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The Cough Cold and Fever Clinic: A Model for the Safe Management of Ambulatory Patients With Suspected COVID-19

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Background and Objective: When the coronavirus disease-2019 (COVID-19) pandemic swept through New York City, hospital systems became quickly overwhelmed and ambulatory strategies were needed. We designed and implemented an innovative program called the Cough Cold and Fever (CCF) Clinic to safely triage, evaluate, treat, and follow up patients with symptoms concerning for COVID-19. **Methods:** The CCF Clinic was launched on March 13, 2020, in the ambulatory internal medicine office of New York Presbyterian-Weill Cornell Medicine. Patients with symptoms suspicious for COVID-19 were first triaged via telemedicine to determine necessity of in-person evaluation. Clinic workspaces and workflows were fashioned to minimize risk of viral transmission and to conserve COVID-19 testing supplies and personal protective equipment. Protocols containing the most recent COVID-19 practice guidelines were created, updated regularly, and communicated through twice-daily huddles and as a shareable online document. Discharged patients were followed up for at least 7 days through telemedicine. Patient outcomes, including admission to the emergency department (ED), hospitalization, and death, were tracked to ensure clinical quality. **Results:** We report on the first 620 patients seen at CCF between March 13, 2020, and June 19, 2020. Telemedicine follow-up was achieved for 500 (81%). We tested 347 (56%) patients for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with 119 (34%) testing positive. Forty-seven (8%) patients were sent to the ED directly from the CCF Clinic and 42 (89%) of these were admitted. Of the patients discharged home from CCF, 15 (3%) were later admitted to a hospital. Twelve (2%) patients in total died. **Conclusion:** The vast majority of patients, over 90%, seen in CCF were discharged home, with only a small percentage (3%) later requiring admission to a hospital. Of the patients sent directly to the ED from CCF, close to 90% were admitted, verifying the accuracy of our triage. Overall mortality was low (2%), especially when compared with mortality rates in New York City during the pandemic peak. Telemedicine was effective in identifying patients in need of in-person evaluation and in tracking and follow-up. Workflows and protocols were adaptable to reflect rapidly changing resources and clinical guidelines. Frequent communication through a diversity of methods was critical. Through these strategies, we were able to create a safe and effective outpatient program for patients with potential COVID-19.

Key words: COVID-19, outpatient management, outpatient metrics

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On March 1, 2020, the first confirmed case of the 2019 novel coronavirus in New York City was identified.[1] Over the ensuing 5 weeks, New York City saw over 100 000 confirmed cases, nearly 28 000 hospitalizations, and over 5 700 deaths from coronavirus disease-2019 (COVID-19),[2] becoming the epicenter of the pandemic.[3] The sheer volume of infected patients, the speed of case escalation, and the novelty of the virus all contributed to a health care crisis unprecedented in the last century of New York City's history. The need for hospital beds, testing supplies, laboratory resources, and personal protective equipment (PPE) vastly exceeded the supply. Limited understanding of disease transmission, prognostic indicators, and natural history of the disease, along with a lack of effective treatments, further complicated the crisis.

At New York Presbyterian-Weill Cornell Medicine, a large academic medical center in New York City, the response to the COVID-19 crisis took many forms. There was rapid expansion of inpatient care capacity, including the creation of new intensive care units, new medicine teams, and redeployment of personnel to

areas of highest need.[4,5] There was massive expansion of telemedicine and transformation of outpatient care, including the cancellation of nonurgent outpatient visits and elective procedures.[6] In this article, we describe our ambulatory internal medicine response—the creation of a dedicated outpatient program, called the Cough Cold and Fever (CCF) Clinic, to rapidly evaluate, triage, and treat outpatients with symptoms of COVID-19.

The goal was to provide effective triage to determine which patients required inpatient care, and to provide outpatient management for patients who could be safely sent home, including ongoing telemedicine follow-up through their disease course. We aimed to do this while protecting patients and staff from viral exposure, and conserving PPE and testing supplies. Finally, we needed to care for patients with a wide range of medical comorbidities and therefore collaborated closely with subspecialist colleagues.

SETTING AND PARTICIPANTS

Our CCF clinic was embedded within Weill Cornell Internal Medicine Associates (WCIMA), an academic faculty-resident outpatient practice at New York-Presbyterian-Weill Cornell Medicine, which serves a diverse adult population from all 5 boroughs of New York City and the surrounding region. The self-reported race/ethnicity of patients seen at WCIMA is 44.5% White, 24.5% Hispanic, 21.2% Black, and 8.8% Asian. Approximately one-third of patients are insured through Medicaid, one-third through Medicare, and one-third through commercial insurers and self-pay.

PROGRAM DESCRIPTION

Representatives from various disciplines within our practice—including physicians, nurses, and medical technicians—came together to create the initial protocols. We saw our first patient on March 13, 2020. As of June 19, 2020, we had seen a total of 620 patients in person in the CCF Clinic.

Referral sources and patient selection

Patients were referred to the clinic from 3 sources: (1) primary care providers from our group who had determined through a telemedicine encounter that a patient required in-person evaluation for possible COVID-19; (2) subspecialist providers within our institution, who had made a similar determination; and (3) emergency department (ED) providers who referred ED patients with relatively stable vital signs during the height of the pandemic when volume and acuity in the ED threatened to overwhelm capacity. Our hospital system created guidelines for triage of outpatients with suspected COVID-19, which were further elaborated by each primary care or subspecialty division (see the online supplement, Appendix 1, available at: http://links.lww.com/QMH/A63). Guidelines were regularly disseminated throughout the institution via email.

Telemedicine evaluation was a critical component of our previsit triage. Given that the majority of patients with COVID-19 experience relatively mild illness[7] requiring only supportive care at home, and that there was a risk of exposure whenever patients left their homes, we tried to ensure that we only brought patients into the clinic who would benefit from in-person evaluation. This included patients for whom a physical examination or laboratory testing would likely change management or disposition, as determined by the treating provider during the telemedicine visit. When possible, we utilized video visits to carry out these telemedicine evaluations, but we also used telephone calls for patients who were unable to complete a video visit due to lack of access to technology or internet service. This ensured that all of our patients had access to this care.

Infection control protocols

One major goal in the design of the CCF Clinic was to protect both health care workers and uninfected patients from nosocomial spread of COVID-19. We closed off 1 of the 3 clinical areas in our practice to be dedicated solely to the CCF program. We stationed staff members upon building entry to distribute surgical masks and hand sanitizer, and dedicated 1 elevator for use by CCF patients. Upon arrival to our floor, CCF patients were escorted immediately into examination rooms to minimize exposures in the waiting room. We decluttered the rooms of unnecessary and difficult to sanitize items. We stocked each examination room with dedicated equipment, including a stethoscope, pulse oximeter, manual sphygmomanometer to measure blood pressure, and thermometer. All surfaces were disinfected after each use. Staff wore disposable gowns, surgical masks, gloves, and eye protection whenever they were in proximity to a patient. Finally, we designed new clinical workflows to minimize physical contact between health care workers and patients without compromising quality of care or the important human element of provider-patient interaction.

One important feature of the new workflow was the "telephone HPI." Once the patient was placed in an examination room, they were instructed to pick up the telephone. The provider called the patient from outside the room, conducting an unhurried, thoughtful, and empathic interview, unhindered by the discomfort of PPE or the pressure to minimize physical contact time. After the interview, the provider donned PPE, entered the room, checked vital signs, conducted a focused physical examination, and performed severe acute respiratory syndrome coronavirus 2 polymerase chain reaction (SARS-CoV-2 PCR) swabbing if indicated. After the provider exited, a medical technician entered the room to perform any additional services such as phlebotomy, electrocardiogram (EKG), or chest x-ray. That technician would also stay, after the patient left, to sanitize the room, conserving PPE (see the online supplement, Appendix 2, available at: http://links.lww.com/QMH/A64, Cough Cold Fever Clinic Protocol for Providers).

Rapidly evolving knowledge and changes in clinical management

Many details of the workflow evolved as we learned about the characteristics of COVID-19 and risk factors for hospitalization, intubation, or death. After understanding the insidious nature of the hypoxia,[8] we incorporated exertional pulse oximetry into our vital signs, utilizing a 1-minute walk (high step in place) from an algorithm created by our ED[9] to assess for oxygen desaturation, a harbinger of disease severity.[10] When evidence emerged from our own inpatients demonstrating an association between the need for mechanical ventilation and characteristics such as abnormal liver function tests, elevated inflammatory markers, and bilateral infiltrates on chest x-ray,[11] we started to utilize laboratory and radiographic information in our triage and decision-making, arranging for a portable x-ray machine on premises.

Communication

Frequent and clear communication between team members was critical to efficient patient flow and good infection control during a dynamic and evolving pandemic. Twice-daily huddles were instituted, which were conducted in-person in an area of the clinic that allowed physical distancing among staff members. A comprehensive step-by-step handbook was created as an editable online document that served to keep staff members up-to-date on the latest modifications to protocols and guidelines (see the online supplement, Appendix 2, available at: http://links.lww.com/QMH/A64).

A key component in the care for our most complex patients was the close coordination between specialists and primary care providers. Over the course of the pandemic, we identified specific needs of certain patient populations. Definitive confirmation of SARS-CoV-2 was needed, for example, for patients on dialysis, with organ transplantation,[12] or undergoing chemotherapy, as this had direct impact on their treatment schedule. Specialists and CCF providers communicated important patient information through notes in the electronic health record (EHR), supplemented by provider-to-provider phone calls when necessary.

At-home monitoring

To safely follow discharged patients, we provided fingertip pulse oximeters to patients with mild hypoxia (O_2 saturation between 90% and 94%) and monitored them closely through telemedicine. These devices were funded by the hospital. During the last several weeks of the described period, we obtained portable oxygen concentrators, also funded by the hospital, which we provided to selected patients who had mild to moderate hypoxia and whose pulse oximetry improved to safe levels with oxygen administration. Two patients were given these units and instructed in their safe use. Both did well at home, and were able to return the devices for reuse after they had recovered. All patients received discharge instructions (see the online supplement, Appendix 3, available at: http://links.lww.com/QMH/A65) about how to monitor and care for themselves at home.

Follow-up

All patients who were discharged home received several follow-up calls to monitor their status and provide ongoing guidance. The CCF provider made the first call to assess for clinical changes and communicate test results. Subsequent calls were performed by nurses or medical students at approximately days 3 and 7 (see the online supplement, Appendices 4 and 5, available at: http://links.lww.com/QMH/A66 and http://links.lww.com/QMH/A67, for details). Additional calls were made when patients did not substantially improve and many were followed up for over 14 days, as we learned about the protracted recovery course of COVID-19. We created a shared patient list in the EHR and a standardized documentation template for the callers (see the online supplement, Appendix 4, available at: http://links.lww.com/QMH/A66). At least 3 attempts were made to contact each patient. For patients who could not be reached by phone we also called emergency contacts and sent messages through our online patient portal. Through this outreach, we also learned of patients who had required hospitalization outside our system and/or who had died.

PROGRAM EVALUATION

A total of 620 patients were seen in the CCF Clinic between March 13, 2020, and June 19, 2020, with the largest volume of patients (70-100/week) seen during the 4 weeks straddling New York City's pandemic peak.

Overall, we tested 347 (56%) patients for SARS-CoV-2, with 119 (34%) testing positive. In our first month, when PCR testing was most limited, we tested only 38% of patients and 63% of these were positive (Figure). Over the next 4 weeks, as testing capacity grew, we swabbed 64% of patients, and by June we were testing 83% of patients. Liberalization of testing corresponded with a drop in the percentage of positive tests.

Chest radiographs were performed in 189 (30%) patients (Table). Of these, 64 (34%) were abnormal, with bilateral infiltrates as the dominant (75%) abnormality.

Of the 620 patients seen, 47 (8%) were transferred directly to the ED. Of these, 42 (89%) were admitted to the hospital. Of the patients discharged home from clinic, 15 (3%) were later admitted to a hospital. In total, 57 (9%) patients seen in CCF were hospitalized.

To the best of our knowledge, 12 (2%) of the patients seen in the CCF Clinic died. Of these, 5 had been discharged home from the clinic. Two of these 5 were later admitted to a hospital prior to their deaths. Two died at home, 1 with home hospice. The location of death of 1 patient was unknown.

Telemedicine follow-up for at least a 1-week duration was achieved for 500 (81%) patients.

Several clinicians staffing the CCF Clinic became ill with confirmed or suspected COVID-19 during the

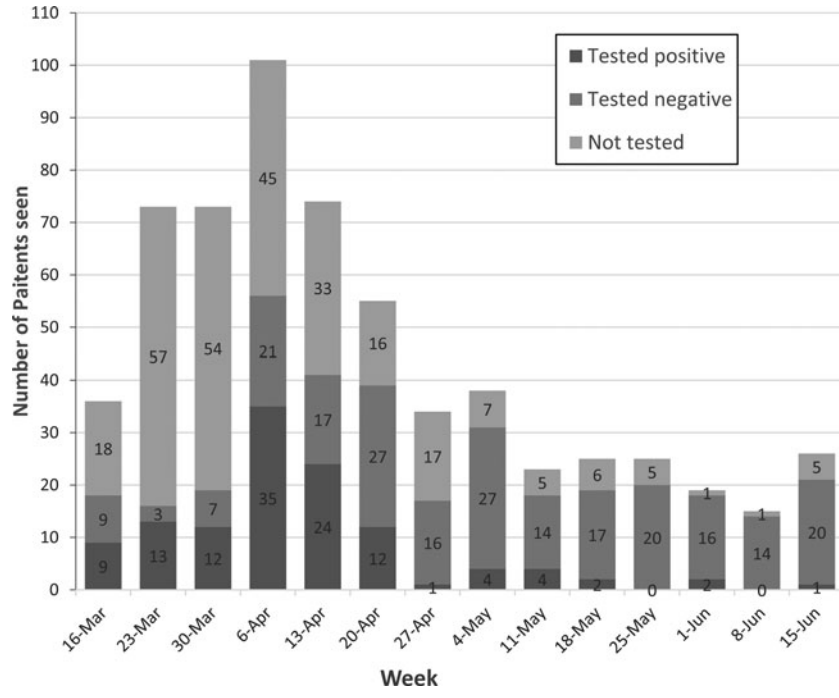

Figure. Patients tested for COVID with test results over time.

Table. Cough Cold and Fever Clinic Metrics

Patients (3/13/20 – 6/19/20)	n (%)
Total seen in CCF Clinic	620
Tested for SARS-CoV-2 PCR	347 (56%)
Positive for SARS-CoV-2 PCR	119 (34%)
Chest x-ray performed	189 (30%)
Abnormal	64 (34%)
Bilateral infiltrates	48 (75%)
Referred to the emergency department from CCF Clinic	47 (8%)
Hospitalized	42 (89%)
Died during hospitalization	7 (16%)
Discharged home from CCF Clinic	573 (92%)
Later hospitalized	15 (3%)
Died (hospitalized and nonhospitalized)	5 (0.8%)
Total hospitalized	57 (9%)
Total died	12 (2%)
Died after initial referral to ED	7
Died after initial discharge home	5
Died during subsequent hospitalization	2
Died without subsequent hospitalization	2 (1 hospice)
Unknown details of death	1
Telemedicine follow-up	500 (81%)

Abbreviations: CCF, Cough Cold and Fever; ED, emergency department; PCR, polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

earliest weeks of the pandemic in March. These infections occurred prior to the adoption of universal masking inside all areas of the clinic, and during the time when PPE was most limited. To our knowledge, no additional infections occurred in CCF staff members after early April.

Our workflow modifications allowed us to substantially reduce the number of staff members who came into contact with each patient. Using our traditional prepandemic workflow, a patient would come into contact with up to 8 staff members during a visit: a registrar who does check-in, a technician who measures vital signs, a medical student, a resident, an attending, a technician who performs EKGs, a phlebotomist, and a registrar who schedules follow-up appointments. If a patient needs an x-ray, they come into contact with several additional staff members at our imaging center across the street. Using our modified workflow for the CCF Clinic, a patient comes into contact with no more than 4 staff members at most: a greeter, a provider, a single technician who performs phlebotomy and EKGs, and an x-ray technician. Patients who do not need blood work or x-rays come into direct contact with only 2 staff members.

Our workflow modifications reduced the usage of PPE from up to 9 sets per patient (1 for each of 8 staff members and an additional set for the staff member who would clean the room after the patient's departure) down to 2 to 4 sets per patient.

DISCUSSION

Through our experience we learned how to safely manage patients with symptoms of concern for COVID-19

in an ambulatory setting. We discharged to home the vast majority, over 90%, of the patients seen in CCF, with only a small number (3%) later requiring admission to a hospital. Of the patients sent directly to the ED from CCF, close to 90% were admitted, attesting to the sensitivity of our triage. Of the 5 patients who died after being sent home from CCF, 2 were redirected back to the hospital when their condition worsened and died in the hospital, 2 declined redirection to the hospital and died at home (one enrolled in home hospice), and information is missing on the death of 1 patient. This patient was seen in March at the start of CCF prior to our systematic use of desaturation challenge, on-site chest radiographs, and postdischarge calls, underscoring the importance of all of these programmatic elements. Overall mortality was low (2%), especially when compared with mortality rates in New York City during the pandemic peak.

Limitations in our analysis include the lack of definitive COVID-19 test results for many patients seen in CCF, necessitated by early shortages in testing supplies, masking the true disease burden in this population. Overall, we tested a little over half (56%) of our patients, with about a third (34%) of these testing positive.

Additionally, while we found that thoughtful use of space, equipment, and workflow was important to minimizing infectious risk, we were unable to definitively draw correlations between staff infections and CCF exposures. Initially, we tracked the names of staff members who were exposed to confirmed COVID-19 patients in CCF; however, due to our inability to accurately confirm COVID-19 infections among our staff and any of their confounding exposures, we ceased our tracking efforts.

We believe that our ability to rapidly respond and adapt to changing conditions was critical. When we learned from our inpatient cohort that patient characteristics, such as older age, male gender, obesity, and cardiovascular and pulmonary comorbidities, as well as clinical information including exertional pulse oximetry, laboratory markers, and lung imaging could improve risk stratification, we added these pieces of equipment and points of data into our protocols. For example, we performed on-site chest x-rays for 30% of CCF patients, a percentage atypical for primary care.

Follow-up is achievable with telemedicine and important for quality assurance. Using tools in the EHR, we were able to follow over 80% of the patients seen, provide aftercare and track outcomes. Through this mechanism, we learned that COVID-19 infection often includes a second cliff of symptoms with respiratory decompensation, and we were thankfully able to identify this downturn for a few of our patients and guide them back in for care.

As New York City has undergone its phased reopening and as we return to routine primary care, we have maintained a CCF area for our practice, allowing us to continue to provide streamlined and safe care, as the worldwide pandemic continues.

REFERENCES

1. Goldstein J, McKinley J. Coronavirus in NY: Manhattan woman is first confirmed case in state. *The New York Times*. March 1, 2020. https://www.nytimes.com/2020/03/01/nyregion/new-york-coronvirus-confirmed.html. Published March 2, 2020. Accessed June 14, 2020.
2. New York City Department of Health. COVID-19: Data. https://www1.nyc.gov/site/doh/covid/covid-19-data.page. Accessed June 14, 2020.
3. McKinley J. New York City region is now an epicenter of the coronavirus pandemic. *The New York Times*. March 22, 2020. https://www.nytimes.com/2020/03/22/nyregion/Coronavirus-new-York-epicenter.html. Accessed June 18, 2020.
4. Kumaraiah D, Yip N, Ivascu N, Hill L. Innovative ICU physician care models: COVID-19 pandemic at New York Presbyterian. https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0158. Published April 28, 2020.
5. Peters A, Chawla K, Turnbull Z. Transforming ORs into ICUs. *N Engl J Med*. 2020;382(19):e52. https://www.nejm.org/doi/10.1056/NEJMc2010853.
6. Shah M, Emlen MF, Mayer S, Goldstein P, Scrimenti L, Hidalgo M. Adapting hematology and medical oncology clinical care in the epicenter of the COVID-19 pandemic. https://catalyst.nejm.org/doi/full/10.1056/cat.20.0329. Published June 4, 2020.
7. Yu ZY, Googan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China. Summary of a report of 72314 cases from the Chinese Center for Disease Control. *JAMA*. 2020;323(13):1239-1242.
8. Levitan R. The Infection That's Silently Killing Coronavirus Patients. *New York Times*. April 20, 2020. https://www.nytimes.com/2020/04/20/opinion/sunday/coronavirus-testing-pneumonia.html. Accessed June 23, 2020.
9. Suh E, Abrukin L, Bodnar D, et al. Evaluation Pathway for Patients with Possible COVID-19. ACEP COVID-19 Field Guide March 2020. https://www.acep.org/corona/covid-19-field-guide/risk-stratification/evaluation-pathway-for-patients-with-possible-covid-19/ Accessed June 19, 2020.
10. Petrilli CM, Jones SA, Yang J, et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. *BMJ*. 2020;369:m1966. https://www.bmj.com/content/bmj/369/bmj.m1966.full.pdf
11. Goyal P, Choi J, Pinheiro L, et al. Clinical characteristics of COVID-19 in New York City. *N Engl J Med*. 2020;382(24):2372-2374. https://www.nejm.org/doi/full/10.1056/NEJMc2010419; https://www.nejm.org/doi/suppl/10.1056/NEJMc2010419/suppl_file/nejmc2010419_appendix.pdf.
12. Lubetzky M, Aull M, Craig-Shapiro R, et al. Kidney allograft recipients, immunosuppression, and coronavirus disease-2019; a report of consecutive cases from a NYC transplant center. *Nephrol Dial Transplant*. 2020;35(7):1250-1261. https://academic.oup.com/ndt/article/35/7/1250/5873247.