual contact with patients provided insight into how telehealth platforms and remote monitoring capabilities can speed the transformation to value-based care and achieve the triple-aim: improving the patient experience, enhancing population health, and reducing costs.[17] Healthcare leaders, payers, and regulators must embrace and champion the "care everywhere" ethos facilitated by virtual care and catalyzed by the pandemic. This may be particularly true for the WTC first responder population—many of whom once again found themselves on the front line of a global disaster—and in need of care.

Emily Senay, MD, MPH
Dawn Byrne, RN, BS, BA
Christina Mattson, AGPCNP-BC
Gauri Shukla, MPH

Laura Crowley, MD
Icahn School of Medicine at Mount Sinai
Selikoff Centers for Occupational Health
World Trade Center Health Program
Clinical Center of Excellence
New York, New York

REFERENCES

1. Axelson B. Coronavirus Timeline in NY: Here's How Gov. Cuomo Has Responded to COVID-19 Pandemic Since January. Syracuse. Updated April 15, 2020. Accessed: March 1, 2021 from https://www.syracuse.com/coronavirus/2020/04/coronavirus-timeline-in-ny-heres-how-gov-cuomo-has-responded-to-covid-19-pandemic-since-january.html.

2. Notice: The "New York State on Pause" Executive Order. United States Department of State. March 20, 2020. Accessed November 20, 2020 from https://www.state.gov/wp-content/uploads/2020/03/2020-03-20-Notice-New-York-on-Pause-Order.pdf.

3. Boserup B, McKenney M, Elkbuli A. The impact of the COVID-19 pandemic on emergency department visits and patient safety in the United States. *Am J Emerg Med*. 2020;38: 1732–1736.

4. Glenza J, Rao A, Villarreal A. 'It's What Was Happening in Italy': The Hospital at the Center of New York's COVID-19 Crisis. The Guardian. 2020. https://www.theguardian.com/us-news/2020/mar/27/new-york-coronavirus-elmhurst-hospital. Accessed February 21,2021.

5. Choi A, Olumhense E. New Yorkers Flock to ERs Despite Urgent Warnings to Stay Away Even If Sick. The City. , 2020. https://www.thecity.nyc/health/2020/3/26/21210399/new-yorkers-flock-to-ers-despite-urgent-warnings-to-stay-away-even-if-sick. Accessed February 21,2021.

6. Feuer W. Doctors Worry the Coronavirus is Keeping Patients Away From US Hospitals as ER Visits Drop: 'Heart Attacks Don't Stop'. CNBC. Updated 2020. https://www.cnbc.com/2020/04/14/doctors-worry-the-coronavirus-is-keeping-patients-away-from-us-hospitals-as-er-visits-drop-heart-attacks-dont-stop.html. Accessed February 11, 2021.

7. Commonwealth Fund. The Impact of the COVID-19 Pandemic on Outpatient Care: Visits Return to Prepandemic Levels, But Not For All Providers and Patients. https://www.commonwealthfund.org/publications/2020/oct/impact-covid-19-pandemic-outpatient-care-visits-return-prepandemic-levels. Accessed March 28, 2021.

8. Gandhi RT, Lynch JB, Del Rio C. Mild or moderate COVID-19. *N Engl J Med*. 2020; 383:1757–1766.

9. National Institute of Health. Clinical Spectrum of SARS-CoV-2 Infection. 2020. https://www.covid19treatmentguidelines.nih.gov/overview/clinical-spectrum/. Accessed March 1, 2021.

10. Hong Z, Li N, Li D, et al. Telemedicine during the COVID-19 pandemic: experiences from Western China. *J Med Internet Res*. 2020;22:e19577. https://www.jmir.org/2020/5/e19577/. 10.2196/19577.

11. Welch AE, Caramanica K, Debchoudhury I, et al. A qualitative examination of health and health care utilization after the September 11th terror attacks among World Trade Center Health Registry enrollees. *BMC Public Health*. 2012;12:721. https://bmcpublichealth.biomedcentral.com/articles/. 10.1186/1471-2458-12-721.

12. Demeke HB, Pao LZ, Clark H, et al. Telehealth practice among health centers during the COVID-19 pandemic – United States, July 11–17, 2020. *Morb Mortal Wkly Rep*. 2020;69:1902–1905.

13. Mann DM, Chen J, Chunara R, Testa PA, Nov O. COVID-19 transforms health care through telemedicine: evidence from the field. *J Am Med Inform Assoc*. 2020;27:1132–1135.

14. Xu H, Huang S, Qiu C, et al. Monitoring and management of home-quarantined patients with COVID-19 using a WeChat-based telemedicine system: retrospective cohort study. *J Med Internet Res*. 2020;22:e19514. https://www.jmir.org/2020/7/e19514/. 10.2196/19514.

15. Wosik J, Fudim M, Cameron B, et al. Telehealth transformation: COVID-19 and the rise of virtual care. *J Am Med Inform Assoc*. 2020;27:957–962.

16. Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *Lancet*. 2020;395: 1973–1987.

17. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Affairs*. 2008;27:759–769.