

COVID-19 NC Collaboratory Projects

**Final Narrative
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Vector or Victim: SARS-CoV-2 Infection in Healthcare Workers and Their Household Contacts at The University Of North Carolina Medical Center

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Overview of Project:

The COVID-19 pandemic now accounts for more than 1.1 million confirmed infections and nearly than 70,000 deaths in the United States (US), along with unprecedented disruption to social networks and economic systems. The causative agent, the SARS-CoV-2 coronavirus, is primarily spread from person-to-person through the inhalation or direct contact with aerosolized droplets. Frontline **healthcare personnel** (HCP) are at increased risk of infection due to frequent exposure to and close contact with infected patients and contaminated surfaces. Shortages of critical personal protective equipment (PPE) may further exacerbate this risk. A review of the epidemiological data from the site of the initial COVID-19 outbreak in Wuhan, China showed that 63% of HCPs were infected with SARS- CoV-2, many of who developed severe disease. While data from US facilities is still emerging, an analysis of case reports submitted to the Centers for Disease Control and Prevention (CDC) found nearly 10,000 cases of COVID-19 among HCPs.

Infected HCPs can also contribute to disease transmission, both in the hospital setting and in the community. When infection results in overt clinical symptoms, identifying and isolating infected HCPs is relatively straightforward. However, a large proportion - perhaps as high as 25% - of SARS-CoV-2 infected individuals are asymptomatic or develop only mild symptoms and thus are unlikely to seek care. Yet, even asymptomatic individuals can transmit infections to others. Outside of the hospital, little is known about the role HCPs play in the transmission of SARS-CoV-2, particularly among household members and close contacts. The potential for HCPs to transmit the disease to immediate family is, however, a source of considerable stress that may adversely impact mental health and job performance.

There is an urgent need to quantify the incidence of SARS-CoV-2 infections among HCPs and the determine how these individuals may contribute to within hospital and community transmission. This information will guide the development and implementation of effective screening and prevention measures that seek to protect HCPs, patients, and communities. The overarching goal of this project is to quantify and describe the risk of SARS CoV-2 infection among frontline healthcare workers, ancillary support staff, and their family members amidst the COVID-19 pandemic.

To address the knowledge gaps described above, starting in July 2020, we implemented a longitudinal cohort study of healthcare personnel at the University of North Carolina Medical Center that is currently ongoing. Enrolled healthcare personnel complete frequent surveys on symptoms, work activities, SARS-CoV-2 exposures and testing, and mental health and wellness. They also provide serum and nasal samples for SARS-CoV-2 antibody and PCR testing, respectively, every two weeks for the first 12 weeks of study participation and monthly thereafter. Additionally, interactions between participants and their movement within the clinical environment is captured with a smartphone app and Bluetooth sensors. Finally, a subset of participants' households are randomly selected every two weeks for further investigation, and enrolled households provide serum and nasal samples via at-home collection kits.

Progress to Date:

Thus far, we have enrolled a total of 213 HCP participants and 59 household (HH) members in this study. With our current funding, we will be able to continue study visits for enrolled participants through March 1, 2021. We stopped active recruitment of participants as of 11/30/20 to have at least 12 weeks of data on all enrolled participants. However, we have

continued to enroll those who express interest after 11/30/20 and the few participants who happened to see posted recruitment materials and fill on the online pre-screener after that date. In addition, we are actively recruiting household members every two weeks. We are currently seeking additional funds to be able to restart active recruitment and extend follow-up.

Demographic data and seroprevalence results have been collected for all enrolled participants. By SARS-CoV-2 total Ig ELISA antibody testing, we have identified 7 participants who seroconverted during follow-up and 5 who had positive testing at their baseline visit. Only one of the nasal swabs tested thus far has been positive by PCR. This participant had had a positive clinical test for SARS-CoV-2 because of symptoms approximately 2 weeks prior to the swab being collected. No household members have seroconverted over the duration of study follow-up, but one did have antibody detected by ELISA testing of their Day 0 and Day 21 samples. None of the HH nasal swabs have been positive for SARS-CoV-2 by PCR. We are continuing to monitor for incident infection biweekly for the first 3 months and monthly until study end for the HCP and at Day 0 and Day 21 for the household members.

Vaccination for HCP against SARS-CoV-2 began in December 2020, so we added additional questions looking at COVID-19 vaccine uptake to our questionnaires. In addition, our longitudinal study design has allowed us to monitor antibody responses pre- and post-vaccination for our study participants. Analysis of these data are ongoing. Although our numbers are overall small, these results may have implications for vaccine allocation.

We have also started preliminary analysis of the data regarding the impact of the COVID-19 pandemic on HCP mental health. At enrollment, 66 of participants reported that they were afraid they would pass COVID-19 onto others, and 70% reported feeling additional stress at work. On preliminary review of the Bluetooth contact tracing data, we have been able to document interactions between participants and each other and between participants and the environment, and formal analyses are in process.

We have submitted one manuscript outlining the protocol for this study in November, and it is currently under review by the journal, JMIR Research Protocols (preprint is available at <https://preprints.jmir.org/preprint/25410>). We are scheduled to present our results at a UNC conference in April 2021, and at least 3 other publications are planned.

This project has also led to funding from and a collaboration with researchers at the CDC/National Institute of Occupational Safety and Health. These analyses will focus on the impact of participant occupational role and activities, and PPE usage and breaches, on risk of SARS-CoV-2 infection. We are currently pursuing a funding opportunity to be able to restart active recruitment and extend longitudinal follow-up for the study, with specific interest in tracking immune responses over time to vaccination.

In summary, the Collaboratory funds were utilized to conduct research that will guide the development and implementation of effective screening and prevention measures that seek to protect HCPs, patients, and communities.