Occupational Health Providers' Perceptions of Employee Vaccine Hesitancy

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Objective: This study examined the perspectives of occupational health providers (OHPs) on the most frequently encountered clinically relevant reasons for employee vaccine hesitancy. **Methods:** We conducted an anonymous, online, cross-sectional survey of US OHPs ($N = 217$). The survey asked OHPs about the major reasons that employees cite for being unwilling to receive the following three categories of vaccines: COVID-19, annual influenza, and others relevant to the workplace. **Results:** Concern about adverse effects was the most frequently reported reason for employee vaccine hesitancy for each vaccine category. Mistrust was reported more frequently for COVID-19 than for the influenza vaccine or other vaccines (χ^2 $P < 0.05$). Targets of employee mistrust included government and researchers or scientists, but mistrust of healthcare providers was uncommon. **Conclusions:** These results can be used to inform interventions to address vaccine hesitancy in the occupational health setting.

Keywords: vaccine, vaccine hesitancy, COVID-19, influenza, occupational health providers, employee health

LEARNING OUTCOMES

Upon completion of this article, readers will be able to:

- List the top reasons for employee vaccine hesitancy as reported by occupational health providers.
- Describe how employee vaccine hesitancy differs between COVID-19, influenza, and other vaccines relevant to the workplace.
- Describe how employee vaccine hesitancy may differ by industry.

Occupational health providers (OHPs) fill a key role in ensuring workplace health and safety, which includes managing workplace vaccination programs and providing education around vaccination. On-site workplace vaccination programs are an important tool to improve vaccination uptake in working adults.[1–3] Reasons for COVID-19 vaccine hesitancy include negative attitude toward immunization generally, concerns about the speed of vaccine development, doubts about effectiveness, belief that vaccination is not needed, and lack of trust (in health providers or researchers).[4,5] Previous studies have noted similar reasons for low vaccine confidence. In the setting of influenza[6] and pneumococcal vaccination,[7] additional reasons for vaccine hesitancy have included low social pressure to get vaccinated and low perceived disease risk.

Among a specific category of employees, healthcare workers, reasons for vaccine hesitancy are complex and influence whether they recommend vaccination to others.[8,9] A review of studies investigating COVID-19 vaccine hesitancy among healthcare workers worldwide noted a prevalence of up to 72%, with top reasons for hesitancy being vaccine safety, efficacy, and adverse effects.[10] A multisite survey of healthcare workers in Canada elucidated the following reasons for COVID-19 vaccine hesitancy: concern that vaccine is "new," preference to let others get vaccinated first, lack of available information on the vaccine, and lack of time to make a decision.[11]

Healthcare workers constitute an important population relevant to OHPs, particularly given the context of infection control guidelines and employee vaccination requirements or recommendations in healthcare settings. However, healthcare workers are part of a larger category of essential workers. Essential nonhealthcare workers include social service workers, first responders, and workers in correctional facilities, grocery stores, public transit, schools, and the postal service.[12] Essential nonhealthcare workers likely have higher rates of vaccine hesitancy, as suggested by the US Census Bureau's 2021–2022 Household Pulse Survey.[12] The survey also found that among essential nonhealthcare workers, 15% were unvaccinated and unwilling to get vaccinated in 2022, compared with 12% of nonessential workers and 6% of essential healthcare workers. In addition, COVID-19 vaccine hesitancy decreased over time (2021–2022) for essential healthcare workers and nonessential workers but increased for essential nonhealthcare workers. Aside

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from a few studies investigating healthcare worker vaccine hesitancy, there is scant other literature discussing the context for vaccine hesitancy in other types of workers.

This study was conducted to provide input from the target community for a related community-engaged research project involving training in motivational interviewing to help OHPs address vaccine hesitancy, to ensure that the planned training addresses real-life needs and situations. Given the high levels of public trust in physicians, interpersonal communication between patients and provider are one of several strategies to address vaccine hesitancy in the general population.[13,14] Among healthcare providers, OHPs have an important perspective, given their patient population represents more than 150 million working individuals in the United States[15] across a wide range of industries and occupations. The objective of this study was to provide an updated understanding on vaccine hesitancy or refusal that OHPs encounter clinically among employees. This study aims to (1) to determine the major reasons that employees cite for being unwilling to receive vaccinations relevant to the workplace and (2) to estimate the prevalence of interventions implemented in workplaces to improve vaccination uptake among employees, as perceived by OHPs.

METHODS

Study Design and Participants

We conducted an anonymous, online, cross-sectional survey of OHPs in the United States. A nonprobability sample of respondents was recruited via email using listservs of professional organizations serving OHPs, including the American Association of Occupational Health Nurses, Association of Occupational Health Professionals in Healthcare, and the American College of Occupational and Environmental Medicine and the Occupational and Environmental Medicine listserv managed by the University of North Carolina. The recruitment email also invited recipients to share the email with other groups of professionals among the target audience. We included OHPs (nurses, physicians, physician assistants, or nurse practitioners) who practiced primarily within the United States and reported engaging with patients about vaccines in some way at the time of the survey. We excluded respondents who do not see patients in their clinical practice. The survey was available to OHPs from October 3, 2022, through November 7, 2022. The Strengthening the Reporting of Observational Studies in Epidemiology guidelines for reporting cross-sectional studies were observed for reporting this study (Supplementary Fig. 1, http://links.lww.com/JOM/B440).

Survey Instrument

The survey was developed by the authors with collective experience spanning the fields of occupational medicine, occupational health nursing, and motivational interviewing. The study team also solicited the input and review by a small OHP Advisory Board, which included three occupational medicine physicians, one occupational health nurse, and one occupational health physician assistant, each with decades of experience and representing very different industrial sectors. The survey was created in Qualtrics online survey platform (Qualtrics, Provo, Utah, USA). See Supplementary File for full survey, http://links.lww.com/JOM/B441. The study was determined to be exempt from institutional review board (IRB) review by the study site institutional review board.

The 27-item survey included initial questions to ensure participants met eligibility criteria and agreed to participate. Questions then included demographic factors (provider type, practice setting, states/territories of practice), industries in which their patient employees work,[16] which vaccines are offered to employees, whether participants have had prior training in motivational interviewing, and several questions about participants' perceptions of vaccine hesitancy among employees. Questions relevant to vaccine hesitancy included: "What are the reasons that employees cite for being unwilling to get vaccinated against COVID-19?" with similar question for influenza, and illnesses other than COVID-19 and influenza that are relevant to the workplace such as hepatitis B, tetanus and measles, mumps, and rubella (MMR). Answer options were potential reasons for vaccine hesitancy rated on a 5-point Likert scale measuring frequency from "never" to "always," including an "other" option with write-in response. Other questions asked the percentage of employees that decline vaccinations if not mandated by the employer (<25%, 25%–50%, 50%–75%, >75%, unsure), types of interventions implemented in their workplace to address vaccine hesitancy and their perception on effectiveness, and a final free-response question asking for any additional comments: "Please share any additional comments you have about vaccine hesitancy among the employees you interact with."

Data Analysis

For quantitative analysis, frequencies and proportions were obtained to describe the distribution of responses to survey questions. χ^2 tests were used to compare distribution of reasons for vaccine hesitancy across vaccine types (COVID-19, influenza, and other workplace-relevant vaccines) and Fisher exact tests were used to compare the distribution of reasons for COVID-19 vaccine hesitancy among manufacturing versus healthcare and social assistance employees. These two industries were chosen for comparison based on sufficient representation of OHPs working only in that industry. Missing data were excluded from analysis. All quantitative analyses were conducted using SAS™ OnDemand For Academics software, copyright © 2021 SAS Institute, Inc, Cary, NC.[17]

Qualitative analysis was performed for the 45 free-text responses for the final survey question. Qualitative themes for these responses were generated by two authors, C.D. and N.S., and agreed upon. Responses were then coded by themes and reconciled to reach agreement on final themes. The other free text fields had fewer and shorter responses, and thus were summarized.

RESULTS

A total of 245 providers started the survey during the study period, and of these, 217 OHPs met eligibility criteria and completed the survey. Most respondents were nurses (41.0%) or physicians (39.6%) (Table 1). The most common practice sites indicated were an employee health clinic based at a workplace (52.5%) and occupational health clinics serving multiple clients (38.7%). Of the 21 different industries listed in which employees work, the most commonly reported industries were manufacturing (52.5%) and healthcare and social assistance (51.6%) (Table 2).

The reasons for vaccine hesitancy and their perceived frequencies for COVID-19 and influenza are shown in Figure 1. Reasons for which most respondents indicated frequencies of "often" or "always" include concern for vaccine adverse effect(s) (66.5%), mistrust of the vaccine itself (61.7%), mistrust of the government (71.6%), and mistrust in vaccine effectiveness (57.7%). For the annual influenza vaccine, the only reason reported as "often" or "always" implicated in vaccine hesitancy by a majority of respondents was mistrust of vaccine effectiveness (51.0%). Reasons for other workplace-relevant vaccine hesitancy were reported at lower frequencies overall, as seen in Supplementary Figure 2 (http://links.lww.com/JOM/B440).

In addition to the reasons provided in the survey, additional themes expressed in the 45 unique free text comments were aversions to mandates ($n = 8$), low perceived disease risk or severity ($n = 6$), rigid, inflexible beliefs ($n = 6$), and conspiracy beliefs or misinformation as stated directly by respondents or by implication of anti-vaccine figures or ideas ($n = 6$). Unique to influenza vaccination was the idea that the vaccine causes illness. The Supplementary Table (http://links.lww.com/JOM/B440) displays the themes that emerged from qualitative analysis of other reasons for vaccine hesitancy with their frequencies.

Reasons for vaccine hesitancy differed by vaccine type. Table 3 compares the frequencies of reasons reported as "often" or "always" in instances of employee vaccine hesitancy among the three vaccine types. Nearly every reason for vaccine hesitancy was reported as "often" or "always" more frequently for COVID-19 than for influenza and other workplace-relevant vaccines ($P < 0.05$). The only exceptions to this pattern were prior adverse reactions to the same vaccine ($P = 0.07$ and $P = 0.27$, respectively) and allergy to a vaccine component ($P = 0.13$ and $P = 0.74$). Between COVID-19 and influenza, there were also no significant differences in the "often" or "always" frequency of reasons: adverse reaction to a different vaccine ($P = 0.09$), mistrust of health providers ($P = 0.10$), and mistrust of vaccine effectiveness ($P = 0.19$).

There were 34 OHPs who reported working exclusively with employees in the manufacturing industry and 33 who reported working exclusively with employees in the healthcare and social assistance industry. The frequency of reasons reported as "often" or "always" for COVID-19 vaccine hesitancy differed in these groups as well (Table 4). Compared with the healthcare and social assistance industry, OHPs serving manufacturing employees reported reasons including concern about adverse effects (87.5% vs 50.0%, $P = 0.003$), mistrust of vaccine (84.4% vs 50.0%, $P = 0.007$), and mistrust of the government (78.1%% vs 40.6%, $P = 0.005$) more frequently. Compared with the manufacturing industry, OHPs serving healthcare and social assistance employees reported religious concerns (45.5% vs 9.4%, $P = 0.002$) more frequently.

When asked about the frequency of interventions to overcome vaccine hesitancy, employer mandates were the most frequently reported strategy, reported by 74% of OHPs (Fig. 2). Patient-centered counseling techniques, such as motivational interviewing, were reported as the least encountered intervention (19%). Furthermore, when asked about prior training in motivational interviewing, only 35% of OHPs reported any prior training. Employer mandates were perceived to be the most effective type of intervention, with (50%) rating them as "very effective" (Fig. 2), followed by mass vaccination events, employee incentives, and patient-centered counseling. Most strategies were rated as "somewhat effective" or "unclear if effective or ineffective."

TABLE 1. Characteristics of OHPs Participating in Survey ($N = 217$)

Characteristic	*n* (%)
Provider type	
Nurse	89 (41.0)
Physician	86 (39.6)
Nurse practitioner	33 (15.2)
Physician assistant	9 (4.2)
Practice setting*	
Academic occupational health	10 (4.6)
Attending workplace vaccination events or health fairs	29 (13.4)
Corporate medical director/occupational health program director	26 (12.0)
Employee health clinic based at a workplace	114 (52.5)
Occupational health clinic serving multiple clients	84 (38.7)
Other†	9 (4.1)
Practice location	
Northeast	36 (16.6)
South	59 (17.2)
Midwest	67 (30.9)
West	22 (10.1)
National or multiple regions	7 (3.2)
Missing	26 (12.0)

OHP, occupational health provider.

*Occupational health providers were instructed to select all that apply, therefore percentages do not sum to 100; many OHPs indicated multiple practice settings and most OHPs worked with employees in >1 industry.

†Other unique responses included consulting, governmental occupational health, resident training program, and home health.

TABLE 2. Employee Industries Served by OHPs Participating in Survey ($N = 217$)

Industry in Which Employees Work*	*n* (%)
Agriculture, forestry, fishing, and hunting	36 (16.6)
Mining, quarrying, and oil and gas extraction	22 (10.1)
Utilities	62 (28.6)
Construction	70 (32.3)
Manufacturing	114 (52.5)
Wholesale trade	31 (14.3)
Retail trade	55 (23.4)
Transportation and warehousing	78 (35.9)
Information	32 (14.8)
Finance and insurance	29 (13.4)
Real estate and rental and leasing	17 (7.8)
Professional, scientific, and technical services	64 (29.5)
Administrative and support and waste management and remediation services	52 (24.0)
Educational services	51 (23.5)
Health care and social assistance	112 (51.6)
Arts, entertainment, and recreation	31 (14.3)
Accommodation and food services	17 (7.8)
Other services (except public administration)	18 (8.3)
Public administration	33 (15.2)
Military	21 (9.7)
Other†	9 (4.2)
Missing	19 (8.8)

*Occupational health providers were instructed to select all that apply; therefore, percentages do not sum to 100; many OHPs indicated multiple practice settings and most OHPs worked with employees in >1 industry.

†Other responses included public safety (2), department of energy (1), prison and corrections personnel (2), airline (1) food manufacturing (1), the pharmaceutical industry (2), railroads (1), hotels (1), and research (1).

DISCUSSION

In this national sample of OHPs, reasons for vaccine hesitancy differed by vaccine type. In all three vaccine categories, two reasons were implicated frequently: concern about vaccine adverse effects and mistrust of the vaccine or vaccines more generally. For COVID-19, reasons indicating mistrust were predominant. Mistrust of the vaccine, vaccine effectiveness, the government, or scientists were the reasons reported often or always by a majority of OHPs. In contrast, reported

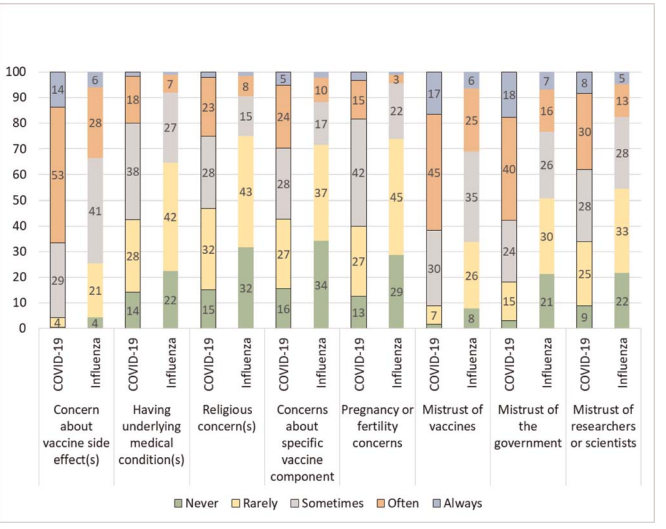

FIGURE 1. Select reasons for COVID-19 and influenza employee vaccine hesitancy as reported among OHPs ($N = 217$).

TABLE 3. Comparison of Reasons for Employee Vaccine Hesitancy Reported by OHPs for the Following Three Vaccine Types: COVID-19 Vaccines, Influenza Vaccines, and Other Workplace-Relevant Vaccines

Reported Reasons for Employee Vaccine Hesitancy	COVID-19, *n* (%)*	Influenza, *n* (%)*	Other, *n* (%)*	COVID-19 vs Influenza, *P*†	COVID-19 vs Other, *P*‡
Concern about vaccine adverse effects	127 (66.5)	66 (33.5)	38 (20.8)	<0.001	<0.001
Prior adverse reaction to a previous dose of the same vaccine	33 (17.2)	47 (24.6)	24 (13.1)	0.07	0.27
Prior adverse reaction to a different vaccine	43 (22.5)	57 (30.0)	23 (12.8)	0.09	0.01
Allergy to vaccine component	8 (4.3)	15 (8.0)	9 (5.0)	0.13	0.74
Having underlying medical conditions	38 (19.9)	15 (8.0)	12 (6.8)	<0.001	<0.001
Religious concerns	48 (25.0)	18 (9.5)	10 (5.6)	<0.001	<0.001
Concerns about specific vaccine components	57 (29.6)	22 (11.8)	13 (7.3)	<0.001	<0.001
Pregnancy or fertility concerns	35 (18.4)	8 (4.3)	10 (5.6)	<0.001	<0.001
Mistrust of vaccine or vaccines	119 (61.7)	59 (31.1)	45 (24.7)	<0.001	<0.001
Mistrust of the government	111 (71.6)	44 (23.3)	35 (19.4)	<0.001	<0.001
Mistrust of health providers	34 (17.7)	22 (11.7)	17 (9.4)	0.10	0.02
Mistrust of researchers or scientists	73 (38.0)	33 (17.5)	26 (14.2)	<0.001	<0.001
Mistrust in vaccine effectiveness	112 (57.7)	97 (51.0)	39 (21.7)	0.19	<0.001

*N is the number of responses indicating "always" or "often" for a given reason in each vaccine category. The percentage is N divided by all responses for a given reason.
†χ^2 analysis comparing frequency of reason for COVID-19 vaccine hesitancy with frequency of reason for influenza vaccine hesitancy.
‡χ^2 analysis comparing frequency of reason for COVID-19 vaccine hesitancy with frequency of reason for hesitancy of other workplace-relevant vaccines.

mistrust of healthcare providers was uncommon. For the influenza vaccine, additional predominant reasons included mistrust in vaccine effectiveness and prior adverse reactions to the same or different vaccines. Qualitative analysis of additional reasons supported survey findings and provided additional insights such as aversions to mandates, low perceived risk, and what OHPs thought to be based on conspiracy theories or misinformation.

Occupational health providers perceived nearly all of the given reasons for vaccine hesitancy significantly more often for COVID-19 than for influenza and other workplace-relevant vaccines. Reasons for COVID-19 vaccine and influenza vaccine hesitancy are generally similar, including concerns about safety, lack of trust, lack of need for vaccination, and cultural or religious reasons.[18] However, vaccine hesitancy has been speculated to have intensified with the COVID-19 pandemic,[14] so the recency of the pandemic and its vaccine efforts may have influenced perceptions of vaccine hesitancy. In contrast, the influenza vaccine has been recommended for many years and the proportion of uptake in the general population has been relatively stable since 2010.[19] In addition, some workplaces, such as hospitals, have mandated receipt of the influenza vaccine by employees, which may also impact vaccine hesitancy. Attitudes about "other" workplace-relevant vaccines, as described, are likely influenced by their perceived importance to a given industry.

The top reasons for COVID-19 vaccine hesitancy, as reported by individual employees, also include concern about safety and efficacy, the newness of the vaccine and perceived haste in the research and approval process, and lack of trust.[20–23] This aligns with our findings and suggests that OHPs are an accurate source of information about employee vaccine hesitancy.

These surveys have focused on healthcare workers, however. Employees of other industries have been surveyed less than healthcare workers. One online national survey found rates of vaccine hesitancy to be highest (>35%) among employees in construction and extraction; installation, maintenance and repair; and farming, fishing, and forestry.[24] Adverse effects, mistrust in the vaccine, mistrust in the government, and lack of concern about the disease were the most commonly cited reasons in these employment categories, similar to the findings in our study. The Household Pulse Survey of Americans found greater

TABLE 4. Comparison of Reasons for Employee COVID-19 Vaccine Hesitancy Reported by OHPs for Manufacturing and Healthcare and Social Assistance Employees

Reported Reasons for Employee Vaccine Hesitancy	Manufacturing (*n* = 34 OHPs), *n* (%)*	Healthcare and Social Assistance (*n* = 33 OHPs), *n* (%)*	*P*†
Concern about vaccine adverse effects	28 (87.5)	16 (50.0)	0.003
Prior adverse reaction to a previous dose of the same vaccine	5 (15.2)	8 (25.0)	0.37
Prior adverse reaction to a different vaccine	7 (21.9)	10 (31.3)	0.40
Allergy to vaccine component	0 (0.0)	3 (9.4)	0.24
Having an underlying medical condition	4 (12.5)	11 (34.4)	0.07
Religious concerns	3 (9.4)	15 (45.5)	0.002
Concerns about specific vaccine components	13 (40.6)	12 (37.5)	1.00
Pregnancy or fertility concerns	9 (29.0)	7 (21.9)	0.57
Mistrust of vaccine or vaccines	27 (84.4)	16 (50.0)	0.007
Mistrust of the government	25 (78.1)	13 (40.6)	0.005
Mistrust of health providers	6 (19.4)	6 (18.75)	1.00
Mistrust of researchers or scientists	20 (62.5)	12 (37.5)	0.08
Mistrust in vaccine effectiveness	24 (75.0)	18 (54.5)	0.12

*The frequency of reasons reported by providers who reported working exclusively with employees in each industry. N is the number of responses indicating "always" or "often" for a given reason in each vaccine category. The percentage is n divided by all responses for a given reason.
†Fisher exact test.

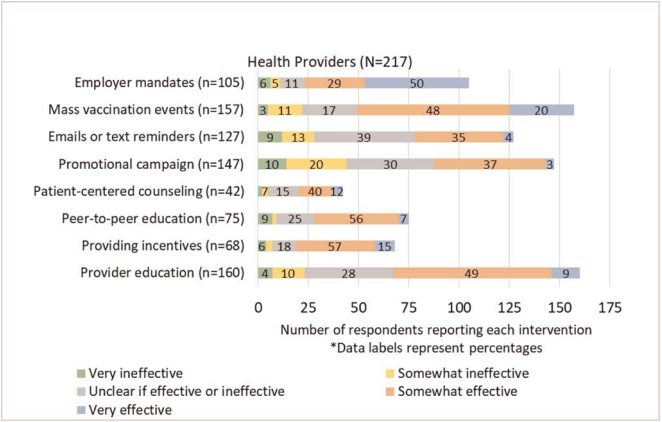

FIGURE 2. Frequency and perceived effectiveness of interventions at overcoming employees' vaccine hesitancy, as reported among OHPs ($N = 217$).

rates of vaccine hesitancy among essential nonhealthcare workers and nonessential workers than healthcare workers.[12]

In our study, comparison of the manufacturing industry to the healthcare and social assistance industry provides additional insight into how vaccine hesitancy may differ by industry. The OHPs exclusively serving manufacturing employees reported mistrust-related reasons more commonly than OHPs exclusively serving employees in healthcare and social assistance. The healthcare and social assistance group also reported unique reasons like religious concerns and underlying medical concerns at a greater frequency than the manufacturing industry.

Within a given industry, reasons for hesitancy have been shown to differ by gender, age, race, and role. In the hospital setting, physicians and scientists have the highest rates of vaccine acceptance (>95%) compared with those in ancillary services, with acceptance rates of 80%.[25] These insights may help tailor interventions to these industries and suggest that interventions may benefit from gathering input on specific reasons for vaccine hesitancy in the design phase.

Among reported interventions in OHPs' workplaces to address employee vaccine hesitancy, employer mandates, mass vaccination events, and employee incentives were considered the most effective at overcoming vaccine hesitancy. While these strategies, along with others such as reminders, may improve vaccine uptake among vaccine-ready or vaccine-neutral employees, they are unlikely to impact reasons for hesitancy.[26,27] Mandates, which have been shown to be effective in improving influenza uptake among healthcare employees,[28] are a measure that are recommended only with careful consideration of potential benefits and harms, such as worsening antivaccine sentiment.[29,30] Interventions relating to education provision, including patient-centered counseling, were perceived as the next most effective, but were less frequently used than other interventions. Patient-centered counseling can include motivational interviewing, a communication method that aims to elicit a patient's own underlying reasons for change and is rooted in principles of partnership and empathy.[31] Our finding of a low prevalence of mistrust in healthcare providers supports the idea that providers are a trusted and valuable source of information for vaccine hesitant employees. However, only about one third of OHPs in this survey reported prior training in motivational interviewing. Motivational interviewing has been endorsed as an effective communication method to address vaccine hesitancy, including COVID-19 vaccine hesitancy.[32–35] These findings thus indicate an opportunity to expand use of this communication method in occupational health settings to address vaccine hesitancy among employees.

Our study had several strengths including detail in which reasons were elicited, and specificity to COVID-19, influenza, and other workplace-relevant vaccines for comparison. In addition, OHPs who represented a variety of practice settings, locations around the country, and a variety of employee industries participated in the study, which is likely a reflection of the national reach of the professional listservs used for recruitment.

Limitations of this study include sampling bias resulting from use of a nonprobability convenience sample of OHPs, which also limits generalizability to US OHPs. Employees may be less likely to report hesitancy and reasons for hesitancy such as mistrust of healthcare providers to a healthcare provider. Furthermore, all potential reasons for vaccine hesitancy were not represented in the survey, such as low perceived disease risk or severity. In addition, the small sample sizes of OHPs that exclusively care for employees from specific industries limit the ability to make inferences about industry-specific differences.

CONCLUSIONS

Occupational health providers are a valuable source of insight into vaccine hesitancy among working individuals. In this national sample of OHPs, the top reasons for vaccine hesitancy related to the COVID-19, influenza, and other workplace-relevant vaccines were concerns about adverse effects and mistrust of vaccines. Reasons for COVID-19 vaccine hesitancy were reported more frequently than influenza and other workplace-relevant vaccines and differed by industry. Our data suggest that the perspective of OHPs accurately captures employees' concerns about vaccines when surveyed. These results underline the importance of leveraging patient-provider relationships to communicate about vaccines effectively. These results also help inform how OHPs may tailor their vaccine-related efforts to vaccine type, specific employee concerns, and employee industry.

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