Title: Universal Masking is an Effective Strategy to Flatten the SARS-CoV-2 Healthcare Worker Epidemiologic Curve

Short Title: Universal Masking in Healthcare Workers

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Introduction

Atypical presentations of SARS-CoV-2 infection along with its ability to be transmitted from asymptomatic and pre-symptomatic individuals pose unique infection prevention challenges.\(^1\)\(^5\) Universal masking policies requiring all healthcare workers (HCW) 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. In addition to daily symptom screening and removal from work of symptomatic employees, Duke Health implemented universal masking as a strategy to preserve our workforce and 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 pre-symptomatic exposures. We aimed to measure the effect of universal masking on SARS-CoV-2 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 fully-recommended 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 Durham, Granville, Orange, Person, and Wake counties in North Carolina.\(^6\)

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 units.
Of the healthcare-associated cases, 70% were related to unmasked exposure to another HCW for more than 10 minutes less than 6 feet apart and 30% were thought to be secondary to direct care of SARS-CoV-2 positive patients.

One week following the implementation of universal masking on March 31, 2020, we observed a significant decrease in the cumulative incidence rate of healthcare-acquired SARS-CoV-2 infections among HCWs (Figure) (LRT 4.38, p-value 0.03). The cumulative incidence rates in community-acquired cases and cases with no clear source of acquisition did not significantly change, however, and continued to mirror the cumulative incidence rates of SARS-CoV-2 in the communities surrounding Duke Health.

**Discussion**

Universal masking of all healthcare workers significantly reduced the rate of healthcare-acquisition of SARS-CoV-2, thereby flattening the healthcare-associated SARS-CoV-2 infection epidemiologic curve in our healthcare system. HCWs with community-acquired SARS-CoV-2 or an unknown route of acquisition acquired SARS-CoV-2 at the same incidence rate as other community members. We attribute the lower rate of healthcare-acquired infections in part to providing universal source control via masking, thereby mitigating the spread from asymptotically infected or minimally-symptomatic individuals. Mask etiquette, defined as ‘wearing a mask at all times around anyone outside of your household contacts when physical distancing is not possible, limiting unmasked exposures indoors, and performing hand hygiene before and after touching your mask’ needs to be reinforced both inside and outside of the workplace to help preserve the HCW workforce. Mask etiquette must also be performed alongside other infection prevention measures including symptom screening, following standard and transmission-based precautions, hand hygiene, physical distancing, and self-isolation coupled with immediate testing and contact notification when symptomatic. Finally, the recent changes to the CDC guidance that call for masking all inpatients and outpatients while direct care is provided and the addition of a face shield to our standard pandemic PPE will hopefully lead to further reduction in healthcare-acquired SARS-CoV-2 infection. HCWs will need ongoing reminders to follow recommended public health guidance to protect themselves from community acquisition of SARS-CoV-2 infection as the pandemic continues.

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Figure. Cumulative incidence of positive SARS-CoV-2 tests among Duke Health healthcare workers stratified by community-acquired, healthcare-acquired, or unknown acquisition location compared to community cumulative incidence rates from Durham, Granville, Orange, Person, and Wake counties in North Carolina.

References: