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## COVID-19 screening, testing and vaccination: Perceptions from emergency medicine residents and medical students



The novel coronavirus COVID-19 pandemic originated in Wuhan, China in 2019 and spread globally with reported cases in the United States as early as January 2020 [1]. Since then, there have been 114 million reported cases with just over 2.5 million deaths globally [2].

As cases continue to fluctuate, guidelines on testing and advances in the development of therapeutic interventions have gained increasing importance. One source estimates the use over 433 therapeutic drugs of which 346 are currently being used in human trials as well as 179 total vaccines developed with an estimated 56 in various stages of human trials (Biorender [3]). While these critically important developments unfold, we must consider the perspectives of frontline healthcare workers in strategically and efficiently addressing factors related to the pandemic. Our survey was distributed to roughly 5,000 Emergency Medicine (EM) residents and medical students from the Emergency Medicine Residents' Association (EMRA) to understand sentiments regarding COVID-19 screening, testing and vaccination.

While most EDs are not currently screening all patients that visit the ED for COVID-19, a majority agreed that they would use this method under ideal situations suggesting current limitations in existing screening processes. Given the differences between current and ideal circumstances and similar to the findings of Wee et al. [4], frontline clinicians, in conjunction with local, state and national guidelines and expectations, should have leeway to make informed decisions regarding COVID-19 screening processes in the ED.

We found that of 156 respondents, 68% ( $n = 106$ ) said that they thought they had been previously infected but were never tested for COVID-19. This may be due to variations in testing availability, variability in guidelines on screening or testing symptomatic versus asymptomatic staff [5] or workforce privacy concerns.

We also found that EM residents and medical students strongly agreed that they would not only be willing to receive regular COVID-19 testing but that they agreed that frontline healthcare workers should be offered regular testing. Mani et al. [6] reported that within a roughly one-month period, 3477 symptomatic employees were tested for COVID-19 in which 5.3% ( $n = 185$ ) tested positive. Similarly, our survey identified that of those residents and medical students who were tested using the non-antibody or non-antibody test, between nine and 12% tested positive for COVID-19. Another study found that in various countries including Italy, China, Spain, the United States and France, infection rates among healthcare workers were between 15 and 18% and as high as 20% [7]. It was also found that of 98 healthcare workers who were asymptomatic at testing, 19.4% tested positive, suggesting similar results to the findings from our survey as well [8].

The majority of our respondents said that they were otherwise neutral in regard to testing for their families and/or close contacts. More information is needed in this area to understand the potential for symptomatic and asymptomatic carriers of COVID-19 that are related to healthcare workers to provide guidelines on regular testing.

Non-antibody testing was more highly ranked in terms of its use in clinical decision making, but this may be because of its use in conjunction with imaging, especially in the ED. In fact, non-antibody testing for COVID-19 as early as February 2020 suggested that because of the high false-negative rate, additional measures, such as imaging, should be used in conjunction with non-antibody testing for clinical decision-making [9]. Additional guidelines are needed pertaining to non-antibody testing. The average sensitivity and specificity of FDA-approved antibody tests is 84.90% and 98.63%, respectively, and can therefore be useful in areas of high COVID-19 prevalence [10]. In areas of low COVID-19 prevalence, the efficacy of antibody testing elicits further exploration.

Though there have been rapid efforts to vaccinate our population, there is little-to-no peer-reviewed literature pertaining to the perceptions of the use of COVID-19 vaccines by healthcare workers. More so, the rapid development of the vaccine has raised questions around who should receive the vaccine and how else it should be distributed. The results of our survey demonstrate unanimous agreement that healthcare workers should be the first to receive a vaccine and that the majority of respondents, roughly 61%, agree that they would be willing to receive a vaccine under Emergency Use Authorization (EUA). Most respondents were neutral in regard to their families and/or close contacts receiving a vaccine. Given the timing of when we sent out our survey and the constantly evolving nature of the pandemic, the information summarized here may not capture changes in testing practices and clinical standards based on more recently published guidelines for COVID-19 patients. Similarly, the perspectives summarized only capture a fraction of the healthcare workforce at large with emphasis strictly on the perspectives of 156 EM residents and medical students. Although opinions regarding the rapid development of the vaccine are not well-captured in this survey, it does highlight sentiments surrounding the vaccination of healthcare workers.

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### Meetings

None.

### Declaration of Competing Interest

The authors have no conflicts of interest.

## References

- [1] Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, et al. First case of 2019 novel coronavirus in the United States. *N Engl J Med*. 2020;382(10):929–36. <https://doi.org/10.1056/NEJMoa2001191>.
- [2] The Johns Hopkins Coronavirus Resource Center. Retrieved December 15, 2020, from <https://coronavirus.jhu.edu/>; 2021.
- [3] COVID-19 Vaccine Tracker. Biorender. Accessed 11/05/2020 <https://biorender.com/covid-vaccine-tracker>; 2020.
- [4] Wee LE, Fua TP, Chua YY, Ho AFW, Sim XYJ, Conceicao EP, et al. Containing COVID-19 in the emergency department: the role of improved case detection and segregation of suspect cases. *Acad Emerg Med*. 2020;27(5):379–87. <https://doi.org/10.1111/acem.13984>.
- [5] Rivett L, Sridhar S, Sparkes D, Routledge M, Jones NK, et al. Screening of healthcare workers for SARS-CoV-2 highlights the role of asymptomatic carriage in COVID-19 transmission. *Elife*. 2020 May 11;9:e58728. <https://doi.org/10.7554/eLife.58728>.
- [6] Mani NS, Budak JZ, Lan KF, Bryson-Cahn C, Zelikoff A, et al. Prevalence of COVID-19 infection and outcomes among symptomatic healthcare workers in Seattle, Washington. *Clin Infect Dis*. 2020:ciaa761. <https://doi.org/10.1093/cid/ciaa761>.
- [7] Ali S, Noreen S, Farooq I, Bugshan A, Vohra F. Risk assessment of healthcare Workers at the Frontline against COVID-19. *Pak J Med Sci*. 2020;36:S99–S103. <https://doi.org/10.12669/pjms.36.COVID19-S4.2790> (COVID19-S4).
- [8] Stock AD, Bader ER, Cezayirli P, Inocencio J, Chalmers SA, Yassari R, et al. COVID-19 infection among healthcare workers: serological findings supporting routine testing. *Front Med (Lausanne)*. 2020;1(7):471. <https://doi.org/10.3389/fmed.2020.00471>.
- [9] Li Y, Yao L, Li J, Chen L, Song Y, Cai Z, et al. Stability issues of RT-PCR testing of SARS-CoV-2 for hospitalized patients clinically diagnosed with COVID-19. *J Med Virol*. 2020 Jul;92(7):903–8. <https://doi.org/10.1002/jmv.25786>.
- [10] Mathur G, Mathur S. Antibody testing for COVID-19. *Am J Clin Pathol*. 2020;154(1):1–3. <https://doi.org/10.1093/ajcp/aqaa082>.

Alexandrea O. Cronin MPH  
 Department of Emergency Medicine, University of California, San Diego,  
 San Diego, CA, United States  
 \*Corresponding author at: Department of Emergency Medicine, 200  
 West Arbor Dr., MC 8676, San Diego, CA 92103, United States.  
 E-mail address: [aocronin@health.ucsd.edu](mailto:aocronin@health.ucsd.edu)

Christopher J. Coyne MD, MPH  
 Department of Emergency Medicine, University of California, San Diego,  
 San Diego, CA, United States

Edward M. Castillo PhD, MPH  
 Department of Emergency Medicine, University of California, San Diego,  
 San Diego, CA, United States

Christian Dameff MD  
 Department of Emergency Medicine, University of California, San Diego,  
 San Diego, CA, United States  
 Department of Computer Science and Engineering, University of California,  
 San Francisco, San Francisco, CA, United States  
 Department of Biomedical Informatics, University of California, San Diego,  
 San Diego, CA, United States