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Research Brief

Healthcare worker infection with SARS-CoV-2 and test-based return to work

Erica S. Shenoy MD, PhD[1,2,3], Lauren R. West MPH[2], David C. Hooper MD[1,2,3], Rosemary R. Sheehan[4], Dean Hashimoto MD[5], Ellyn R. Boukus MA[6], Marisa N. Aurora MPH[6], Dustin S. McEvoy[7] and Michael Klompas MD, MPH[8,9]

[1]Division of Infectious Diseases, Massachusetts General Hospital, Boston, Massachusetts, [2]Infection Control Unit, Massachusetts General Hospital, Boston, Massachusetts, [3]Department of Medicine, Harvard Medical School, Boston, Massachusetts, [4]Human Resources, Mass General Brigham, Boston, Massachusetts, [5]Occupational Health Services, Mass General Brigham, Boston, Massachusetts, [6]Data and Analytics Organization, Mass General Brigham, Boston, Massachusetts, [7]Clinical Informatics, Mass General Brigham, Boston, Massachusetts, [8]Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts and [9]Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts

Infection of healthcare workers (HCWs) with SARS-CoV-2 can result from either community or workplace exposure. Determination of when the HCW can return to work (RTW) has important implications for patient and workforce safety as well as workforce preservation. On April 13, 2020, the Centers for Disease Control and Prevention (CDC) modified its guidance to indicate a preference for the use of a test-based strategy to determine when HCWs may return to work in healthcare settings over a symptom-based strategy. Subsequent iterations have indicated that either time plus symptom–based or test-based approaches are acceptable.[1] At Massachusetts General Brigham (MGB), test-based RTW criteria was established at the start of the coronavirus disease 2019 (COVID-19) pandemic. We report average intervals until test-based clearance and the number of excess lost work days using test-based clearance.

Methods

The MGB system is a not-for-profit healthcare system with 78,000 employeees, 2 academic health centers, 6 community hospitals, 2 speciality hospitals, a rehabilitation network, as well as urgent care centers, community health centers, and home-based care programs. Employees with symptoms compatible with COVID-19 were referred to MGB Occupational Health Services for evaluation and were referred for nasopharyngeal (NP) sampling. Various viral RNA nucleic acid amplification methods were used (Supplementary Material online). Initially, testing was contingent upon symptom onset with respect to clinical duties. As testing capacity expanded, all employees with any symptoms consistent with COVID-19 were referred for testing.

The following RTW criteria were implemented: resolution of fever without fever-reducing medications, improvement in respiratory symptoms, and at least 2 consecutive negative NP swabs collected ≥24 hours apart. A minimum interval of time from resolution of symptoms to first test of clearance was not specified.

Author for correspondence: Erica S. Shenoy, E-mail: eshenoy@mgh.harvard.edu
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Outcomes included number of days to first and second sequential negative NPs summarized using mean, median, standard deviation, Kaplan Meier estimator, and confidence intervals. Lost work days were calculated comparing a time plus symptom–based clearance to the test-based protocol. For the former, we assumed that the day the employee was tested under test-based clearance indicated the resolution of symptoms. All analyses were completed in R version 4.0.0 statistical software (R Foundation for Statistical Computing). The activities conducted here were considered routine infection control and occupational health procedures and not human subjects research by the institutional review board.

Results

Between March 7, 2020, and April 22, 2020, 8,930 employees were tested and 1,049 (11.7%) were positive for SARS-CoV-2. Of those, 37 (3.5%) were hospitalized at an MGB institution within 7 days of their positive test.

Among 590 HCWs with subsequent testing, 425 (72.0%) had at least 1 negative NP swab (Supplementary Fig. S1 online). The mean and median number of days from first positive to first negative were 17.1 (SD, 6.7) and 17 (IQR, 9), with a minimum of 2 days and a maximum observed of 38 days. Of the 425 HCWs with positive SARS-CoV-2 test results, 263 (61.9%) had a sequential second negative NP. The mean and median number of days from first positive to second negative were 19.5 (SD, 6.1) and 19 (IQR, 8), with a minimum observed of 6 days, 25th percentile at 15 days, and a maximum observed at 37 days (Fig. 1). The Kaplan-Meier estimate of median time to clearance was 29 days (95% CI, 28–31) (Supplementary Fig. S2 online). We estimated that test-based clearance accounted for an additional 4,097 days of cumulative lost work time, corresponding to a mean of 7.2 additional days of work lost per employee than would have been accrued using the time plus symptom-based clearance method.

Discussion

The HCWs diagnosed and treated for COVID-19 had prolonged recovery of viral RNA; the test-based strategy resulted in a median time to RTW of 19 days. The long duration of PCR

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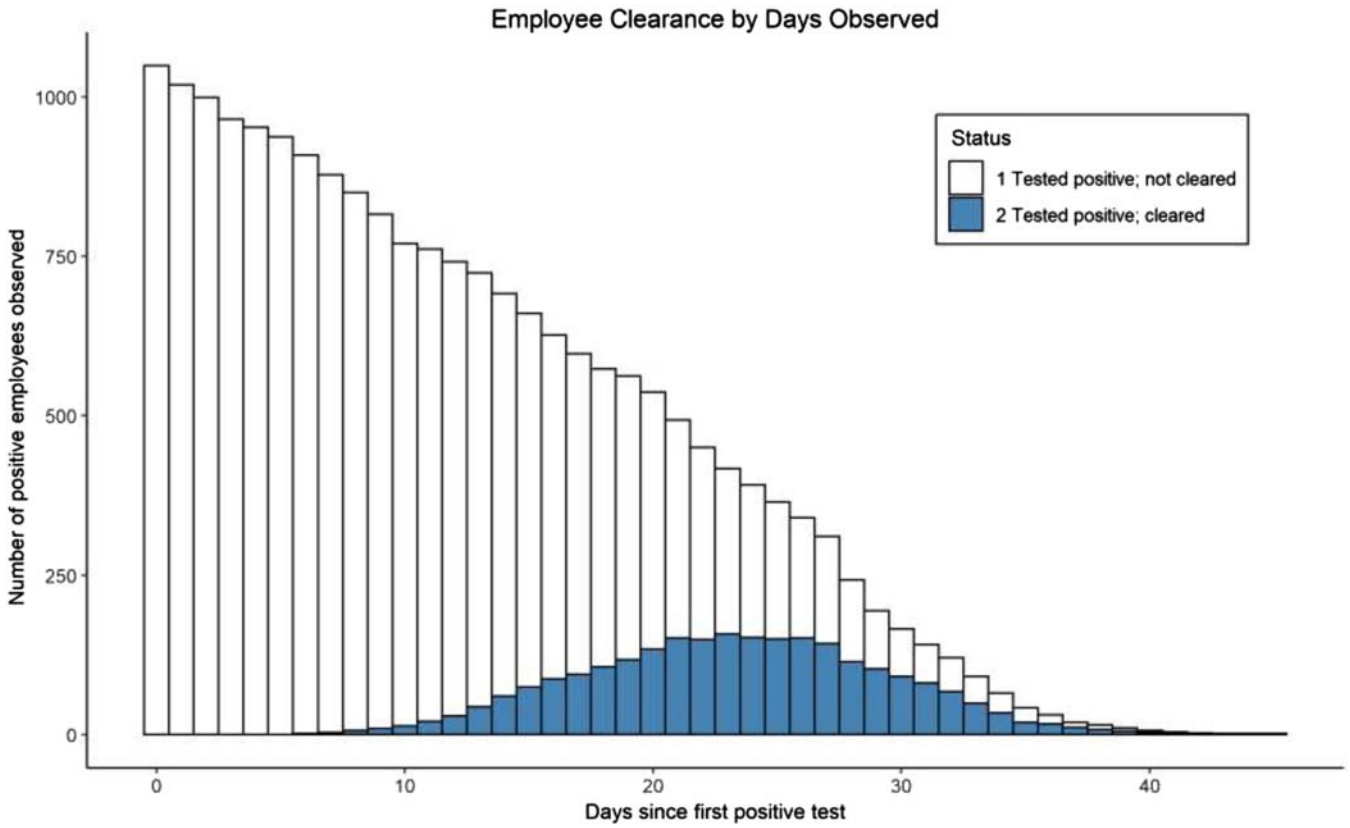

Fig. 1. Employee return to work (RTW) by days observed. Employees in whom 2 sequential negative nasopharyngeal swabs were obtained at least 24 hours apart are shown in blue. Those without repeat testing or with a single negative swab are shown in white.

positivity is consistent with prior studies. The time plus symptom–based criteria would have resulted in 4,097 fewer lost work days, or an average of 7.2 fewer days of work lost per employee. The additional psychological toll of prolonged positivity on HCW well-being was not assessed; some HCWs reported stress and anxiety from isolating within their households and extended delays in returning to work.

This research had several limitations. A subset of employees were still in process for RTW considerations at the end of the study period. Some employees lost to follow-up include those who elected not to be retested despite meeting criteria, including those who were working remotely during the study period.

Also during the study period, additional evidence emerged regarding lack of transmission after recovery from symptoms,[2–6] which has informed a shift away from a test-based strategy in favor of a time plus symptom–based strategy for ending isolation and permitting RTW in healthcare settings. Viral load has been shown to be highest at the time of symptom onset and then to decline within a week thereafter.[4] Transmission is rare among close contacts of COVID-19 cases when that contact occurred after day 6 of the source individual's infection,[3] and transmission has not been reported from close contacts of patients who have tested positive after recovery from their illness.[5] These observations were noted by the CDC in their May 3, 2020, decision memo supporting a move away from test-based strategies for discontinuation of isolation.[7] MGB accordingly switched to time plus symptom–based RTW criteria on May 22, 2020.

In summary, persistently positive RNA PCRs are common in healthcare workers and present a formidable challenge to healthcare institutions.[8] If test-based criteria are used for RTW, we recommend establishing a minimum duration of days prior to test of clearance. Switching to time plus symptom–based clearance criteria will allow an ealier RTW for most workers and can aid in workforce preservation.

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Universal masking is an effective strategy to flatten the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) healthcare worker epidemiologic curve

Jessica L. Seidelman MD, MPH[1,2], Sarah S. Lewis MD, MPH[1,2], Sonali D. Advani MBBS, MPH[1,2], Ibukunoluwa C. Akinboyo MD[1,2], Carol Epling MD[3], Matthew Case DO[3], Kristen Said MD, MPH[3], William Yancey MD[3], Matthew Stiegel PhD[4], Antony Schwartz PhD[4], Jason Stout MD, MSH[1], Daniel J. Sexton MD[1,2] and Becky A. Smith MD[1,2]

[1]Division of Infectious Diseases and International Health, Department of Medicine, Duke University School of Medicine, Duke University, Durham, North Carolina, [2]Duke Center for Antimicrobial Stewardship and Infection Prevention, Duke University Medical Center, Durham, North Carolina, [3]Division of Occupational and Environmental Medicine, Department of Community and Family Medicine, Duke University Medical Center, Durham, North Carolina and [4]Occupational and Environmental Safety Office, Laboratory Safety, Duke University and Health System, Durham, North Carolina

Atypical presentations of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection along with its ability to be transmitted from asymptomatic and presymptomatic individuals pose unique infection prevention challenges.[1-5] Universal masking policies requiring all healthcare workers (HCWs) to wear face masks while on hospital premises are believed to reduce the risk of transmission in healthcare environments by providing source control and decreasing the spread of SARS-CoV-2 virus-laden oral and nasal droplets from infected individuals. We implemented universal masking (of all HCWs) as a strategy to preserve our workforce and to protect patients by reducing the risk of SARS-CoV-2 transmission from HCW to HCW, from patient to HCW, and from HCW to patient during asymptomatic or presymptomatic exposures. We aimed to measure the effect of universal masking on coronavirus disease 2019 (COVID-19) acquisition within the healthcare setting.

Methods

Duke Health consists of a tertiary care academic hospital, 2 community hospitals, 21,014 HCW, and more than 180 primary care and specialty clinic practices in 10 counties in North Carolina, providing approximately 70,000 inpatient hospitalizations and 2.4 million outpatient visits annually. We prospectively recorded incident SARS-CoV-2 infections among HCW across our healthcare system to determine the impact of universal masking on nosocomial acquisition of SARS-CoV-2 within this population. We defined HCW to include all staff working in the inpatient or outpatient healthcare setting, regardless of the provision of direct patient care. Incident cases of HCW-associated SARS-CoV-2 cases were reported to the hospital system's infection prevention team by Employee Health (EH). A team of case tracers interviewed all HCW patients to review potential community and occupational exposures. Based on the interview findings, each case was adjudicated by a panel of the authors (JS, SL, CE, MC, KS, WY, MS, BS) into the following categories: community-acquired, healthcare-acquired, or an unknown acquisition route. Community-acquired SARS-CoV-2 cases were defined as HCWs who had an unmasked exposure to a known positive person such as a family member, friend, or coworker outside of the hospital for greater than 10 minutes at less than 6 feet. Healthcare-acquired SARS-CoV-2 cases were defined as a HCW who had an unmasked exposure for greater than 10 minutes at less than 6 feet to another HCW who was symptomatic and tested positive for SARS-CoV-2 or a HCW who had an exposure to a patient with a positive SARS-CoV-2 test and was either not wearing the Centers for Disease Control and Prevention (CDC) (https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-risk-assesment-hcp.html) fully-recommended Personal Protective Equipment (PPE) or reported a breach in PPE.

We used negative binomial regression to compare the incidence rates of healthcare-acquired SARS-CoV-2 cases among Duke Health HCWs before and after institution of universal masking using a likelihood ratio test. We also compared incidence rates of healthcare-acquired SARS-CoV-2 to community incidence rates from local counties (i.e. Durham, Granville, Orange, Person, and Wake) in North Carolina.

Results

From March 15, 2020 to June 6, 2020 we assessed all HCWs who tested positive for SARS-CoV-2. Based on the panel adjudication, 38% cases were community-acquired, 22% were healthcare-associated, and 40% did not have a clear source of acquisition. Of note, 80% of HCWs did not work on COVID-19 units.

Author for correspondence: Jessica L. Seidelman, E-mail: Jessica.seidelman@duke.edu
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