RESEARCH LETTER

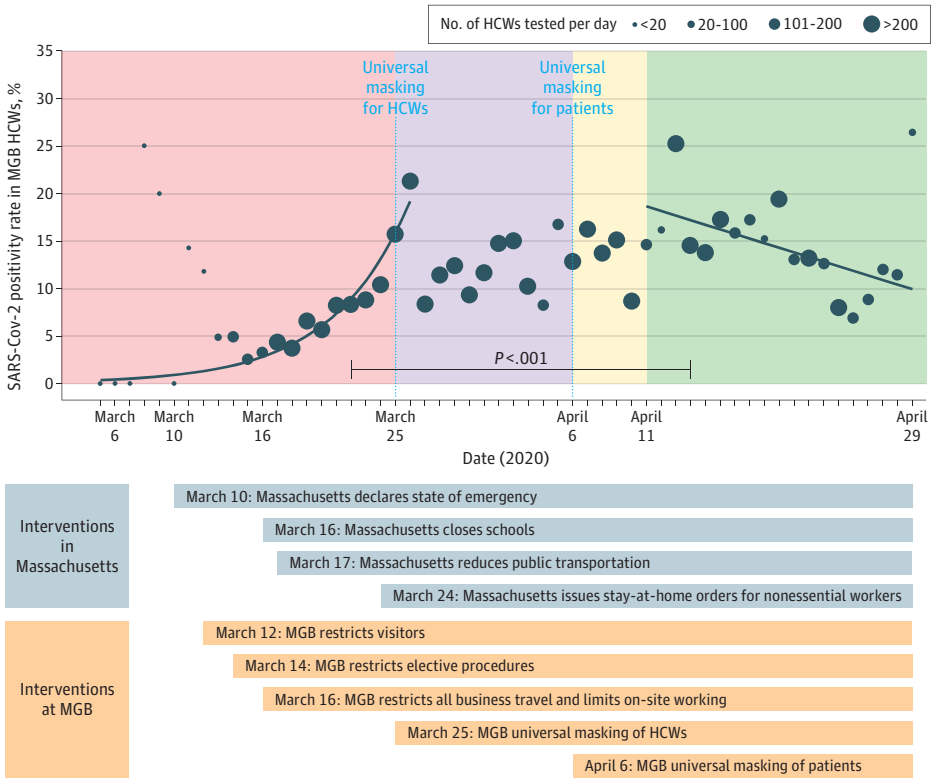
Association Between Universal Masking in a Health Care System and SARS-CoV-2 Positivity Among Health Care Workers

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has severely affected health care workers (HCWs).[1] As a result, hospital systems began testing HCWs[2] and implementing infection control measures to mitigate workforce depletion and prevent disease spread.[3] Mass General Brigham (MGB) is the largest health care system in Massachusetts, with 12 hospitals and more than 75 000 employees. In March 2020, MGB implemented a multipronged infection reduction strategy involving systematic testing of symptomatic HCWs and universal masking of all HCWs and patients with surgical masks.[4] This study assessed the association of hospital masking policies with the SARS-CoV-2 infection rate among HCWs.

Editorial

Methods | The institutional review board of MGB approved the study and waived informed consent. Using electronic medical records, we identified HCWs providing direct and indirect patient care who were tested for SARS-CoV-2 with reverse transcriptase–polymerase chain reaction between March 1 and April 30, 2020. The primary criterion for testing HCWs in our health care system was having symptoms consistent with SARS-CoV-2 infection. Information on the job description of each HCW was obtained by linking their record to the MGB Occupational Health Services and Human Resources databases.

Figure. Temporal Trend in Percentage Positivity of SARS-CoV-2 Testing Among HCWs



HCW indicates health care worker; MGB, Mass General Brigham; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2. All dates given are for the year 2020. The size of each data marker is proportional to the total number of SARS-CoV-2 tests performed each day over the time of the study period (x-axis), while the position of each data marker along the y-axis shows the percentage of daily test results that were positive among HCWs. The horizontal bars below the x-axis represent the timing of key interventions implemented in the state of Massachusetts and at MGB. The dotted lines represent the implementation dates of hospital policies. The study period is divided into 3 phases: a preintervention period before implementation of universal masking of HCWs (pink), which includes March 26, the day after implementation of universal masking for HCWs, to account for HCWs who became symptomatic after business hours on March 25 and were tested on March 26; a transition period until implementation of universal masking of patients (purple) plus an additional lag period (yellow); and the intervention period (green). For the preintervention and intervention periods, daily tests were fitted by weighted nonlinear regression (curves). The change in overall slope was compared between the 2 curves to determine any statistically significant changes in trend (as shown by the *P* value).

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We identified 3 phases during the study period: a preintervention period before implementation of universal masking of HCWs (March 1-24, 2020); a transition period until implementation of universal masking of patients (March 25-April 5, 2020) plus an additional lag period to allow for manifestations of symptoms (April 6-10, 2020), as previously defined[5]; and an intervention period (April 11-30, 2020). Positivity rates included the first positive test result for all HCWs in the numerator and HCWs who never tested positive plus those who tested positive that day in the denominator. For each HCW, any tests subsequent to their first positive test result were excluded. Using weighted nonlinear regression, we fit the best curve for the preintervention and intervention periods (based on R^2 value). The number of daily tests was used as the weight such that days with more tests had more weight in determining the curve. The overall slope of each period was calculated using linear regression to estimate the mean trend, regardless of curve shape. The change in overall slope between the preintervention and intervention periods was compared to determine any statistically significant change in mean trend, using a 2-sided $\alpha = .05$. The analysis was conducted using R version 4.0 (R Foundation).

Results | Of 9850 tested HCWs, 1271 (12.9%) had positive results for SARS-CoV-2 (median age, 39 years; 73% female; 7.4% physicians or trainees, 26.5% nurses or physician assistants, 17.8% technologists or nursing support, and 48.3% other). During the preintervention period, the SARS-CoV-2 positivity rate increased exponentially from 0% to 21.32%, with a weighted mean increase of 1.16% per day and a case doubling time of 3.6 days (95% CI, 3.0-4.5 days). During the intervention period, the positivity rate decreased linearly from 14.65% to 11.46%, with a weighted mean decline of 0.49% per day and a net slope change of 1.65% (95% CI, 1.13%-2.15%; $P < .001$) more decline per day compared with the preintervention period (**Figure**).

Discussion | Universal masking at MGB was associated with a significantly lower rate of SARS-CoV-2 positivity among HCWs. This association may be related to a decrease in transmission between patients and HCWs and among HCWs. The decrease in HCW infections could be confounded by other interventions inside and outside of the health care system (Figure), such as restrictions on elective procedures, social distancing measures, and increased masking in public spaces, which are limitations of this study. Despite these local and statewide measures, the case number continued to increase in Massachusetts throughout the study period,[6] suggesting that the decrease in the SARS-CoV-2 positivity rate in MGB HCWs took place before the decrease in the general public. Randomized trials of universal masking of HCWs during a pandemic are likely not feasible. Nonetheless, these results support universal masking as part of a multipronged infection reduction strategy in health care settings.

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Administrative, technical, or material support: Wang, Ferro, Hashimoto.
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