Table 1. Proportion of Positive PCR Tests for SARS-CoV 2, Influenza A, Influenza B, RSV, and Group A *Streptococcus* Detroit Medical Center, September–February

	Adults, No. of Positives/No. Total Tests (% Positivity)		Children, No. of Positives/No. Total Tests (% Positivity)	
Pathogen	2019–2020	2020–2021	2019–2020	2020–2021
SARS-CoV-2	0/0 (0)	1,198/18,708 (6)	0/0 (0)	172/4,308 (4)
Influenza A	780/6,795 (12)	0/6,830 (0)	1300/10,475 (12)	0/1441 (0)
Influenza B	892/6,795 (13)	0/6,830 (0)	2117/10,475 (20)	0/1441 (0)
RSV	240/2,673 (9)	0/6,822 (0)	1,653/6,985 (24)	1/1404
Group A *Streptococcus*	212/933 (23)	49/212 (23)	1,050/3,894 (27)	163/777 (21)

Note. PCR, polymerase chain reaction; RSV, respiratory syncytial virus.

would have been low. Additionally, viral interference, with SARS-CoV-2 being the dominant respiratory pathogen, might have contributed to the decrease in rates of other respiratory viral illnesses. This idea is not unfounded. During the H1N1 pandemic in 2009, while the number of H1N1 influenza cases increased, the incidence of seasonal influenza and RSV decreased significantly compared to prior years. This trend lasted until the H1N1 strain transitioned from a pandemic to a seasonal virus the following year.[9]

In conclusion, SARS-CoV-2 was the dominant pathogen, while other community respiratory viral and group A *Streptococcus* throat infections markedly declined in frequency in both adults and children during the 2020–2021 season compared to 2019–2020. The reason for the decline may be attributed to the mitigating measures widely employed in the community. Although it is difficult to predict the incidence of respiratory viral infections after the resolution of the COVID-19 pandemic, it is likely that the number of non–SARS-CoV-2 respiratory infections will rise back to normal in the coming years as SARS-CoV-2 becomes a seasonal virus.

Acknowledgments.

Financial support. No financial support was provided relevant to this article.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

References

1. The flu season. Centers for Disease Control and Prevention website. https://www.cdc.gov/flu/about/season/flu-season.htm. Published May 6, 2021. Accessed May 31, 2021.
2. Kestler M, Muñoz P, Mateos M, Adrados D, Bouza E. Respiratory syncytial virus burden among adults during flu season: an underestimated pathology. *J Hosp Infect* 2018;100:463–468.
3. Jackson ML, Chung JR, Jackson LA, *et al*, Influenza vaccine effectiveness in the United States during the 2015–2016 season. *N Engl J Med* 2017;377:534–543.
4. Zhang K, Vilches TN, Tariq M, Galvani AP, Moghadas SM. The impact of mask wearing and shelter in place on COVID-19 outbreaks in the United States. *Int J Infect Dis* 2020;101:334–341.
5. Jones N. How coronavirus lockdowns stopped flu in its tracks. *Nature* 2021. doi: 10.1038/d41586-020-01538-8.
6. Jones N. How COVID-19 is changing the cold and flu season. *Nature* 2020;588:388–390.
7. BioFire Syndromic Trends: epidemiology tool. BioFire Diagnostics website. https://www.biofiredx.com/products/filmarray/biofire-syndromic-trends/. Accessed May 31, 2021.
8. Personal correspondence. Individual name. BioFire Syndromic Trends, 515 Colorow Drive, Salt Lake City, Utah 84108.
9. Meningher T, Hindiyeh M, Regev L, Sherbany H, Mendelson E, Mandelboim M. Relationships between A(H1N1)pdm09 influenza infection and infections with other respiratory viruses. *Influenza Other Respir Viruses* 2014;8:422–430.

Coronavirus disease 2019 (COVID-19) mRNA vaccine effectiveness in asymptomatic healthcare workers

Pablo Knobel PhD[1], Consol Serra PhD[2], Santiago Grau PhD[3], Rocio Ibañez PhD[4], Pilar Diaz MS[2], Olivia Ferrández PhD[3], Rocío Villar PhD[2], Alonso Fernando Lopez MD[2], Nuria Pujolar GR[4], Juan Pablo Horcajada PhD[5], Marta Roman PhD[1,6], Merce Comas PhD[1,6], Maria Sala PhD[1,6] and Xavier Castells PhD[1,6]

[1]Department of Epidemiology and Evaluation, Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain, [2]Occupational Health Service, Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain, [3]Department of Pharmacy, Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain, [4]Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain, [5]Service of Infectious Diseases, Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain and [6]Research Network on Health Services in Chronic Diseases (REDISSEC), Barakaldo, Biscay, Spain

Author for correspondence: Xavier Castells, E-mail: xcastells@psmar.cat.

Cite this article: Knobel P, *et al.* (2021). Coronavirus disease 2019 (COVID-19) mRNA vaccine effectiveness in asymptomatic healthcare workers. *Infection Control & Hospital Epidemiology*, 42: 1517–1519, https://doi.org/10.1017/ice.2021.287

The protection offered by the BNT162b2 vaccine (Pfizer–BioNTech) and the mRNA-1273 vaccine (Moderna) to prevent coronavirus disease 2019 (COVID-19) disease has been well documented during phase 3 trials[1,2] and subsequent observational

Table 1. Percent Positivity According to Vaccination State

Screening Moment	No. of Screenings	No. of Positives	% Positivity	95% CI
Unvaccinated	6,767	94	1.39	1.11–1.67
From vaccination until 14 d after 1st dose	2,076	32	1.54	1.01–2.07
>14 d after first dose until 7 d after 2nd dose	2,350	19	0.81	0.45–1.17
>7 d after second dose	5,530	7	0.13	0.03–0.22

studies using real-world data.[3] Healthcare workers (HCWs) have been included in the initial target group to be vaccinated due to their exposure[4] and their role in transmission[5] and because they are an essential part of the fight against COVID-19. However, there is little evidence regarding postvaccination severe acute respiratory coronavirus virus 2 (SARS-CoV-2) asymptomatic infection.

Fully understanding the vaccination effect is essential to improving the response to the pandemic within healthcare facilities, and it can also reduce the psychological burden on HCWs. We present the effect of mRNA vaccination on subsequent polymerase chain reaction (PCR) test SARS-CoV-2 positivity in asymptomatic HCWs.

Methods

This analysis included front-line HCWs of Hospital del Mar in Barcelona, Spain, routinely screened every 2 weeks for SARS-CoV-2 with PCR assays. HCWs were contacted by the occupational health service of the hospital through mobile text messages and had a nasal swab taken by trained personnel. The sample was analyzed in situ in the hospital laboratory. Vaccination began on January 5, 2021. The screening continued throughout and after the vaccination period.

We analyzed 2,462 HCWs screened at Hospital del Mar starting on December 1, 2020, and followed until April 20, 2021 (141 days). We excluded HCWs who had a positive test before December 1. We included only PCR tests performed on asymptomatic HCWs without a known close contact with an infected person within the hospital. Participant age, sex, workplace, and type and dates of vaccine received were obtained from the Hospital administrative database. The mean age of the sample was 38.9 years (SD, 12.4), and 75.5% were female. Participants were unevenly distributed among different types of care units, the most common being in non–COVID-19 wards (44.6%). Most participants were vaccinated with Pfizer–BioNTech (73.5%). In total, 314 HCWs (12.8%) were not vaccinated by April 20, 2021. Although the screenings were periodically scheduled, adherence varied among HCWs: 45.0% had ≥8 tests, 39.0% had 3–8 tests, and 16.0% had 1–2 tests.

Results

We present the PCR positivity rates grouped by vaccination state. In total, 16.723 PCRs were performed. Test positivity decreased from 1.39% (95% confidence interval [CI], 1.11–1.67) for nonvaccinated HCWs to 0.13% (95% CI, 0.03–0.22) 1 week after the second vaccine dose, resulting in a 90.6% vaccine effectiveness. The PCR tests positivity between 2 weeks after the first dose and 1 week after the second was 0.81% (95% CI, 0.45–1.17), resulting in a 41.7% effectivity (Table 1).

Discussion

One week after the second dose, vaccination with mRNA vaccines substantially reduced the COVID-19 test positivity and incidence among asymptomatic HCWs. These results are consistent with previous studies regarding mRNA vaccination protection from COVID-19 in healthcare settings.[6] The protective effect of vaccination 2 weeks after the first dose was weaker than reported in phase 3 trials of the vaccines and other studies conducted in healthcare settings, even when including asymptomatic testing.[7] The discrepancy might be a consequence of the focus on asymptomatic nonsuspicious cases, which might have gone undetected in previous studies. Previous studies highlight the importance of keeping the guard up in the first days after the first dose of vaccine.[8] Our findings suggest that vaccine recipients should be aware that the risk of infection is not reduced until at least 1 week after the second dose of vaccine.

Two main limitations of our study should be noted. First, the small number of positives in the vaccinated groups (especially 2 weeks after the second dose) limited our ability to obtain narrower confidence intervals. Second, the rapidly changing dynamics of COVID-19 incidence in the general population might have influenced our results. However, the population incidence remained relatively stable during the study.

Similarly, several strengths should be noted. First, trained professionals gathered the samples, and the samples were analyzed in the hospital laboratory, which ensured high-quality sampling and reduced problems derived from sample handling and transportation. Second, the mandatory proactive screening of asymptomatic HCWs combined with the exclusion of COVID-19 tests to suspected cases among HCWs allowed a very refined view of the vaccine effect on asymptomatic infection. Finally, the follow-up of up to 3 months after the first dose of vaccine allowed us to see the effects beyond the period immediately following vaccination.

Although the results of this study are promising, similar studies should be repeated over time because 2 concerns remain: the effectiveness against rising variants of concern (VoC)[9] and the period through which the vaccines offer protection.[10] Both of these factors remain unknown.

Acknowledgments.

Financial support. No financial support was provided relevant to this article.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

References

1. Baden LR, El Sahly HM, Essink B, *et al.* Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. *N Engl J Med* 2021;384:403–416.

https://doi.org/10.1017/ice.2021.287 Published online by Cambridge University Press

2. Polack FP, Thomas SJ, Kitchin N, *et al.* Safety and efficacy of the BNT162b2 mRNA COVID-19 vaccine. *N Engl J Med* 2021;383:2603–2615.
3. Pawlowski C, Lenehan P, Puranik A, *et al.* FDA-authorized COVID-19 vaccines are effective per real-world evidence synthesized across a multistate health system. *MedRxiv* 2021. doi: 10.1101/2021.02.15.21251623.
4. Nguyen LH, Drew DA, Graham MS, *et al.* Risk of COVID-19 among front-line healthcare workers and the general community: a prospective cohort study. *Lancet Public Health* 2020;5:e475–e483.
5. Jones NK, Rivett L, Sparkes D, *et al.* Effective control of SARS-CoV-2 transmission between healthcare workers during a period of diminished community prevalence of COVID-19. *ELife* 2020;9:1–10.
6. Benenson S, Oster Y, Cohen MJ, Nir-Paz R. BNT162b2 mRNA COVID-19 vaccine effectiveness among healthcare workers. *N Engl J Med* 2021. doi: 10.1056/NEJMc2101951.
7. Thompson MG, Burgess JL, Naleway AL, *et al.* Interim estimates of vaccine effectiveness of BNT162b2 and mRNA-1273 COVID-19 vaccines in preventing SARS-CoV-2 infection among health care personnel, first responders, and other essential and frontline workers—eight US Locations, December 2020–March 2021. *Morbid Mortal Wkly Rept* 2021;70:495–500.
8. Amit S, Beni SA, Biber A, Grinberg A, Leshem E, Regev-Yochay G. Postvaccination COVID-19 among healthcare workers, Israel. *Emerg Infect Dis* 2021;27:1220–1222.
9. Hacisuleyman E, Hale C, Saito Y, *et al.* Vaccine breakthrough infections with SARS-CoV-2 variants. N Engl J Med 2021.
10. Doria-Rose N, Suthar MS, Makowski M, *et al.* Antibody persistence through 6 months after the second dose of mRNA-1273 vaccine for COVID-19. *N Engl J Med* 2021;384:2259–2261.

Healthcare worker perceptions of hand hygiene monitoring technologies: Does technology performance matter?

Deborah G. Druckerman BS[1], Nital Appelbaum PhD[1], Jo Dee Armstrong-Novak BS[2], Nadia Masroor BS[2], Kaila Cooper RN, MSN[2], Michael P. Stevens MD, MPH[1,2], Emily Godbout MD, MPH[1,2], Gonzalo Bearman MD, MPH[1,2] and Michelle E. Doll MD, MPH[1,2]

[1]Virginia Commonwealth University School of Medicine, Richmond, Virginia and [2]VCU Health System, Richmond, Virginia

Hand hygiene (HH) is essential to decreasing healthcare-associated infections.[1] Although direct observation remains the gold standard for monitoring HH, inability to collect comprehensive HH data, human error, and the Hawthorne effect[2] limit its usefulness. Technology to detect HH may improve compliance among healthcare providers when it is part of a comprehensive HH program.[3] However, healthcare providers have concerns about system accuracy and privacy.[4] The ability to change user perceptions of HH technology has not been demonstrated, even though centers attempting to implement these systems have aimed to increase their user acceptability.

Two electronic hand hygiene monitoring systems (EHHMSs) were pilot tested in 4 inpatient units to assess system performance prior to hospital-wide integration of one of the technologies. User perceptions were assessed using a survey addressing key aspects of the Unified Theory of Acceptance (UTA) and Use of Technology and Technology Acceptance Model (UTTAM).[5,7] We compared survey responses between the 2 pilot studies to determine whether user perceptions are impacted by EHHMS characteristics.

Methods

We tested 2 EHHMSs in 90-day pilot studies at an 865-bed tertiary-care medical center. Pilot study A was conducted on a general medical unit and a pediatric ICU containing collectively 50 rooms and 80 beds. Pilot study B was conducted on a general medical unit and an oncology unit with 60 rooms and 60 beds. Pilot study A was completed in fall 2016 and pilot study B was completed in early 2018. Both systems used wireless technologies. In pilot study A, infrared signals were also used to capture badges. Pilot study B technology provided real-time feedback via beeps/lights to users; no immediate feedback was available in pilot study A. The accuracy of each system was formally assessed and reported previously.[6] Pilot study participation by all personnel in the patient environment was strongly encouraged by hospital leadership but not mandated. Units were provided education before the studies began. Compliance data from direct observers and EHHMS were shared with units monthly throughout the pilot studies. We previously published that system-defined compliance varied between the 2 products; the EHHMS in pilot study B was more accurate than the EHHMS in pilot study A.[6]

An anonymous survey was developed using the UTA as a theoretical base.[5] Specific constructs addressing key aspects of the UTTAM[7] were incorporated (Table 1). Respondents used a 5-point Likert agreement scale (1 = strongly disagree, 5 = strongly agree) to answer questions addressing each construct. Surveys requested demographic data including age, gender, role, years of experience, unit, and allowed additional comments regarding the pilot study experience. A Qualtrics survey link was emailed to participants at completion.

Mean responses to each question and overall construct were calculated. Responses were compared between pilot study A and pilot study B using the Student *t* test. Open-ended comments were categorized thematically. Statistical analysis was performed using EpiTools.[8]

Results

Surveys were completed by 93 participants in pilot study A (30% response rate) and 56 participants in pilot study B, for a 33% response rate. Most participants were nurses: pilot study A had 36 nurses, 20 physicians, and 37 other participants, and pilot study

Author for correspondence: Michelle E. Doll, E-mail: Michelle.Doll@vcuhealth.org
Cite this article: Druckerman DG, *et al.* (2021). Healthcare worker perceptions of hand hygiene monitoring technologies: Does technology performance matter?. *Infection Control & Hospital Epidemiology*, 42: 1519–1520, https://doi.org/10.1017/ice.2021.286

https://doi.org/10.1017/ice.2021.287 Published online by Cambridge University Press