

High Completion of COVID-19 Vaccination Among Health Care Workers Despite Initial Self-Reported Vaccine Reluctance

Vivek Jain,^{1,a} Sarah B. Doernberg,^{2,a} Marisa Holubar,^{3,a} Beatrice Huang,⁴ Jenna Bollyky,³ Hannah Sample,⁵ Yingjie Weng,⁶ Di Lu,⁶ Manisha Desai,⁶ Yvonne Maldonado,^{7,b} and George Rutherford^{8,b}, for the CHART Study Consortium*

¹Division of HIV, Infectious Diseases & Global Medicine, San Francisco General Hospital, University of California, San Francisco, San Francisco, California, USA, ²Division of Infectious Diseases, University of California, San Francisco, San Francisco, California, USA, ³Division of Infectious Diseases and Geographic Medicine, Stanford University School of Medicine, Stanford, California, USA, ⁴Department of Family and Community Medicine, San Francisco General Hospital, University of California, San Francisco, San Francisco, California, USA, ⁵Department of Biochemistry and Biophysics, University of California, San Francisco, San Francisco, California, USA, ⁶Quantitative Sciences Unit, Stanford University School of Medicine, Stanford, California, USA, ⁷Division of Pediatric Infectious Diseases, Stanford University School of Medicine, Stanford, California, USA, and ⁸Division of Infectious Disease and Global Epidemiology, Department of Epidemiology and Biostatistics, University of California, San Francisco, California, USA

Surveys of US health care workers (HCWs) have demonstrated variable reluctance to receiving coronavirus disease 2019 (COVID-19) vaccination [1, 2]. The degree to which prevaccination opinions correlate with actual vaccination completion is unclear. We also describe emergent reasons for vaccine delay and noncompletion among HCWs.

We conducted 2 cross-sectional surveys (11/16/20–12/8/20 and 4/7/21–4/30/21) (Supplementary Data) nested in the COVID-19 Healthcare Worker Antibody and RT-PCR (CHART) Study, a longitudinal cohort study of HCWs open to all employees at the University of California, San Francisco (UCSF), Zuckerberg San Francisco General Hospital, and Stanford Health Care [3]. On-site vaccinations were offered in a staged fashion starting in December 2020; all HCWs were invited before the second survey; HCWs were also given materials about multiple community-based locations where they could receive vaccination. Both surveys were web/email-based and

used REDCap electronic data capture tools hosted at Stanford University (surveys included as Supplemental Data) [4]. We defined vaccine reluctance in the first survey as a 5-point Likert scale response of “definitely no” or “unlikely” to the question “If a vaccine received Emergency Use Authorization but not formal FDA approval, would you get it?” We ascertained HCW vaccine completion via survey and defined delay in receipt of vaccine as an individual receiving vaccination ≥ 2 weeks after their invitation for vaccination. The UCSF Committee on Human Subjects Research and the Stanford University School of Medicine Panel on Human Subjects in Medical Research approved this study, and patients provided individual written consent to participate.

Overall, 2069/2238 (92.5%) participants responded to survey #1, 1747 (78.1%) to survey #2, and 1671 (74.7%) to both. Table 1 describes participant characteristics. Overall, nearly all respondents to survey #2 (1725/1747 [98.7%]) self-reported receipt of ≥ 1 vaccine dose: 1614 (92.4%) received vaccination immediately, and 111 (6.4%) delayed initiation but eventually received vaccination (Table 1). Among respondents to both surveys, 502/1671 (30.0%) expressed initial vaccine reluctance on survey #1. Reluctant HCWs had a higher frequency of vaccine delay compared with nonreluctant HCWs (11.4% vs 3.4%) (Table 1). Despite this, 487/502 (97.0%) reluctant HCWs eventually received ≥ 1 vaccine dose (430 [85.7%] immediately and 57 [11.4%] delayed).

For the 111 HCWs who delayed vaccination by ≥ 2 weeks after the initial offer, the top reasons included concerns about side effects (29, 26.1%), pregnancy/breastfeeding (21, 18.9%), and personal logistic barriers to accessing available vaccine appointments (20, 18.0%).

Overall, 22/1747 (1.3%) HCWs remained unvaccinated by April 2021. The top reasons for not receiving vaccine included concerns about side effects, regulatory approval processes, vaccine efficacy, allergy to vaccine components or other agents, and pregnancy/breastfeeding. However, when asked if they would eventually receive COVID-19 vaccination, only 4/22 (18.2%) responded “definitely not” or “unlikely,” while 11/22 (50%) responded “likely” or “definitely.”

In a cohort of >2000 California HCWs, >98% of HCWs self-reported completing COVID-19 vaccination despite 30% initially reporting reluctance. A small fraction of HCWs delayed vaccination at the time they first became eligible but eventually sought vaccination. Among HCWs who remained unvaccinated in April 2021, months after initial eligibility, diverse reasons included concerns about side effects, vaccine efficacy, and a perception that there were insufficient data for women who were pregnant. Half of unvaccinated HCWs indicated a high likelihood of future vaccine completion.

Received 10 August 2021; editorial decision 19 August 2021; accepted 3 September 2021.

^aEqual contribution

^bEqual contribution

*Consortium co-authors are listed in the Supplementary Data

Correspondence: V. Jain, MD, MAS, Division of HIV, Infectious Diseases & Global Medicine, Zuckerberg San Francisco General Hospital, University of California, San Francisco (UCSF), UCSF Box 0874, San Francisco, CA 94143-0874 (vivek.jain@ucsf.edu).

Open Forum Infectious Diseases® 2021

© The Author(s) 2021. Published by Oxford University Press on behalf of Infectious Diseases Society of America. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs licence (<https://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial reproduction and distribution of the work, in any medium, provided the original work is not altered or transformed in any way, and that the work is properly cited. For commercial re-use, please contact journals.permissions@oup.com <https://doi.org/10.1093/ofid/ofab446>

Table 1. Demographic Characteristics and COVID-19 Vaccine Completion Among Survey Respondents (n = 2069)

Demographic Characteristic	Vaccine Survey #1 Respondents	Vaccine Survey #2 Respondents	Respondents Only to Survey #1	Respondents to Both Surveys	
No.	2069	1747	398	1671	
Age at baseline, mean (SD), y	40.9 (10.2)	41.6 (10.4)	37.1 (8.4)	41.8 (10.4)	
Gender, No. (%)					
Male	417 (20.2)	347 (19.9)	85 (21.4)	332 (19.9)	
Female	1642 (79.4)	1392 (79.7)	311 (78.1)	1331 (79.7)	
Trans/genderqueer/gender nonbinary/no answer	10 (0.5)	8 (0.5)	2 (0.5)	8 (0.5)	
Latinx ethnicity, No. (%)					
Yes	219 (11.1)	174 (10.4)	58 (15.7)	161 (10.0)	
No	1742 (88.2)	1497 (89.2)	306 (82.7)	1436 (89.5)	
Decline to answer	13 (0.7)	7 (0.4)	6 (1.6)	7 (0.4)	
Race, No. (%)					
White	1235 (62.6)	1073 (64.0)	203 (55.0)	1032 (64.4)	
Black	30 (1.5)	18 (1.1)	12 (3.3)	18 (1.1)	
Asian	434 (22.0)	368 (21.9)	88 (23.8)	346 (21.6)	
Multiple races	116 (5.9)	98 (5.8)	22 (6.0)	94 (5.9)	
Other	115 (5.8)	87 (5.2)	32 (8.7)	83 (5.2)	
Decline to answer	42 (2.1)	33 (2.0)	12 (3.3)	30 (1.9)	
Education, No. (%)					
Less than college	21 (1.1)	16 (1.0)	8 (2.2)	13 (0.8)	
College	820 (41.5)	669 (39.9)	188 (50.8)	632 (39.4)	
Higher than college	1120 (56.7)	984 (58.6)	169 (45.7)	951 (59.3)	
Other	13 (0.7)	9 (0.5)	5 (1.4)	8 (0.5)	
Work category, No. (%)					
Direct patient care involved in intubating/suctioning patient airways	578 (29.3)	467 (27.8)	137 (36.9)	441 (27.5)	
Direct patient care but NOT performing any airway procedures	1050 (53.2)	916 (54.6)	169 (45.6)	881 (54.9)	
Staff with indirect patient contact (eg, reception, environmental services)	105 (5.3)	89 (5.3)	24 (6.5)	81 (5.0)	
Laboratory	49 (2.5)	41 (2.4)	11 (3.0)	38 (2.4)	
Work in health care but not with patients or biological samples	75 (3.8)	67 (4.0)	8 (2.2)	67 (4.2)	
Other	118 (6.0)	98 (5.8)	22 (5.9)	96 (6.0)	
Healthcare role, No. (%)					
Registered nurse and nurse manager	887 (42.9)	735 (42.1)	186 (46.7)	701 (42.0)	
Physician (attending, staff, fellow, resident, or intern), student, advanced practitioner (physician asst., nurse practitioner, CRNA)	715 (34.6)	620 (35.5)	117 (29.4)	598 (35.8)	
Respiratory or speech therapist	27 (1.3)	22 (1.3)	6 (1.5)	21 (1.3)	
Medical or nurse assistant or technologist, phlebotomy	64 (3.1)	53 (3.0)	13 (3.3)	51 (3.1)	
Registration/ward clerk, clinic manager/coordinator	35 (1.7)	24 (1.4)	14 (3.5)	21 (1.3)	
Social worker, child life specialist, spiritual care, counselor, case manager, behavioral health specialist, interpreter	63 (3.0)	53 (3.0)	13 (3.3)	50 (3.0)	
Radiology technician, physical or occupational therapy/training, patient transport	97 (4.7)	82 (4.7)	20 (5.0)	77 (4.6)	
Environmental services, food services, or nutrition	14 (0.7)	14 (0.8)	1 (0.3)	13 (0.8)	
Microbiology or other laboratory staff	30 (1.4)	25 (1.4)	8 (2.0)	22 (1.3)	
Pharmacist or pharmacy technologist	36 (1.7)	33 (1.9)	4 (1.0)	32 (1.9)	
Research, administration, facilities, information technology	101 (4.9)	86 (4.9)	16 (4.0)	85 (5.1)	
		Vaccine Survey #2 Respondents (n = 1747)		Respondents to Both Surveys (n = 1671)	
Vaccine completion				Vaccine Reluctant (n = 502)	Vaccine Nonreluctant (n = 1169)
Have not received any vaccination	–	22 (1.3)	–	15 (3.0)	6 (0.5)
Delayed initiation of vaccination	–	111 (6.4)	–	57 (11.4)	40 (3.4)
Received vaccination right away	–	1614 (92.4)	–	430 (85.7)	1123 (96.1)

Abbreviation: COVID-19, coronavirus disease 2019.

Our data add to an emerging picture of HCW vaccination. Our vaccination rates are higher than in other regions but align with California's overall high general population vaccine uptake [5] and are very similar to a 96% vaccine completion recently reported among Los Angeles HCWs [6]. The limitations of our study include voluntary participation in a research cohort and a high fraction of physicians and nurses, both of which could reduce generalizability to all HCWs, as well as a lower second survey response rate. Vaccine hesitancy among nonrespondents to the second survey was only modestly higher than among respondents to both surveys (153/398 [38.4%] vs 502/1671 [30.0%]), indicating that estimates of vaccine completion were reasonably representative of the cohort.

HCW vaccination is critical for ensuring the safety and stability of the workforce and for promoting public confidence in the vaccines. Despite widespread availability for HCWs, vaccination rates are still below targets. Our data underscore the critical need for health care systems to (1) continue to maintain low-barrier access to vaccination at work sites and other venues and (2) continue to inform HCWs about the vaccine approval process and existing safety data. Emerging COVID-19 vaccine safety data among pregnant/lactating individuals [7] should also be integrated into outreach campaigns. Given the high willingness of unvaccinated HCWs to be vaccinated eventually, health systems should not view these HCWs as having fixed opinions; rather they should be continually engaged in the process of vaccination offerings.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

Acknowledgments

We gratefully acknowledge the participation of health care worker participants in the CHART Study at UCSF Health and Zuckerberg San Francisco General Hospital, University of California, San Francisco, CA, and at Stanford Health Care, Palo Alto, CA. We also acknowledge the support of medical center leadership at the 3 CHART study sites and all members of the CHART Study team.

Financial support. This work was supported by a research grant from the Chan Zuckerberg Initiative.

Potential conflicts of interest. S.D. has served as a consultant to Genentech and Basilea Pharmaceutica for work unrelated to this study and has received funding from the NIH (UM1AI104681) for work unrelated to this study. All authors have received research grant funding from the Chan Zuckerberg Initiative for this work. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

Patient consent. The UCSF Committee on Human Subjects Research and the Stanford University School of Medicine Panel on Human Subjects in Medical Research approved this study, and patients provided individual written consent to participate.

References

1. Shaw J, Stewart T, Anderson KB, et al. Assessment of U.S. health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system. *Clin Infect Dis*. 2021; doi:10.1093/cid/ciab054.
2. Meyer MN, Gjorgjieva T, Rosica D. Trends in health care worker intentions to receive a COVID-19 vaccine and reasons for hesitancy. *JAMA Netw Open* 2021; 4:e215344.
3. Jain V, Doernberg SB, Holubar M, et al. Healthcare personnel knowledge, motivations, concerns and intentions regarding COVID-19 vaccines: a cross-sectional survey. medRxiv 2021.02.23.21251993 [Preprint]. 23 February 2021. Available at: <https://doi.org/10.1101/2021.02.19.21251993>. Accessed 9 August 2021.
4. Harris PA, Taylor R, Thielke R, et al. Research Electronic Data Capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009; 42:377–81.
5. Vaccination progress data. <https://covid19.ca.gov/vaccination-progress-data>. Accessed 7 May 2021.
6. Halbrook M, Gadoth A, Martin-Blais R, et al. Longitudinal assessment of COVID-19 vaccine acceptance and uptake among frontline medical workers in Los Angeles, California. *Clin Infect Dis*. 2021; doi:10.1093/cid/ciab614.
7. Shimabukuro TT, Kim SY, Myers TR, et al; CDC v-safe COVID-19 Pregnancy Registry Team. Preliminary findings of mRNA Covid-19 vaccine safety in pregnant persons. *N Engl J Med* 2021; 384:2273–82.