

A Specialized Acute COVID-19 Outpatient Clinic at an Academic Medical Center

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Abstract

Health systems are challenged to provide equitable access to coronavirus disease 2019 (COVID-19) outpatient care during the pandemic. Infected patients may have difficulties accessing regular care and rely on emergency rooms. With the goal to improve system efficiencies and access to care, Stanford launched a designated outpatient COVID-19 “Care and Respiratory Observation of Patients With Novel Coronavirus” clinic in April 2020 in which all adult Stanford patients with newly diagnosed severe acute respiratory syndrome coronavirus 2 were offered follow-up for 2–3 weeks through video, telephone, and in-person encounters. Patients were triaged into risk categories and received home pulse oximeters based on a standardized protocol. Between April 15, 2020, and March 26, 2021, the Care and Respiratory Observation of Patients With Novel Coronavirus clinic enrolled 1317 patients. The clinic provided evaluation of Patients under Investigation, management of acute COVID-19 symptoms, care for COVID-19 patients after hospital discharge, clinical advice, and opportunities for research. The authors share crucial implementation lessons related to team agility, care personalization, and resource optimization.

Keywords

COVID-19, access to health care, quality of care

Introduction

Over a year into the American coronavirus disease 2019 (COVID-19) pandemic, most health systems’ pandemic responses remain focused on hospital-based care—including emergency departments (EDs), intensive care, and hospital COVID surge units.¹

Once diagnosed, COVID-19 patients not requiring acute care are often left to navigate care on their own—creating particular hardships on underserved patients

who suffer disproportionately from the pandemic.² Concerned patients may overwhelm primary care offices or EDs despite having stable disease, thereby unnecessarily risking exposure to others.³ Worse, a minority of patients will clinically deteriorate without corresponding symptoms, leading to “silent hypoxia.”⁴ Academic medical centers have served as the “tip of the spear” supporting their communities, researching COVID-19, and facilitating innovations in telemedicine and home-based care.⁵ Given the ongoing COVID-19 pandemic and the possibility of future new infectious disease outbreaks, academic medical centers and their patients can benefit from proactive outpatient infectious disease management protocols tailored to individual patient and disease processes.^{6–8}

Rapid scientific progress has reduced COVID-19 case mortality rates, but has made keeping up with changing guidelines increasingly difficult, even in academic environments.⁹ One strategy employed for other conditions has been to concentrate expertise in disease-specific clinics. Clinics for chronic infectious diseases, such as HIV or tuberculosis, have improved condition-specific care and outcomes.¹⁰ Similar to early HIV care, COVID-19 has no proven outpatient treatment beyond supportive care and complication monitoring, while enrollment into clinical trials remains critical. Like HIV, many COVID-19 positive patients have comorbidities, requiring disease-specific comanagement strategies. A disease-specific

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COVID-19 clinic staffed by physicians with growing disease expertise may improve individual patient outcomes and increase disease understanding through clinical research.

Approach

In April 2020, Stanford Healthcare launched a novel clinic to provide outpatient care for patients with COVID-19 called Care and Respiratory Observation of Patients With Novel Coronavirus (CROWN). CROWN is staffed by primary care providers and nurses with special training in COVID-19 disease processes and protocols, who provide comprehensive patient care that incorporates up-to-date research and access to trials. Here, authors describe clinic genesis and implementation and consider the implications of this type of clinic in the continuum of COVID-19 outpatient care.

Following health system's rapid transition to telemedicine,¹¹ options to safely offer in-person evaluation and outpatient procedures despite the ongoing pandemic were explored. Primary care and specialist clinics were not initially configured to safely conduct in-person COVID-19 visits. Patients with confirmed or suspected COVID-19 needed to use the public stairs or elevators to reach a majority of clinics and risked exposing staff and other patients to the virus. Providers, staff, and patients did not feel safe working and receiving care in these settings, which made the existence of a geographically isolated COVID-19 clinic a necessity. Patients with confirmed or suspected COVID-19 frequently presented with multiple concerns and questions not easily addressed by standard information sources. Further, prior to CROWN's launch, their only option for in-person care was the

Emergency Room, given strict symptom screening protocols being enacted throughout the system. These patients often needed longer appointments due to the high volume of patients' questions and increased time associated with personal protective equipment use and room decontamination; these extended appointments required new scheduling templates.

To address these system-level challenges, Stanford launched CROWN in April 2020, a designated clinic to support and monitor patients with COVID-19 throughout their acute illness. Based in a preexisting first-floor urgent care center with a separate patient entrance, CROWN serves as the first-line resource for COVID-19 patients and is the center of Stanford's outpatient COVID-19 response. CROWN has 5 objectives: (1) improve access and quality of care for patients with COVID-19, (2) facilitate the production of generalizable knowledge regarding COVID-19, (3) improve clinician, staff, and non-COVID-19 patient safety, (4) reduce health-related inequities, and (5) reduce inappropriate care utilization (Table 1).

CROWN Clinic Implementation

The Stanford virology lab scaled severe acute respiratory syndrome coronavirus 2 testing from approximately 2000 samples/day in April 2020 to 4500 samples/day by August 2020. About half of the samples were obtained through Stanford testing sites, the other half was collected in non-Stanford affiliated testing sites. The percentage of positive tests averaged over a month varied from 3% in June 2020 to nearly 6% during the region's first surge in July 2020 and nearly 9% during the region's second surge in January 2021. Clinic enrollment broadly reflected these

Table 1. Activities Supporting Health Equity Goals of the Stanford CROWN Clinic in Caring for Outpatients With COVID-19.

Health equity goals	CROWN clinic activities
Improve clinical outcomes for all patients with COVID-19	<ul style="list-style-type: none"> • Provide comprehensive, compassionate, timely medical care for all COVID-19 patients through both virtual and in-person visits throughout their acute illness • Detect episodes of "silent hypoxia" by offering home pulse oximetry to moderate- and high-risk patients and advise higher acuity care when appropriate • Adapt rapidly to the best available evidence by following and continually updating centralized protocols • Provide culturally appropriate care
Facilitate creation of generalizable knowledge regarding COVID-19	<ul style="list-style-type: none"> • Provide a safe site for clinical trial enrollment • Support patients through completion of COVID-19 clinical trials
Improve clinical, staff, and non-COVID-19 patient safety	<ul style="list-style-type: none"> • Prevent clinic-related disease transmission • Allow physicians and staff to volunteer (rather than mandate) to care for patients with COVID-19 • Shepherd PPE supplies towards highest need areas when resources are limited
Reduce health-related inequities	<ul style="list-style-type: none"> • Improve access to care for all patients diagnosed with COVID-19 within our health system • Culturally appropriate follow-up in the patient's preferred language, regardless of location or insurance status
Reduce inappropriate care utilization	<ul style="list-style-type: none"> • Reduce costs associated with inappropriate utilization of health services, such as emergency department and in-person visits for nonacute COVID-19-related care

Abbreviations: COVID-19, coronavirus disease 2019; CROWN, Care and Respiratory Observation of Patients With Novel Coronavirus; PPE, personal protective equipment.

trends. All Stanford patients who were diagnosed with COVID-19 were contacted by an ED nurse to discuss results and were offered options to join ongoing research studies and/or receive follow-up through CROWN. Patients who declined enrollment were provided the CROWN phone number to call for COVID-related questions.

CROWN was staffed with providers drawn from Stanford Express Care, a same-day urgent care clinic. Each day, CROWN staffing included: 1 medical provider (physicians or advanced practice provider), 3 medical assistants, 1–2 nurses, and ancillary staff support (radiology, information technology [IT], and other services). Working in CROWN was voluntary for all staff. Team members were expected to participate in ongoing training, as clinic protocols changed frequently to reflect research updates and optimize patient care and efficiency. The CROWN staffing pool consisted of approximately 10 physicians/advanced practice providers (APPs), 3 nurses, and 15 medical assistants to facilitate rapid adaptation to changing protocols. All clinical team members underwent in-person personal protective equipment training. CROWN operated from 9 AM to 5 PM, 6 days per week. Patient calls were redirected to advice nurse services during off-hours. Resident trainees could volunteer in CROWN with residency director permission. Fellows helped conduct research in CROWN, and students engaged in virtual visits.

Outpatient COVID-19 Care With Pulse Oximetry

Patients enrolled in CROWN were contacted by a clinic provider and followed for 2 weeks from their symptom onset with the option of extending for a total of 3 weeks, depending on the severity of symptoms. Without validated national and international guidelines, in April 2020, the authors contacted outpatient primary care leaders at several academic medical centers to understand their differing approaches to COVID-19 care. Based on this expert consensus and literature review,¹² the research group established their own risk stratification system to categorize patients into low-, moderate-, and high-risk groups based on 4 criteria: age >65 years old, preexisting conditions, symptoms, and illness progression (see Supplemental Appendix A, available at <http://links.lww.com/AJMQ/A44>). Risk category determined follow-up frequency and intensity by virtual or in-person visits (see Supplemental Appendix B, available at <http://links.lww.com/AJMQ/A45>).

The research team utilized a standard questionnaire for CROWN clinic intake to address clinical as

well as social concerns (see Supplemental Appendix C, available at <http://links.lww.com/AJMQ/A46>). Patients were followed most intensely between days 7–10 after diagnosis, when clinical deterioration is most likely.¹³ Protocols were developed to aid in the workup for patients who needed to be evaluated in person and treatments were suggested for targeted therapy and symptomatic relief (see Supplemental Appendix D, available at <http://links.lww.com/AJMQ/A47>).

All moderate- or high-risk patients were lent Food and Drug Administration (FDA)-approved pulse oximeters for home monitoring.⁴ Oximeters were express-mailed to patients' homes with instruction sheets available in multiple languages, including instructional photographs to address low literacy, and prepaid envelopes with return instructions. CROWN clinicians also connected patients with social work and public resources when appropriate to facilitate patients' ability to safely shelter-in-place. Non-English speaking patients were contacted using professional interpreter services.

Patients with confirmed or suspected COVID-19 needing in-person visits were seen in CROWN, with in-room portable x-ray, and lab tests drawn by CROWN medical assistants. Rooms were disinfected after each encounter and each night following strict protocols.

Post-Hospital Discharge Follow-Up

In late April 2020, COVID-19 patients were being discharged from our hospital in increasing numbers, often with ongoing respiratory complaints. CROWN began providing specialized care for patients recently discharged from the hospital starting in July 2020. Between July 2020 and April 2021, the team followed 294 COVID-19 patients post-hospital discharge with a protocol that included video visits every 2–3 days to monitor symptoms, comorbidity management, rehabilitation (see Supplemental Appendix E, <http://links.lww.com/AJMQ/A48>), and weaning of supplemental oxygen where indicated (see Supplemental Appendix F, available at <http://links.lww.com/AJMQ/A49>).

Research and Clinical Trial Enrollment

Given the widespread interest to utilize CROWN to study COVID-19, a Primary Care Research Advisory panel was created to review and coordinate all Stanford COVID-19 research. The CROWN clinic, with its dedicated entrance and strict infection containment protocols, served as the primary site to collect in-person clinic trial data for patients who were contagious for

severe acute respiratory syndrome coronavirus 2. CROWN medical assistants conducted phlebotomy on COVID-19 patients and, in the event of an emergency, CROWN medical doctors (MDs) and APPs were available to provide care. Clinic leadership and implementation evaluation team met weekly, sharing observations/outcomes, which inspired new research questions and fruitful collaborations.^{14,15}

Community Partnerships

Many patients enrolled in the CROWN clinic were from safety-net clinics and were language-discordant from CROWN providers. When the care teams recognized that these patients appeared more comfortable being treated in familiar environments of their preexisting community clinics, community partnerships were pursued. In July 2020, the research team partnered with community clinics where COVID-19 patients diagnosed at Stanford received primary care. They shared their specialized COVID-19 protocols, supported the community clinic primary care physicians (PCPs) in seeing patients with COVID, and provided consultation around challenging cases.

Outcomes

Patient Demographics

Between April 1, 2020, and March 26, 2021, the CROWN clinic enrolled 1317 patients, including 55% female, 54% Hispanic/Latino, and 37% without a primary care provider. Forty-two percent of the patients preferred to communicate in a language other than English (Table 2). Patients were categorized as 23% high risk, 43% moderate risk, and 33% low risk (1% not categorized). Patients were followed for a mean of 5.1 days (SD, 4.5 d) for low risk, range 1–25 days. Medium and high risk were followed for a mean of 9.4 days (SD, 5.2 d), range 1–30 days. Clinic volume was dynamic and reflective of local epidemiological trends. In April 2020, there was capacity to follow 40 patients per day. By October 2020, streamlined protocols allowed the team to actively follow 100 patients per day.

Implementation Lessons

The CROWN Clinic faced a number of challenges during implementation. Here, key lessons learned and ongoing challenges are shared.

Agile Process

With rapidly shifting COVID-19 literature, local disease burden, and quarantine protocols, CROWN

Table 2. Characteristics of 1317 Stanford CROWN Clinic Patients With COVID-19 Diagnosed Between April 2020 and March 2021.

	Clinical risk score for potential clinical deterioration during CROWN clinic intake			
	Total number of patients	Low risk (n = 431)	Medium risk (n = 562)	High risk (n = 298)
Gender				
Female	732	230	324	167
Male	585	201	238	131
Age				
<20	36	27	7	2
20–29	227	120	95	11
30–39	248	114	97	36
40–49	287	96	126	54
50–59	231	54	106	63
60–69	184	20	89	71
70–79	75	–	33	41
80–89	24	–	7	17
90+	5	–	2	3
Preferred language				
English	767	230	368	160
Spanish	493	184	177	117
Other	27	6	8	13
Unknown	15	10	3	1

Abbreviations: COVID-19, coronavirus disease 2019; CROWN, Care and Respiratory Observation of Patients With Novel Coronavirus; –, Everyone age 65 and older was considered at least medium risk, thus, there were no low risk patients older than 65.

protocols had to be regularly updated. When the census expanded during a July 2020 surge and the published literature and personal experience with the disease grew, outreach protocols were adjusted such that low-risk patients received only a simple intake calls with personalized education, rather than scheduled repeat follow-up. This freed resources to follow additional moderate and high-risk patients.

Two key aspects facilitated these rapid adaptations. First, the volunteer nature of the team, inclusive of medical assistants, clinic managers, nurses, providers, and information technologists, allowed for a self-selection of highly motivated individuals that brought a higher degree of energy and “hero-ship” to the creation of a safe, effective work environment. Second, the small size of the pool of CROWN clinician facilitated rapid communication and implementation of clinic changes. This small, agile team met initially daily, then weekly, to trouble-shoot and optimize existing workflows. It was crucial that everyone on the CROWN team (Medical Assistants, nurses, providers, managers) was able and willing to provide input so the research team was able to evaluate all aspects of care.

Collaboration With Specialists

Early on the team was able to establish close relationships with specialists. When it was noticed that many patients had organ-specific symptoms and

COVID-19 sequelae, the team reached out to specialists in Pulmonary, Cardiology, and Neurology and identified a few physicians who were interested in seeing these patients on an urgent basis. A seamless referral process to improve access to timely, high quality clinical care was created with the specialist partners.

Culturally Tailored Care

Care was culturally tailored whenever possible. For example, when it was noticed that many non-English speaking patients were initially refusing care through CROWN, processes were shifted to have language-concordant medical assistants conduct nonmedical aspects of intake care, thereby increasing patient acceptability and uptake.

Tailored Clinical Care

Many patients expressed worry about their COVID-19 diagnosis and had planned on going to the ED for reevaluation. Patients often had unique questions specific to their personal circumstances that could not be answered by general information sheets. Several patients had symptoms lasting longer than 2–3 weeks and wanted further answers on symptom evaluation and treatment. After CROWN providers' proactive and tailored outreach, patients reported reassurance and continued appropriate home-based medical care.

Resource Optimization

A system-wide hiring freeze given the uncertain economic environment meant that clinic staff were drawn from existing clinics. To support overall system access, CROWN providers with light workloads could open their afternoon schedule to urgent care visits unrelated to COVID-19. Many CROWN patients are uninsured or underinsured. While providers billed directly for COVID-19 visits, the time spent by nurses and medical assistants monitoring patients was not reimbursed. Health system leadership has viewed the clinic as a critical resource in order to provide safe care to the broader population during the COVID-19 pandemic and continue to support its operations, despite the clinic's cost structure.

Next Steps

As millions of individuals in the United States have been diagnosed with COVID-19, academic medical centers should consider how specialized COVID-19 clinics can add value to their patients and health systems during this pandemic.

The Stanford CROWN Clinic was created to address unmet needs of patients and the health system around COVID-19, by providing equitable specialized education, monitoring, and management from the point of COVID-19 diagnosis to recovery or escalation of care. These unmet needs include (1) improving access and quality of care for patients with COVID-19, (2) facilitating the production of generalizable knowledge regarding COVID-19, (3) improving clinician, staff, and non-COVID-19 patient safety, (4) reducing health-related inequities, and (5) reducing inappropriate care utilization.

In an effort to reduce health inequities, the CROWN Clinic has served as a critical portal of entry for patients who are marginalized. While technology-focused symptom monitoring may be an option for well-resourced patients with available primary care, safety-net populations may not have access or resources to participate in these online systems. In addition, many patients had questions particular to their circumstances not addressed by standard information sheets and decisional algorithms used to provide population-level care. By providing individualized guidance, patients appeared to have greater acceptance of home-based COVID self-care recommendations.

As with many of disease-specific clinics, COVID-19 specialized clinics have the potential to holistically improve access to care and patient outcomes. COVID-19 specialized clinics may have a role in improving patient and system-level efficiency and financial outcomes. Active outreach ensures that patients have a more seamless experience of care without delays. Primary- and specialty-care clinics can operate more safely during the pandemic. EDs can focus on patients requiring emergency-level care. Given the novelty of COVID-19 and the dynamic nature of the disease, determining if access, quality of care and clinical outcomes for patients with COVID-19 have improved under this clinic model is an area for future investigation. In the interim, the research team is expanding their community partnerships and language support services to embrace the diverse communities affected by the pandemic.

Conflicts of Interest

The authors have no conflicts of interest to disclose.

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Author Contributions

Dr Barman involved in concept and design, collection and analysis of data, and preparation of article. Dr Srinivasan involved in analysis and article preparation. Dr Thomas involved in preparation of article. Dr Vilendrer involved in analysis and article preparation. Mr. Singh involved in data analysis. Dr Asch involved in preparation of article. Dr Artandi involved in concept and design, collection and analysis of data, and preparation of article.

Institutional Review Board Approval

This quality improvement project was reviewed by the Stanford Institutional Review Board and did not meet the definition of human subjects research (Protocol number: 56054).

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