COVID-19

Testing Asymptomatic Emergency Department Patients for Coronavirus Disease 2019 (COVID-19) in a Low-prevalence Region

James S. Ford, MD, Aman Parikh, MD, Rupinder Sandhu, Samuel Turnipseed, MD, Beth Morris, MPH, Larissa May, MD, MSPH, and James F. Holmes, MD, MPH

The first cases of Coronavirus disease 2019 (COVID-19) were reported in Wuhan, China, in December 2019.[1] The literature demonstrates geographic variation with regard to estimates of infection incidence, suggesting that COVID-19 has been underdiagnosed in certain regions.[2,3] The rate of asymptomatic infection has been estimated to be as high as 30.8%, which may help explain variation in incidence, particularly in regions with differing screening practices.[3] Transmission of COVID-19 by asymptomatic carriers has been reported in multiple family units, indicating that this mode of infection is important in understanding disease epidemiology and population risk.[4,5] In one study, in individuals who were asymptomatic at the time of confirmed COVID-19 infection, the median communicable period (defined as time from positive test to negative test) was 9.5 days (range = 1–21 days), and approximately 21% of these patients went on to develop symptoms, suggesting that individuals may be infectious prior to the development of symptoms.[5] As such, identifying asymptomatic individuals is likely important in containing the spread of the virus. With the temporary closure of many ambulatory care settings, the emergency department (ED) has become a focal point in COVID-19–related health care delivery in many communities. However, due to various factors including limited testing capacity, data regarding the yield of routine screening of asymptomatic individuals are limited. Furthermore, while the utility of screening asymptomatic individuals has been explored in high-prevalence regions, studies have not been published for low-prevalence regions.[6,7] In this study, we aimed to describe screening for COVID-19 in asymptomatic ED patients in a low-prevalence region.

This was a retrospective cohort study of data from the study site's electronic health record (EHR). The study was approved by the study site's institutional review board. The study site is an urban, Level I trauma center and tertiary referral center with an annual ED volume of 82,000 patients. It resides in a county with a population of 1,527,718 people. We included all ED patients who had a COVID-19 test ordered under the site's asymptomatic screening protocol, either in the ED or within 24 hours of admission from the ED. The study site was also performing asymptomatic COVID-19 testing at one of its clinics, for patients scheduled for surgical procedures. Patients were excluded if they incorrectly presented to the ED for this asymptomatic screening. On April 4, 2020,

From the University of California Davis Health, Sacramento, CA, USA.
Received June 1, 2020; revision received June 3, 2020; accepted June 3, 2020.
Author contributions: JH, AP, RS, and ST conceived and designed the study; BM performed data collection; JH and BM managed and analyzed the data; JH and JF interpreted the data; JH and JF drafted the manuscript; and all authors contributed substantially to its revision. JH takes responsibility for the paper as a whole.
The authors have no relevant financial information or potential conflicts to disclose.
Supervising Editor: Jeffrey A Kline, MD.
Address for correspondence and reprints: James S. Ford, MD; e-mail: jsford@ucdavis.edu.
ACADEMIC EMERGENCY MEDICINE 2020;27:771–774.

doi: 10.1111/acem.14044
ISSN 1553-2712

the study site began testing for COVID-19 in asymptomatic ED patients who were placed on involuntary psychiatric holds. This testing process began due to concerns that COVID-19 infections would be difficult to control in the close living environments of psychiatric hospitals, and the study site wanted to ensure that patients did not have COVID-19 prior to transfer to these facilities. On April 14, 2020, the asymptomatic screening protocol expanded to include testing for all patients admitted to the hospital from the ED and all patients awaiting placement in other close living environments (i.e., skilled nursing facility, jail, or other congregate living facility). When ordering asymptomatic COVID-19 testing, the provider was required to enter the indication for testing, including "other" if the reason for testing was not listed. All patients undergoing asymptomatic testing were required to wear surgical masks, and all ED providers were also required to wear surgical masks. No further isolation (contact or airborne) was implemented as part of the asymptomatic screening protocol.

Detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was performed by reverse transcriptase polymerase chain reaction, using samples obtained from nasopharyngeal swabs. Two assays were used during the study period, both of which were sanctioned by the Food and Drug Administration's Emergency Use Authorization and validated for use with nasopharyngeal swab samples. One assay was run on a high-throughput platform (Cobas 6800, Roche Diagnostics) and one assay was run on a medium-throughput platform (BDMax, Becton Dickinson). Data were collected from April 4, 2020, to May 13, 2020 (40 days). The following data were explicitly defined and collected from the EHR for each patient meeting inclusion criteria: age, sex, Emergency Severity Index (ESI) triage criteria, homeless status, indication for asymptomatic COVID-19 testing, COVID-19 test order, COVID-19 test result, and admission team. ESI is a triage scheme that stratifies patients into five categories from one (most severe) to five (least severe).[8] Homeless status was categorized as "yes" or "no," based on patient self-report. Indications for asymptomatic COVID-19 testing included the following: 1) admission to the hospital, 2) involuntary psychiatric hold, 3) placement in a close living environment, and 4) "other." When the indication of "other" was selected, providers were required to insert the reason as free text. In the case of canceled COVID-19 tests, data regarding the reason for cancelation were not captured for individual patients. However, tests were usually canceled because of an inadequate sample or because the patient refused testing. The primary outcome measure was the result of COVID-19 testing. The infectious disease service was consulted to assist with management of patients with positive test results. Data are described with simple descriptive statistics. Continuous data are presented as mean ± one standard deviation (SD). Ninety-five percent confidence intervals (95% CIs) are presented, where appropriate. Data analysis was conducted using Stata 15 (StataCorp, 2017).

A total of 1,342 ED patients had an order placed for COVID-19 testing using the asymptomatic testing protocol. The mean ± SD age was 47.4 ± 22.9 years and 823 (61%) were male. Of these, 96 (7.1%, 95% CI [5.8%, 8.7%]) patients had their test canceled (either specimen was inadequate or patient refused testing). Patient characteristics, stratified by testing status (completed vs. canceled), are presented in **Table 1**. Thirty-six patients had a testing indication of other (clinic request = 3, homeless = 3, predialysis = 2, high-risk = 2, clearance for return to work = 2, possible admission = 1, resolved symptoms of COVID-19 = 1, chills/sick contact = 1). In the 1,246 patients who completed asymptomatic testing for COVID-19, two (0.2%, 95% CI [0.02%, 0.6%]) tested positive. One of these cases underwent repeat testing the next day (while admitted) and tested negative and remained asymptomatic during hospitalization. This case was considered by the infectious diseases consult team to be either a false-positive test or an asymptomatic infection. The other positive patient, when evaluated by the infectious diseases consult team, was determined to have both a cough and close contact with COVID-19–infected individuals and thus was deemed a symptomatic infection. During the 40-day study period, the study site tested 886 symptomatic patients for COVID-19 and 37 (4.2%, 95% CI [3.0%, 5.7%]) tested positive.

As COVID-19 testing capacity increases with time, more institutions will likely seek to adopt an asymptomatic screening protocol for admitted patients or for patients who will be transferred to other inpatient settings, to control nosocomial spread of the virus. In this study, we describe the testing of asymptomatic ED patients for COVID-19 in a low-prevalence region of the United States. Prior studies on asymptomatic screening are from high-prevalence regions. During the study period, 526 cases of COVID-19 were

Table 1
Characteristics of Asymptomatic Patients Tested for COVID-19

	Test Completed (*n* = 1,246)	Test Canceled (*n* = 96)
Age (years)	47.9 ± 22.9	40.3 ± 21.9
Sex (male)	758, 61% (58%–64%)	65, 68% (57%–77%)
Homeless*	189/1035, 16% (14%–19%)	19/82, 23% (15%–34%)
Indication for test		
Admission	956, 77% (74%–79%)	65, 68% (57%–77%)
Psychiatric hold	229, 20% (18%–23%)	21, 22% (14%–31%)
Placement	25, 2% (1%–3%)	2, 2% (0%–7%)
Other	29, 2% (2%–3%)	7, 7% (3%–14%)
Unknown (missing)	10, 1% (0%–1%)	1, 1% (0%–6%)
ESI triage category†		
1	36, 3% (2%–4%)	3, 3% (0.7%–9%)
2	71, 6% (5%–7%)	5, 5% (2%–12%)
3	626, 51% (48%–54%)	43, 45% (35%–56%)
4	337, 27% (25%–30%)	40, 42% (32%–53%)
5	32, 3% (2%–4%)	4, 4% (1%–10%)

Continuous variables described as mean ± SD. Categorical variables described as number, percent (95% CI).
ESI = Emergency Severity Index.
*Data are self-reported. Data were missing for 225 patients.
†Data were missing for 12 patients.

diagnosed in the study site's county (40-day incidence = 34 cases per 100,000 population).[9] The Centers for Disease Control and Prevention reported a national incidence that varied significantly by region, ranging from 20.6 to 915.3 cases per 100,000 population, during a time period just prior to this study (February 12 to April 7, 2020).[10] Thus, the study site represents a low-prevalence region. In our study population, we found a very low true-positive rate among asymptomatic patients undergoing testing. While the rate of asymptomatic infection was low, testing led to the diagnosis of COVID-19 in one inpatient, who then was placed in appropriate isolation. Had this patient not been tested via the asymptomatic screening protocol, this COVID-19 infection would not have been identified, potentially exposing health care workers and other patients. When performing disease surveillance in low-prevalence regions, the presence of false-positive test results is inevitable. In our study, one of the two patients with positive test results was likely a false-positive. This asymptomatic individual was retested the next day and found to be negative.

This study must be interpreted in the setting of its limitations. This was a single-center study, so our results may not be generalizable to other settings. As the prevalence and impact of COVID-19 is very regional, local COVID-19 infection trends must be considered. This study was retrospective, and thus it is limited by the data available in the EHR and subject to the limitations of a retrospective study. As the data were downloaded from the EHR, errors in manual data abstraction were minimized. Finally, a small percentage of patients (7%) had their test canceled. It is possible that some of these patients may have tested positive.

Screening asymptomatic ED patients for COVID-19 in a low-prevalence region is of very low yield. The decision to test asymptomatic ED patients should be made on an institution-by-institution basis, dependent on regional prevalence and test availability.

References

1. World Health Organization. Pneumonia of Unknown Cause – China. 2020. Available at: https://www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/en/. Accessed Apr 15, 2020.
2. Nishiura H, Jung SM, Linton NM, et al. The extent of transmission of novel coronavirus in Wuhan, China, 2020. J Clin Med 2020;9:330.
3. Nishiura H, Kobayashi T, Miyama T, et al. Estimation of the asymptomatic ratio of novel coronavirus infections (COVID-19). Int J Infect Dis 2020;94:154–4.
4. Bai Y, Yao L, Wei T, et al. Presumed asymptomatic carrier transmission of COVID-19. JAMA 2020;323:1406.
5. Driggin E, Madhavan MV, Bikdeli B, et al. Cardiovascular considerations for patients, health care workers, and health systems during the coronavirus disease 2019 (COVID-19) pandemic. J Am Coll Cardiol 2020;75:2352–71.

6. Sutton D, Fuchs K, D'Alton M, Goffman D. Universal screening for SARS-CoV-2 in women admitted for delivery. N Engl J Med 2020;382:2163–4.
7. Treibel TA, Manisty C, Burton M, et al. COVID- 19: PCR screening of asymptomatic health-care workers at London hospital. Lancet 2020;395:1608–10.
8. Li B, Yang J, Zhao F, et al. Prevalence and impact of cardiovascular metabolic diseases on COVID-19 in China. Clin Res Cardiol 2020;109:531–8.
9. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet 2020;395:1054–62.
10. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020;395:497–506.