Creating a Dedicated Pandemic Ambulatory Clinic: Lessons Learned From COVID-19

Joshua Kwon, MD; Mary Hedges, MD; K. Dawson Jackson, MD; Andrew Keimig, MHA; Dawn Francis, MD, MHS

Background and Objectives: COVID-19 is highly infectious and the pandemic requires many adaptations to how we deliver medical care. Early in the pandemic, much of this focus was on hospital and emergency department care delivery models to ensure the safety of non–COVID-19 patients and health care workers. However, providing much needed outpatient assessments for COVID-19 patients during a pandemic is also fraught with challenges. From our review of the literature, best practices for a dedicated pandemic ambulatory outpatient clinic have not previously been described. We present a model for creating a dedicated ambulatory pandemic clinic at our institution for the acute care needs of COVID-19 patients. **Methods:** To address the current pandemic, the Mayo Acute Symptoms of COVID-19 Clinic was implemented on April 13, 2020, with the aims of providing a stand-alone location for COVID-19 patients to have acute outpatient evaluations as well as diagnostics. **Results:** Recognized challenges addressed included consideration of airflow recirculation patterns in standard medical office buildings, optimization of protocols to conserve personal protective equipment (PPE), limiting total exposure time during patient flow, and reducing surfaces and spaces that patients would physically contact. To this end, unique methods of patient scheduling, patient flow process, staff training, and PPE protocols were developed and are explained in detail in this article. **Conclusion:** In the COVID-19 pandemic, as well as inevitably in future pandemics, outpatient medical facilities need to be prepared to care for nonhospitalized and nonemergent pandemic patients. We offer a practical approach that has been successful at our institution, with opportunity for local adaptation based on need and resources.

Key words: acute care clinic, COVID-19, pandemic clinic

COVID-19, the disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), caused a large global outbreak and was declared by the World Health Organization (WHO) on January 30, 2020 as a public health emergency of international concern.[1] With the rapid worldwide spread, hospitals and clinics faced numerous challenges in responding to this outbreak, particularly as new data emerged and recommendations were changing frequently. As nationwide availability of testing for the virus improved, the next step was providing prompt and safe access to care for all patients.

Given the highly infectious and often rapidly progressive nature of COVID-19, many health care systems created specialized wings, clinics, or entire hospitals with dedicated staff to treat COVID-19 patients. This helped decrease burden on emergency departments (EDs) and inpatient hospitalizations. The challenge remained in providing expeditious triage, testing, and symptomatic treatment for patients, as well as keeping infected patients from interacting with noninfected patients and providers without personal protective equipment (PPE). In our review of the literature, we were unable to find any published best practices for a dedicated pandemic ambulatory clinic. Published descriptive articles reviewed included the creation of a clinic adjacent to an ED for the purpose of both evaluating and testing for COVID-19, general and specialty clinic preparation guidance, and recommendations from the Federal Emergency Management Agency (FEMA) and the Centers for Disease Control and Prevention (CDC).[2-5] However, to our knowledge, a dedicated ambulatory pandemic clinic has never been described in the literature. We present a model of how we created a dedicated ambulatory pandemic clinic at our institution to address the acute care needs of COVID-19 patients at the Mayo Clinic in Jacksonville, Florida. This strategy is applicable to other clinics and health care systems during this pandemic crisis and, most importantly, will serve as a template for outpatient management of future pandemics.

Author Affiliations: *Divisions of Internal Medicine (Dr Kwon), Infectious Diseases (Mr Keimig), and Gastroenterology and Hepatology (Dr Francis), Department of Medicine, and Division of Regional Medicine, Department of Family Medicine (Dr Jackson), Mayo Clinic, Jacksonville, Florida; and Division of Community Internal Medicine, Department of Medicine, Jacksonville, Florida (Dr Hedges).*

Correspondence: *Joshua Kwon, MD, Division of Internal Medicine, Department of Medicine, Mayo Clinic, 4500 San Pablo Rd, Jacksonville, FL 32224 (kwon.joshua@mayo.edu).*

The authors give special acknowledgment to the original MASCC team: Brian Eglinger, BA, Amy Wood, RN, Toriann Bertelle, LPN, Justin Crosby, LPN, Bonnie Eggers, RT, Maria Billini, laboratory technician Phlebotomy, in partnership with the authors of this article.

The authors certify that they have no financial arrangements (eg, consultancies, stock ownership, equity interests, patent-licensing arrangements, research support, honoraria, etc) with a company whose product figures prominently in this article or with a company making a competing product.

Q Manage Health Care
Vol. 31, No. 2, pp. 92–98

DOI: 10.1097/QMH.0000000000000323

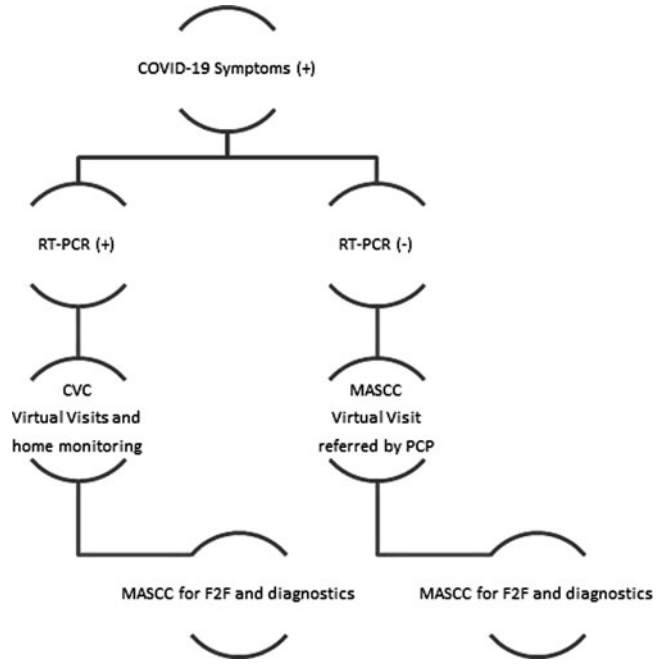

Figure 1. Patient referral to the MASCC via PCP or CVC. RT-PCR indicates reverse transcription-polymerase chain reaction; MASCC, Mayo Acute Symptoms of COVID-19 Clinic; PCP, primary care provider; CVC, COVID-19 Virtual Clinic; F2F, face-to-face.

AIMS

To address the current pandemic, the Mayo Acute Symptoms of COVID-19 Clinic (MASCC) was implemented on April 13, 2020, with the aims of providing a stand-alone location for COVID-19 patients to have acute outpatient evaluations as well as diagnostics. For the purpose of our clinic, COVID-19 patients included both patients confirmed COVID-19 positive by nasopharyngeal reverse transcription-polymerase chain reaction (RT-PCR) testing who were being followed by the COVID-19 Virtual Clinic (CVC) with remote monitoring and patients who had initial RT-PCR testing negative by nasopharyngeal swab but who remained with symptoms consistent with COVID-19 clinical presentation (Figure 1).

METHODS

Location

To provide a separate stand-alone location for patients with COVID-19 symptoms and COVID-19–positive patients, the smallest freestanding clinical building available was requisitioned, with the aim of displacing the fewest providers and patients possible. The building had some limitations inherent to the structure. The first challenge encountered was to minimize the risk with standard recirculation patterns in air handling. It was clear that this step would be a rate-limiting variable for planning safe and effective care during any infectious pandemic. As a result, our process for rooming each patient was designed around the inherent building limitations. Understanding the natural limits of the building structure and ventilation, we devised a protocol that minimized the amount of time that each patient would spend within the building space and all aerosol-inducing testing was performed outdoors. We chose a single hallway as the contaminated space and that hallway was chosen because it shared access to the laboratory and radiology. This hallway was then isolated from the rest of the building with physical barriers built by our facilities team. Any rooms that shared ventilation with the contaminated rooms were considered nonusable space (Figure 2).

Staging

Before being referred to the MASCC, all patients underwent COVID-19 RT-PCR nasopharyngeal testing at Mayo Clinic's drive-through testing center. Those eligible to be seen at the MASCC included patients who tested positive via RT-PCR, as well as patients who tested negative on initial nasopharyngeal RT-PCR testing but who were still experiencing acute symptoms of clinical concern for COVID-19. The symptoms treated at the clinic included cough, fever, sore throat, shortness of breath, chills, and diarrhea with underlying respiratory symptoms. Diagnostic capabilities of the clinic included plain radiographs, blood and urine tests, influenza and respiratory syncytial virus (RSV) nasopharyngeal RT-PCR testing, and electrocardiograms. All patients referred to the MASCC were first scheduled for a video visit with an MASCC provider in advance, before being seen in person at the clinic.

Early in the pandemic, one challenge was to optimize all staff PPE protocols, including phlebotomy, radiology, nursing, and all providers. Each of these services would need to have access to the patient while spending the shortest time possible during each encounter. An operational plan was distributed to all involved providers

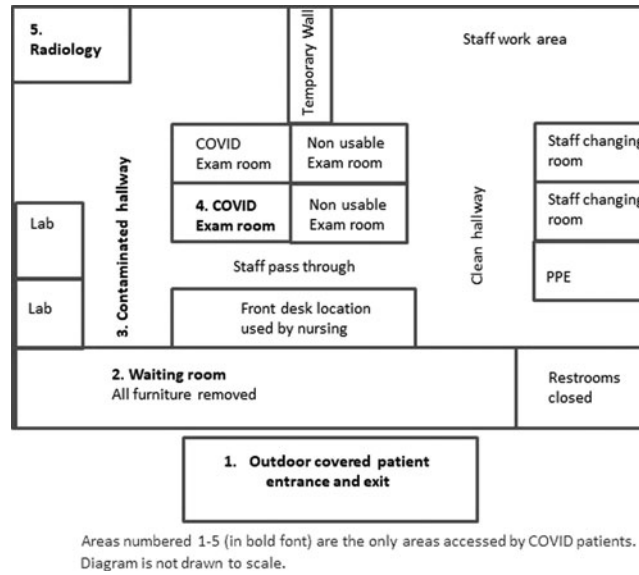

Figure 2. Diagram of patient flow through the Mayo Acute Symptoms of COVID-19 Clinic. PPE indicates personal protective equipment.

and staff, with a 10-question competency test to assess understanding and proper training. Scrubs were provided at the clinic, and all staff members were instructed to change into a new pair of scrubs upon arrival and change back into their own clothes before leaving the clinic. Any staff members involved in the direct care of patients were provided the following PPE: gowns, gloves, medical masks, and eye protection (goggles or face shield), in accordance with the recommendations of the WHO.[1] Providers were supplied disposable stethoscopes for all examinations, and each room was cleaned after each patient use with Sani-Cloth germicidal disposable wipes. Any materials in the examination room that could not be covered by plastic sheets were removed for most efficient cleaning between uses, and all furniture was removed from the lobby to avoid congregating as well as to limit any hard surfaces that could be touched by patients.

Patient scheduling

Referrals from physicians within Mayo Clinic were sent via a message in the electronic health record to an MASCC triage pool. After a review by one of the providers, the patient would be scheduled initially for a video visit with an MASCC provider and thereafter, if indicated, scheduled for diagnostics and a face-to-face visit at the MASCC. Following the video visit, any indicated tests and treatments were preordered to improve efficiency and patient flow while at the MASCC.

Our goal at the MASCC was to minimize the number of minutes the patient was physically in the space to limit exposures to staff as well as between patients. To this end, the scheduling for each patient presenting to the MASCC was team based and focused on having the patient in the building for 15 minutes or less for all aspects of his or her visit (nurse, provider, laboratory, and radiography). We scheduled all aspects for the patient at the same time, blocking a 20- to 30-minute slot total for each individual patient, with the aim to have only one patient in the building at a time. For this reason, scheduling had to be completed manually for each patient by a dedicated MASCC scheduler who understood this process. Our scheduler would instruct each patient to arrive 15 minutes early, to remain in his or her car in the parking lot, and to complete the nurse rooming questionnaire by phone before the nurse would escort the patient into the building. The multidisciplinary MASCC team, including our scheduler, a phlebotomist, a radiology technician, 2 nurses, and 2 providers prehuddled before each patient to determine whether there should be any variations in the planned flow.

The MASCC scheduler would also aim to schedule COVID-19 RT-PCR–negative patients in the morning and RT-PCR–positive patients in the afternoon. While there were some exceptions needed, this allowed the known COVID-19–positive patients to be preferentially scheduled in the afternoon, thus avoiding direct interaction with presumed COVID-19–negative patients. This also allowed known COVID-19–positive patients to be the last patients in the building before the scheduled deep clean by housekeeping services each evening.

Patient flow process

The workflows were designed around the provider care team coordinating its PPE procedures so that each patient would be served in a single room and each service would be introduced into the room for the shortest amount of time possible. We aimed to conserve PPE and limit surface cleaning that would need to take place after each encounter. Our goal was a choreographed event in which the nurse, laboratory technician, radiology technician, and provider were exposed to the patient for 3 minutes each or less so that the total patient time in the building would not exceed 15 minutes.

Table. Standardized Triage Script Used by the Nursing Staff

How are you feeling compared to yesterday's video visit with the doctor? Better, worse, or the same?
Are you having any of the following *symptoms*: shortness of breath, pain, cough, sore throat, palpitations, GI upset, dizziness, or lightheadedness?
If yes to *shortness of breath*: If you were to walk, would you collapse? Can you catch your breath? Is it difficult to take a deep breath?
If yes to *GI upset*: any dietary changes?
How long have your symptoms been going on?
Pain on scale of 1-10?
Any recent changes to medications?
Do you need assistance with walking into the building? Do you need a wheelchair?

Abbreviation: GI, gastrointestinal.

This was achieved via phone interview with the patient while he or she was sitting in his or her car in the parking lot before the visit, allowing each member of the team to collect the appropriate information before the patient entered the building. After physical examination, vital signs, laboratory, and radiography needs were obtained and the assessment and plan were discussed with the patient by phone after he or she returned to his or her car.

Each encounter began when the patient arrived in the clinic parking lot. The patient was instructed to call a phone number that was directed to a nurse triage line indoors. Patients were asked a standard set of questions regarding their symptoms, which are shown in the Table. If any red flags were identified that would warrant ED evaluation (ie, worsening shortness of breath, syncope, blood in the stool, inability to eat or drink or stand), the nurse would request the physician to come to speak to the patient by phone or to evaluate in the parking lot with potential reroute to the ED. If there were no emergent red flags identified, the patient would then be asked the standard Mayo Clinic nurse rooming questions via telephone, including a review of listed medications, allergies, tobacco use, and current visit chief complaint and symptoms (which could include nonemergent COVID-19 symptoms, such as fevers, chills, loss of taste or smell).

A nurse would then don PPE and greet the patient at his or her car. Before entering the building, the patient would undergo ambulatory pulse oximetry. If the patient's oxygen saturations were less than 92%, the patient was redirected to the ED for care. If saturations remained above 92%, the patient was escorted into a sanitized examination room to have a full set of vital signs taken.

After this initial triage and rooming process was finished, the provider would don PPE and enter the sanitized examination room to evaluate the patient and perform a physical examination. If the provider's examination revealed that the patient was too ill for outpatient management, the patient was redirected to the ED. After the provider's encounter with the patient, the provider doffed his or her PPE and verbally notified the clinic laboratory technician donned in PPE that he or she could enter the examination room for blood work. Importantly, the provider did not perform any documentation or place any orders in the examination room with the patient. All computer work was completed in a separate area on the other side of the clinic building that was designated as a clean workspace. After blood work was done, the laboratory technician would direct the patient to the radiology area on the same hallway for radiography to be completed if ordered.

If the patient needed to change into a gown, he or she would change in the radiology room to avoid contaminating an additional space. Radiology technicians would then don PPE and obtain both posteroanterior and lateral chest radiographs. After imaging, the patient was directed toward a designated exit from the building.

On some occasions, if a patient had no other testing ordered besides the radiograph, the radiology suite was used as the examination room for vital signs, pulse oximetry, and the provider's physical examination, with the goal of contaminating the least number of rooms in the building during 1 episode of care.

If an influenza or RSV nasopharyngeal swab was ordered, this was performed outdoors by a nurse donning PPE, due to the risk of this process inducing coughing. The patient was then directed back to his or her vehicle to leave the clinic and subsequently discuss assessment and plan by phone (Figure 3). Every step of the patient flow process for this clinic was designed to protect all providers and staff and patients from exposure. It also aimed to consolidate all patient contact to a minimum number of rooms to maximize efficiency and minimize burden on the cleaning staff.

LESSONS LEARNED

Adapting Agile project management to accelerate development

The MASCC team did not have any formal Agile training before planning and launching this initiative. Several hybrid Agile methods were utilized to launch the MASCC in less than 2 weeks:

1. *Maintaining focus with flexibility on the initial vision*: The clinic's initial launch was focused on providing a stand-alone location for acute outpatient evaluation of potential COVID-19 patients and diagnostic facilities for further workup for known COVID-19–positive patients. Continued discussions with Mayo Clinic leadership highlighted the need to expand diagnostic testing to a broader COVID-19 patient population, such as the known positive COVID-19 patients who were already followed by the CVC but needed diagnostic testing such as laboratory test results and imaging and sometimes a focused physical examination. The MASCC adapted the initial vision to serve these additional patients.

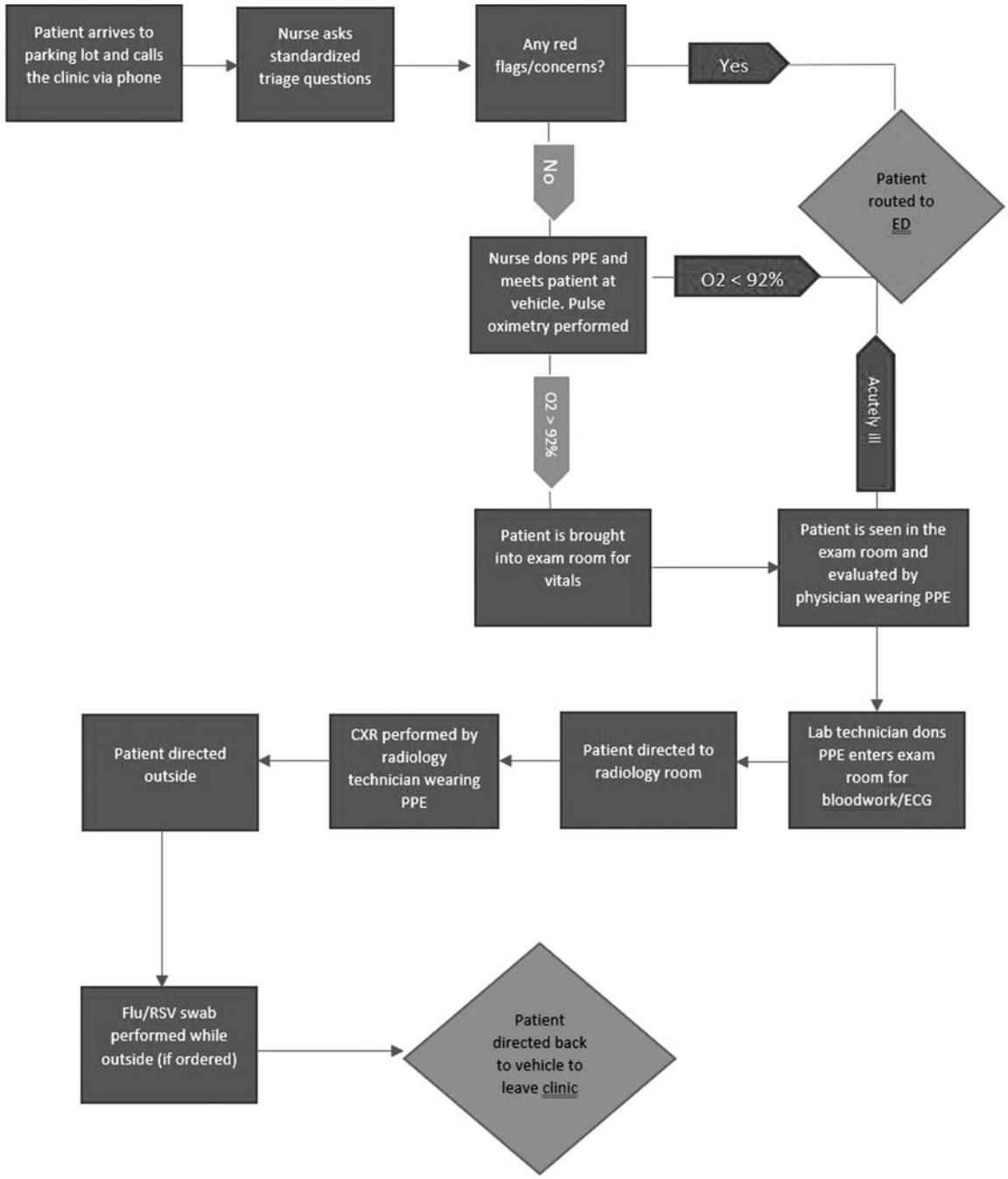

Figure 3. Flowchart of standard patient encounter at the Mayo Acute Symptoms of COVID-19 Clinic. PPE indicates personal protective equipment; ED, emergency department; CXR, chest radiograph; ECG, electrocardiogram; RSV, respiratory syncytial virus.

2. *Incremental "go-lives" while other pieces were still being planned*: Utilizing a minimum viable product mentality, the MASCC began seeing patients while many processes, staffing plans, technology solutions, and broader communications were being developed. This soft launch allowed the team to learn early lessons and update processes to better care for future patients.
3. *Utilizing scrums (daily huddles) during the planning and go-live phases*: Regular huddles with the multidisciplinary team during the planning phases allowed faster issue identification and resolution, pivots on decision making, and role clarity as processes were designed. After the clinic's launch, the daily huddles were continued to allow lessons learned from the previous day to inform process changes for future patients.

Utilizing Lean methodologies to develop clinic processes

The team used ideal state process flow mapping to focus on optimizing patient flow and reducing PPE usage while planning clinic processes. Initial flowcharts were developed and modified to ensure minimal transportation of supplies, patients, and equipment for patient flow, as well as preventing exposures and saving time in the office by reducing motion within the patient flow.

1. *Reducing patient on-site time*: Key to reducing patient and staff exposure to COVID-19 was limiting patient time in the building. Utilizing video visits allowed providers to perform an initial evaluation of the patient and identify potential diagnostic needs. The in-person visit flow then reduced contact time for all staff members and minimized a patient's time in the building. Coordinating staff seeing the patient in an assembly line fashion reduced the PPE usage to 1 set per staff member per patient.
2. *Optimizing patient flow*: As our experience evolved, the MASCC consolidated face-to-face visits to occur at a narrower time of day, in the late afternoon and early evening hours, and narrowed the provider panel to 1 MASCC provider. Additional MASCC or CVC patients were also present during these late afternoon hours for diagnostics. This allowed the facility that was initially requisitioned for the MASCC to return to regular full-time use for non–COVID-19 patients during the day by consolidating the patients with COVID-19 symptoms later in the day and into the evening. The building was deep cleaned each evening again before the non–COVID-19 regular clinic patients returned the following morning.

Diagnostic considerations

A consideration for any pandemic clinic is to keep the differential diagnosis broad. Early in the pandemic, the false-negative rate of COVID-19 nasal swab testing was uncertain. There was a need to evaluate patients with COVID-19 symptoms and negative RT-PCR testing as if they might have COVID-19. However, this same subset of patients should also be evaluated for non–COVID-19 causes for their symptoms. In our MASCC experience of patients with COVID-19 symptoms, we diagnosed a broad array of other medical conditions: mononucleosis, tonsillar abscess, Strep pharyngitis, Bechet syndrome flare, influenza, RSV infection, bacterial and viral pneumonia, hyponatremia, acute respiratory distress syndrome (ARDS), urinary tract infection, gastroesophageal reflux disease, congestive heart failure with pulmonary edema, asthma exacerbation, breast cancer with new pulmonary metastatic lesions, and pulmonary emboli. Experienced general internists and family medicine physicians with superior clinical acumen are needed for the care of this unique subset of symptomatic patients during a global pandemic.

We experienced providing direct medical care at the forefront of new pandemic testing that was evolving rapidly and with controversy regarding false-negatives, implications for viral shedding, and non–FDA-approved testing.[6] Our experience also included several different types of clinical scenarios including the following:

1. COVID-19 RT-PCR patients who were positive then subsequently negative but despite negative testing still presented with delayed cytokine release syndrome and ARDS.
2. COVID-19 RT-PCR–negative patients who were subsequently positive on repeat testing, of which the implications are still unknown at the time.
3. Hospitalized COVID-19 RT-PCR–positive patients who had 2 subsequent negative RT-PCR tests in the hospital but still upon discharge needed a dedicated team to provide care for hypoxia and home oxygen weaning.
4. Stool-positive COVID-19 testing from an outside laboratory that was non–FDA approved in a patient with 2 negative RT-PCR nasopharyngeal swabs.
5. A patient with COVID-19–negative RT-PCR for 2 consecutive tests who subsequently had positive COVID-19 antibodies.

Each of these situations required a nuanced approach to medical care, lifting home isolation, and counseling about testing implications and outcomes, while regularly updating our focused team on CDC and WHO recommendations, which were rapidly evolving.

DISCUSSION

Creating an ambulatory pandemic clinic aims to fill a gap in patient care during the pandemic crisis. In our case, early in the pandemic, this gap included patients with COVID-19 symptoms as well as known COVID-19–positive patients who needed diagnostics and a face-to-face physical examination but were not acutely ill enough to warrant ED evaluation or hospitalization. It was also important to provide proper and prompt triage for those patients who may indeed need to be sent to the ED or directly admitted. A dedicated pandemic clinic allowed our health care system to provide direct patient care without putting other nonaffected patients at risk for exposure.

In our model, we were able to requisition a standalone building for the pandemic clinic. However, we believe that other health care systems could still replicate and adapt this model to an existing clinic if a standalone facility is not feasible. For example, the check-in process of an existing clinic could be transitioned to a virtual check-in with standardized screening questions such as the ones used by our staff as well as initial provider evaluation virtually for all patients. Other ideas include requisitioning a floor of the parking garage on campus for temporary (curtained) examination rooms to allow for best outdoor ventilation. Moreover, freestanding units such as a mobile medical unit vehicle or prefabricated modular office units could be arranged in a parking lot area. Finally, an outdoor vital sign and ambulatory oxygen nurse station with an available provider for evaluation could be implemented at a COVID-19 drive-through testing line. For each of these considerations, patient flow, room and equipment sterilization, ventilation, and ability for laboratory and radiography

studies to be obtained would have to be adapted depending on the available layout and local regulations.

As of January 23, 2021, there were more than 98 million confirmed cases of COVID-19 worldwide and more than 24 million cases confirmed in the United States.[7] As the pandemic continues to spread, and potentially with recurrent waves of exponential increases as were seen during the 1918 influenza pandemic over the course of years, the health care system must be able to continue to adapt and respond quickly to care for all patients. The authors of this article hope that this model may help give guidance globally for creating dedicated outpatient management in a pandemic now or in the future.

CONCLUSION

Medical facilities need to be prepared with a template and best practices to care for nonhospitalized patients during a pandemic, both now and in the future. We offer one approach to consider as well as several lessons learned and opportunities to adapt to unique local needs and resources.

REFERENCES

1. World Health Organization. *Rational Use of Personal Protective Equipment for Coronavirus Disease (COVID-19) and Considerations During Severe Shortages: Interim Guidance, 6 April 2020*. Geneva, Switzerland: World Health Organization; 2020.
2. Baugh JJ, Yun BJ, Searle E, et al. Creating a COVID-19 surge clinic to offload the emergency department. *Am J Emerg Med*. 2020;38(7):1535-1537. doi:10.1016/j.ajem.2020.04.057.
3. Schmidt JM. Seeking evidence-based COVID-19 preparedness: a FEMA framework for clinic management. *NEJM Catalyst*. https://catalyst.nejm.org/doi/pdf/10.1056/CAT.20.0079. Published March 25, 2020. Accessed January 23, 2021.
4. Centers for Disease control and Prevention. Get your clinic ready for coronavirus disease 2019 (COVID-19), preparedness tools. https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinic-preparedness.html. Accessed April 28, 2020.
5. Shaker MS, Oppenheimer J, Grayson M, et al. COVID-19: pandemic contingency planning for the allergy and immunology clinic. *J Allergy Clin Immunol Pract*. 2020;8(5):1477-1488.e5. doi:10.1016/j.jaip.2020.03.012.
6. West CP, Montori VM, Sampathkumar P. COVID-19 testing: the threat of false-negative results. *Mayo Clin Proc*. 2020;95(6):1127-1129. doi:10.1016/j.mayocp.2020.04.004.
7. Johns Hopkins University of Medicine. Coronavirus resource center. https://coronavirus.jhu.edu/map.html. Published 2021. Accessed January 23, 2021.