

Outcomes of COVID-19 Drive-through Screening at an Academic Military Medical Center

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Abstract

Drive-through COVID-19 screening can evaluate large numbers of patients while reducing healthcare exposures and personal protective equipment use. We describe the characteristics of screened individuals as well as drive-through process and outcome measures. Optimal drive-through screening involves rapid turnaround of test results and linkage to follow-up care.

Keywords: drive-through, COVID-19, SARS-CoV-2

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Mitigation of the coronavirus disease 2019 (COVID-19) pandemic requires increased access to testing for its causative agent, SARS-CoV-2 [1]. Drive-through delivery of healthcare was modeled in a training exercise as a safe and efficient mechanism to provide large populations access to testing during the 2009 H1N1 pandemic [2]. During the current pandemic, drive-through screening has processed large volumes of patients more efficiently than conventional in-clinic assessment, while reducing potential healthcare exposures and protective equipment (PPE) use [2-15]. However, there are limited data regarding patient characteristics or outcomes in the drive-through setting [8-11, 15]. Brooke Army Medical Center (BAMC) (San Antonio, TX) implemented drive-through screening for SARS-CoV-2 in March 2020. We describe the demographic and clinical characteristics of screened individuals and report test turnaround time and hospital admissions as safety-outcome measures.

Methods

Drive-through Screening Process

Drive-through COVID-19 screening at BAMC commenced March 18, 2020. Medical technicians, wearing single-patient gloves and extended-use surgical masks, used a questionnaire to interview patients through an open vehicle window in a designated parking lot adjacent to the hospital. The screening questionnaire collected demographics, military duty/beneficiary status, recent travel, contact with confirmed COVID-19 cases, and current symptoms. Each questionnaire was reviewed by a licensed medical provider to disposition patients for SARS-CoV-2 testing, no testing, or immediate referral to the Emergency Department (ED) for additional evaluation.

SARS-CoV-2 testing was performed, at the provider's discretion, for any symptomatic beneficiary regardless of age or an epidemiologic link to COVID-19 given local transmission. Symptoms were defined as an affirmative answer to one or more of the following: fever $>100.4^{\circ}$ F, chills, cough, dyspnea, or sore throat. All samples were obtained via nasopharyngeal swab by a nurse or medical technician wearing single-patient gloves and an extended-use gown, N95 respirator, and face shield.

SARS-CoV-2 testing was performed at BAMC using the Centers for Disease Control and Prevention (CDC) 2019-nCoV Real-Time Polymerase Chain Reaction (RT-PCR) Diagnostic Panel (CDC, Atlanta, GA). Due to limitations in testing capacity, samples were also outsourced (COVID-19 RT-PCR Test, Laboratory Corporation of America, Burlington, NC). All patients were provided educational materials about COVID-19.

Performance Improvement Process

This analysis was performed to optimize BAMC's drive-through screening process and received a Not Research Determination from BAMC's Institutional Review Board. Questionnaires for all patients presenting to the drive-through from March 20-25, 2020, were reviewed, and the first drive-through encounter for each patient was included. Data for SARS-CoV-2 results, testing platform used, and turnaround time were obtained from our Microbiology Laboratory. The electronic medical record was reviewed for comorbid conditions in positive cases, and for additional SARS-CoV-2 testing and BAMC hospital admission within 14 days of screening for all patients. Descriptive statistics were performed using chi-squared, Fisher's exact, or Wilcoxon rank sum test, where appropriate; significance was set at $p < 0.05$.

Results

A total of 979 patients presented for screening during the evaluation period; 15 (1.5%) patients presented multiple times. The median age was 36 years (IQR 25-49), with a similar proportion of men and women (Table 1). SARS-CoV-2 testing was performed for 734 (75.0%) patients, of which 258 (35.1%) were performed in-house and 476 (64.9%) were outsourced, with a median turnaround time of 25 hours (IQR 21-29) and 221 hours (IQR 161-269), respectively. A significantly higher proportion of healthcare workers and active-duty members were tested. Nine (0.9%) patients were dispositioned directly to the ED, all of whom tested negative and were discharged from the ED. Of those screened but not tested, 5 (2.0%) later received testing within 14 days after their drive-

through visit, and all had negative results. Twenty-nine (4.3%) patients with negative index-test results had a subsequent test performed within 14 days, only one of whom converted to positive on day 14.

SARS-CoV-2 testing was positive in 46 (6.3%) patients and inconclusive in 4 (0.5%) patients. Three (0.4%) patients had cancelled drive-through tests due to a subsequent ED visit or hospitalization, where testing was repeated using the in-house assay to expedite results, or due to a sample-collection error; all repeated tests were negative. Additional analyses were conducted for those with positive or negative drive-through testing (n=727). Positive tests were more commonly observed in women than men (8.2% vs 4.5%; $p=0.04$). Chills were reported more often in patients who tested positive (54.3%) versus negative (37.6%; $p=0.02$); there were no other significant differences in reported symptoms. Comorbidities for confirmed cases included allergic rhinitis/seasonal allergies (34.8%), obesity (26.1%), and hypertension (21.7%) (Table 2). No healthcare workers involved in screening or sample collection were diagnosed with COVID-19.

Eleven (1.2%) patients were hospitalized, 10 of whom had been tested for SARS-CoV-2. Two patients had positive tests and an admitting diagnosis of COVID-19, while the remaining 9 patients were admitted for non-COVID-19 illnesses. There was a trend towards hospitalization for patients testing positive (4.3%) versus negative (0.9%; $p=0.09$). The median time from screening to hospitalization was 1 day (IQR 0-4), with the 2 patients positive for SARS-CoV-2 admitted 1-6 days post-screening.

Discussion

A standardized approach to drive-through screening allows for consistent differentiation of possible COVID-19-related symptoms and provides a safe, efficient mechanism for screening large numbers of patients, while minimizing unnecessary exposure to the healthcare environment. Drive-through screening was also an effective method to test healthcare workers [9-10, 15], who represented approximately one-quarter of those tested in our analysis. Although our screening method involved

face-to-face interviews of patients in their vehicles, other drive-through programs have implemented a web-based questionnaire [15], telephone triage [3-7, 9, 14], or on-site microphones [11] for patient assessment or communication. Though we had no cases of COVID-19 in healthcare workers with direct patient interaction, these adaptations would allow for further decreased potential cross-exposure of healthcare workers and patients as well as decreased PPE use [6, 8-11, 13].

A potential risk of drive-through screening is that patients who would otherwise require further medical evaluation due to complex or concerning presentations could be missed due to anchoring on the presence or absence of indications for SARS-CoV-2 testing. In our analysis, <1% of patients screened were dispositioned to the ED, and approximately 1% of patients screened required hospitalization within 14 days, though we did not capture admissions to outside facilities. Our proportion of cases hospitalized (4.3%) was similar to that seen in a Seattle drive-through for healthcare workers (3.2%) [15]. Nonetheless, the median time from screening to admission suggests that some patients requiring additional medical evaluation may have reported to the drive-through. Positioning the drive-through in close proximity to the ED [2, 4-5] and having provider oversight may have mitigated risk for our program. Recognizing the need to mitigate risk, the Mayo Clinic has incorporated telehealth follow-up for confirmed cases, and an in-person clinic for those with respiratory symptoms who tested negative but needed further evaluation [8-9]; by contrast, a drive-through program in Malaysia transported all confirmed cases to their hospital via ambulance [13]. The use of an algorithm to identify more seriously ill patients and linkage to primary-care and/or emergency follow-up are essential elements of a drive-through program. Reflective of active-duty military, our analysis had a high proportion of young and healthy patients. Drive-through platforms drawing older patients and/or those with more comorbidities may require an even greater emphasis on triage to follow-up or immediate care.

A limitation to our process was the approximately 9-day turnaround time for outsourced tests due to high demand and limited testing options at that time. This significantly delayed contact tracing, which is critical in mitigating COVID-19 [16]. Current guidance for outpatient testing states that SARS-CoV-2 results should return within 48 hours of collection to inform decision-making at the individual-patient and public-health levels [1]. Other drive-through centers have reported a 24-72-hour turnaround time [9, 12-14]. Since access to testing with a relatively quick turnaround is important to optimize drive-through effectiveness, BAMC eliminated outsourced testing after the analysis period and added a rapid SARS-CoV-2 assay. An additional limitation was that some patients who had symptoms recorded by questionnaire were not tested. Although specific reasons were not captured, this may have been due to variability in self-reporting of symptom severity [17], additional clarification after provider review (e.g., chronic or resolved symptoms) or ineligibility for testing due to lack of military-beneficiary status. However, none of the screen-only patients later tested positive or were hospitalized for COVID-19 within 14 days. Although our testing protocol focused on symptomatic patients, a universal-testing program in South Korea found that 2.6% of asymptomatic patients without a history of close contact tested positive [11]. Broader testing criteria to include asymptomatic individuals can be considered if resources allow in order to inform medical or public-health decision-making [1].

Given the ongoing need for mitigation of COVID-19 as the economy reopens, optimized access to accurate, efficient, safe testing is important. The BAMC experience shows this is possible through a drive-through platform employing medical technicians as physician extenders. Drive-through screening should be optimized for quick-turnaround time for test results and improved linkage to primary and/or emergency care. As SARS-CoV-2 testing availability increases and guidelines recommend testing selected asymptomatic patients [1], drive-through screening could also be adapted to meet an increased future demand.

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TABLE 1. Characteristics of Patients Presenting for Drive-Through Screening for COVID-19*

Patient Characteristics	Total Screened (n = 979)	Not Tested (n = 245)	Total Tested (n = 734)	P- valu e	Test (+) (n = 46) [†]	Test (-) (n = 681) [†]	P- valu e
Median age, yrs [§]	36 (25-49)	35 (25-53)	36 (25-48)	0.58	39 (27-54)	36 (25-47)	0.18
Female Sex [§]	462 (47.2)	106 (43.4)	356 (48.5)	0.19	29 (63.0)	324 (47.6)	0.04
Active duty	422 (43.1)	92 (37.6)	330 (45.0)	0.04	17 (37.0)	311 (45.7)	0.25
Barracks dweller or military trainee	37 (3.8)	8 (3.3)	29 (4.0)	0.63	0 (0)	29 (4.3)	0.25
Healthcare worker	219 (22.4)	26 (10.6)	193 (26.3)	<0.01	9 (19.6)	183 (26.9)	0.28
Cruise/foreign travel in the 14 days prior to screening [§]	34 (3.6)	11 (4.6)	23 (3.3)	0.35	4 (8.9)	19 (29.1)	0.05
US travel in the 14 days prior to screening [§]	109 (11.5)	22 (9.1)	87 (12.4)	0.17	8 (17.8)	78 (12.0)	0.23
Known (+) contact [§]	211 (21.7)	59 (24.1)	152 (20.9)	0.29	14 (30.4)	137 (20.3)	0.10
Median days of symptoms prior to testing	3 (2-7)	7 (2-14)	3 (2-7)	0.01	3 (1-7)	3 (2-7)	0.35
Fever	210 (21.5)	11 (4.5)	199 (27.1)	<0.01	17 (37.0)	181 (26.6)	0.13
Chills	298 (30.4)	13 (5.3)	285 (38.8)	<0.01	25 (54.3)	256 (37.6)	0.02
Cough	663 (67.7)	52 (21.2)	611 (83.2)	<0.01	41 (89.1)	563 (82.7)	0.26

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Dyspnea	326 (33.3)	12 (4.9)	314 (42.8)	<0.0 1	22 (47.8)	289 (42.4)	0.47
Sore throat	478 (48.8)	31 (12.7)	447 (60.9)	<0.0 1	23 (50.0)	421 (61.8)	0.11

* Data expressed as number (%) or median (IQR), as appropriate.

† 7 tests resulted as "inconclusive" or "canceled" and were not included in the positive or negative test results.

§ Data were missing on 3 patients for age, 1 for sex, 34 for foreign/cruise travel, 35 for US travel, and 6 for known COVID-19 contact. Calculations, as appropriate, reflect the adjusted denominator.

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TABLE 2. Comorbidities of Patients Testing Positive for SARS-CoV-2 at Drive-Through Screening

Number of Confirmed Cases (n = 46)	
Comorbidities	No. (%) of patients
Cardiovascular disease (not including hypertension)	2 (4.3)
Cerebrovascular disease	1 (2.2)
Chronic respiratory illness (including asthma)	4 (8.7)
Chronic kidney disease	0 (0.0)
Chronic liver disease	1 (2.2)
Diabetes	2 (4.3)
Obesity (BMI ≥ 30 kg/m ²)	12 (26.1)
Hypertension	10 (21.7)
Cancer (solid tumors, not including non-melanoma skin cancer)	5 (10.9)
Rheumatologic or autoimmune disease	1 (2.2)
Blood disorder (includes leukemia, lymphoma)	0 (0.0)
Human immunodeficiency virus	1 (2.2)
Solid organ or bone marrow transplant recipient	0 (0.0)
Other immunocompromising condition	0 (0.0)
Pregnancy	0 (0.0)
Allergic rhinitis or seasonal allergies	16 (34.8)