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COVID-19 Booster Vaccine Hesitancy in the Emergency Department

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Study objective: Little is known about COVID-19 booster vaccine hesitancy. We sought to determine the uptake of booster vaccines, as well as the prevalence of and reasons for booster hesitancy in emergency department (ED) patients.

Methods: We performed a cross-sectional survey study of adult patients at 5 safety-net hospital EDs in 4 US cities from mid-January to mid-July 2022. Participants were fluent in English or Spanish and had received at least one COVID-19 vaccine. We assessed the following parameters: (1) the prevalence of nonboosted status and reasons for not getting a booster; (2) the prevalence of booster vaccine hesitancy and reasons for hesitancy; and (3) the association of hesitancy with demographic variables.

Results: Of 802 participants, 373 (47%) were women, 478 (60%) were non-White, 182 (23%) lacked primary care, 110 (14%) primarily spoke Spanish, and 370 (46%) were publicly insured. Of the 771 participants who completed their primary series, 316 (41%) had not received a booster vaccine; the primary reason for nonreceipt was lack of opportunity (38%). Of the nonboosted participants, 179 (57%) expressed hesitancy, citing need for more information (25%), concerns about side effects (24%), and the belief that a booster was unnecessary after the initial series (20%). In the multivariable analysis, Asian participants were less likely to be booster hesitant than White participants (adjusted odds ratio [aOR] 0.21, 95% confidence interval [CI] 0.05 to 0.93), non-English-speaking participants were more likely to be booster hesitant than English-speaking participants (aOR 2.35, 95% CI 1.49 to 3.71), and Republican participants were more likely to be booster hesitant than Democrat participants (aOR 6.07, 95% CI 4.21 to 8.75).

Conclusion: Of almost half of this urban ED population who had not received a COVID-19 booster vaccine, more than one third stated that lack of opportunity to receive one was the primary reason. Furthermore, more than half of the nonboosted participants were booster hesitant, with many expressing concerns or a desire for more information that may be addressed with booster vaccine education. [Ann Emerg Med. 2023;■:1-9.]

Please see page XX for the Editor's Capsule Summary of this article.

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INTRODUCTION

As of November 18, 2022, 81% of the US population completed their initial vaccine series against COVID-19, but only 13.5% of those individuals received an updated bivalent booster vaccine.¹ With the periodic rise in virulent COVID-19 variants across the United States,¹ booster vaccines have become a fixture in public health recommendations. Booster vaccines not only lower the risk of new symptomatic COVID illness but also reduce hospitalizations and deaths from infections.² Although researchers have studied COVID-19 vaccine hesitancy,³ attitudes regarding booster vaccination are less well understood. Historical trends in other multidose vaccines have shown a significant decline in the uptake for both second and third doses.⁴

The emergency department (ED) is a safety net for underserved populations who lack access to primary care, including many individuals who are at the highest risk of severe COVID-19 infection (undomiciled, uninsured, and Black/Latino populations).³ We have previously demonstrated that patients who use the ED as their usual source of care have significantly higher rates of hesitancy to receive primary series COVID-19 vaccines.³

Characterizing the prevalence of booster vaccine hesitancy and its underlying reasons will be important over the next several years, especially in populations who continue to be disproportionately affected by the COVID-19 pandemic. Our study asserts that disparities and challenges with hard-to-reach populations can be addressed with interventions delivered during ED visits. This study

Editor's Capsule Summary*What is already known on this topic*

Emergency department (ED) care allows an opportunity for assessment of and education for vaccinations, including for COVID-19.

What question this study addressed

How often do ED patients report receiving COVID-19 vaccination booster doses and with what patterns of why and who?

What this study adds to our knowledge

A survey of 802 patients seen in 5 urban safety-net hospitals in early 2022 revealed that 41% had not received a booster, most often due to perceived lack of opportunity or hesitancy. Different subgroups reported varying rates of hesitancy.

How this is relevant to clinical practice

ED efforts to increase COVID-19 vaccination boosters could aid but will require multi-pronged approaches.

aims to inform interventions addressing booster vaccine hesitancy in underserved ED populations by assessing the following parameters: (1) COVID-19 booster vaccine uptake and reasons for not getting a booster and (2) booster vaccine hesitancy in those who have not already received booster vaccines, and reasons for booster vaccine hesitancy.

MATERIALS AND METHODS**Design and Setting**

From mid-January to mid-July 2022, we conducted a cross-sectional survey study of adult ED patients at 5 EDs in the following 4 US cities: San Francisco: Zuckerberg San Francisco General Hospital and University of California, San Francisco (UCSF) Medical Center; Philadelphia: Thomas Jefferson University Hospital; Seattle: Harborview Medical Center; and Durham: Duke University Medical Center. We used a central institutional review board approval mechanism (UCSF) with reliance at the other sites.

Survey Instrument

Our research team reviewed and edited a template of questions about vaccine hesitancy adapted from previously published instruments.³ With input from the UCSF COVID-19 Patient Community Advisory Board, we pilot tested the final instrument ([Appendix E1](#); available at

<http://www.annemergmed.com>) with 5 ED patients at the core site (Zuckerberg San Francisco General Hospital) to ensure comprehension and response consistency. In consultation with the Patient Community Advisory Board, we revised the wording of questions to increase comprehension, clarity, and consistency; however, we did not quantify these data.

Selection of Participants: Inclusions, Exclusions, and Survey Administration

Given limits on research personnel during the COVID-19 pandemic, we used a time-block convenience sampling technique (8-hour daytime blocks, 5 weekdays per week), including ED patients aged ≥ 18 years who had received ≥ 1 COVID-19 vaccine. We excluded patients with the following criteria: (1) inability to speak English or Spanish fluently; (2) a major trauma; (3) inability to participate because of intoxication, an altered mental status, or critical illness; (4) incarceration; (5) a psychiatric hold; and (6) at a temporary visit from another country. All patients meeting eligibility criteria during the time blocks were approached. Based on data available from 4 of 5 participating sites, 12% of patients approached were ineligible to participate owing to vaccination status, and 28% declined participation.

After scripted verbal consent, research personnel read survey questions to participants directly from data collection forms and electronic tablets. We did not compensate participants.

Definitions and Primary Outcomes

Patients had a “full initial series” if they had received 2 doses of a messenger ribonucleic acid series vaccine or 1 dose of a single-dose series vaccine. We defined a “boosted” status as having the full initial series and responding “Yes” to the question “Have you received a COVID-19 booster vaccine?” Participants replying “No” or “Unsure” were asked the reasons for not receiving it.

We defined booster hesitancy as a response of “No” or “Unsure” to the question “If a booster vaccine was offered to you, would you accept it?” Participants replying “No” or “Unsure” were asked the reasons for not accepting it. Based on previous work in COVID-19 vaccine hesitancy,³ we inserted a priori lists of potential reasons for nonuptake and booster vaccine hesitancy. To avoid introducing suggestion bias from these lists, the principal investigator trained research personnel to let participants answer these questions freely, then categorize their responses into one or more preset answers, with a free-text “other” category for answers that did not fit. The free-text responses were consolidated and categorized through a consensus between the principal

Table 1. Demographic characteristics of participants, stratified by vaccination status.

Characteristics	Full Initial Series [†] (n = 771, 96%)	Incomplete Initial Series (n = 31, 3.9%)	Boosted (n = 455, 57%)	Not Boosted (n = 316, 39%)
	No. (%)	No. (%)	No. (%)	No. (%)
Age (y), median (IQR)	50 (34-63)	40 (30-62)	56 (40-67)	41 (30-56)
Sex				
Woman	360 (47)	13 (42)	204 (45)	156 (49)
Man	403 (52)	18 (58)	244 (54)	159 (50)
Other [*]	8 (1.0)	0 (0)	7 (1.5)	1 (0.3)
Race and ethnicity[†]				
Asian	35 (4.5)	1 (3.2)	27 (5.9)	8 (2.5)
Black	193 (25)	13 (42)	111 (24)	82 (26)
Hispanic/Latino	160 (21)	6 (19)	85 (19)	75 (24)
Other [‡]	68 (8.8)	2 (6.5)	36 (7.9)	32 (10)
White	315 (41)	9 (29)	196 (43)	119 (38)
Site				
Duke	143 (19)	7 (23)	101 (22)	42 (13)
Jefferson	149 (19)	1 (3.2)	98 (22)	51 (16)
Parnassus	147 (19)	3 (9.7)	114 (25)	33 (10)
Zuckerberg	192 (25)	9 (29)	120 (26)	72 (23)
Harborview	140 (18)	11 (35)	22 (4.8)	118 (37)
Primary language				
English	627 (81)	25 (81)	370 (81)	257 (81)
Spanish	106 (14)	4 (13)	59 (13)	47 (15)
Other	38 (4.9)	2 (6.5)	26 (5.7)	12 (3.8)
Education				
High school or less	286 (37)	22 (71)	139 (31)	147 (47)
Some college	165 (21)	4 (13)	100 (22)	65 (21)
College degree	205 (27)	2 (6.5)	126 (28)	79 (25)
Graduate or professional	102 (13)	2 (6.5)	84 (18)	18 (5.7)
Preferred not to answer	13 (1.7)	1 (3.2)	6 (1.3)	7 (2.2)
Experiencing homelessness				
No	712 (92)	19 (61)	437 (96)	275 (87)
Yes	56 (7.3)	12 (39)	17 (3.7)	39 (12)
Preferred not to answer	3 (0.4)	0 (0)	1 (0.2)	2 (0.6)
Insurance status				
Private	281 (36)	8 (26)	178 (39)	103 (33)
Medicare	201 (26)	6 (19)	139 (31)	62 (20)
Medicaid	154 (20)	9 (29)	74 (16)	80 (25)
Other [§]	61 (7.9)	2 (6.5)	36 (7.9)	25 (7.9)
Uninsured	53 (6.9)	1 (3.2)	20 (4.4)	33 (10)
Unsure	21 (2.7)	5 (16)	8 (1.8)	13 (4.1)
Political party affiliation				
Democrat	260 (34)	5 (16)	186 (41)	74 (23)
Republican	66 (8.6)	2 (6.5)	35 (7.7)	31 (9.8)
Independent	75 (9.7)	3 (9.7)	50 (11)	25 (7.9)
Other	370 (48)	21 (68)	184 (40)	186 (59)
Have primary care				
Yes	593 (77)	17 (55)	383 (84)	210 (66)

Table 1. Continued.

Characteristics	Full Initial Series [†] (n = 771, 96%)	Incomplete Initial Series (n = 31, 3.9%)	Boosted (n = 455, 57%)	Not Boosted (n = 316, 39%)
	No. (%)	No. (%)	No. (%)	No. (%)
No	169 (22)	13 (42)	70 (15)	99 (31)
Unknown/Unsure	9 (1.2)	1 (3.2)	2 (0.4)	7 (2.2)

IQR, interquartile range.

*"Other" included transgender men, transgender women, genderqueer/gender nonbinary, and those who preferred not to answer.

[†]Assessed with 1 "check all that apply" question in which research assistants checked all the choices participants answered.

[‡]"Other" included Middle Eastern, Native Hawaiian/Pacific Islander, Native American/American Indian, Alaska Native, other____, and those who preferred not to answer.

[§]"Other" included Affordable Care Act/ObamaCare, Kaiser Permanente, Veterans Administration, and Healthy San Francisco.

^{||}"Other" included other____, none/unaffiliated/I am not interested in politics, do not know, and those who preferred not to answer.

[¶]Full initial series is defined as the receipt of 2 doses of a messenger ribonucleic acid series or 1 dose of a single-dose vaccine.

investigator, primary author, and lead research coordinator. If more than one reason was given that was consistent with available answer choices, both choices were recorded. Research staff met with the principal investigator and primary author to adjudicate vague responses through the consensus.

Analysis

We summarized participant self-reported demographic characteristics and key survey responses as frequencies and proportions, excluding nonresponses to individual questions in proportion denominators. We included race and ethnicity among these characteristics, given the disproportionate influence COVID-19 has had on Hispanic/Latino and Black populations.³ To assess the differences in vaccine hesitancy between groups (eg, man versus woman), we calculated odds ratios (ORs) with 95% confidence intervals (CIs). We evaluated the association of demographic variables with nonboosted status and with booster hesitancy among nonboosted participants who had completed their initial series using a mixed-effects logistic regression model clustered by the clinical site. The clinical site was modeled as a random effect. For nonboosted status and booster hesitancy, we adjusted for demographic variables known or hypothesized to be associated with the nonreceipt of a booster vaccine and booster hesitancy, respectively.^{3,5} We explored the interactions among age/gender, gender/race and ethnicity, as well as the collinearity among all variables. We managed the study data using REDCap (Research Electronic Data Capture) and conducted statistical analyses using R version 4.1.0 (R Foundation for Statistical Computing).

RESULTS

Of the 802 participants who had received at least 1 COVID-19 vaccine, 771 (96%) had completed their full

primary COVID-19 vaccination series; 373 (47%) were women, 206 (26%) were Black, 324 (40%) were White, and 166 (21%) were Hispanic/Latino, with 110 (14%) primarily speaking Spanish. Three hundred eight (38%) participants had attained high-school education or less, 182 (23%) lacked primary care, and 370 (46%) were publicly insured, ie, Medicare/Medicaid (Table 1). Less than 1% of participants had missing data. We found no evidence of interactions or collinearity.

COVID-19 Booster Vaccination Status

Of the 771 participants with their full initial series, 316 (41%) had not received a booster vaccine. In multivariable analyses adjusting for age, education, housing status, insurance status, political party affiliation, and lack of primary care, we found the following statistically significant associations with nonboosted status: aged 18 to 34 years versus aged more than 65 years (adjusted OR [aOR] 3.87, 95% CI 1.55 to 9.68); women versus men (aOR 1.50, 95% CI 1.01 to 2.22); Asian versus White race (aOR 0.48, 95% CI 0.25 to 0.92); highest educational attainment of high school or less versus higher educational attainment (aOR 2.10, 95% CI 1.30 to 3.41); unhoused versus housed (aOR 3.15, 95% CI 1.95 to 5.08); and lacking a primary care physician/clinic versus having a primary care physician/clinic (aOR 1.76, 95% CI 1.09 to 2.84) (Appendix E2). When nonboosted participants were asked why they had not yet received a booster vaccine, the top 3 reasons cited were "I haven't had the opportunity" (38%), "I don't need one because I'm fully vaccinated" (16%), and "I have concerns about side effects and safety" (13%) (Appendix E3).

COVID-19 Booster Vaccine Hesitancy

Of the 316 nonboosted participants, 179 (57%, 95% CI 51 to 62) stated that they would decline or were unsure whether they would accept a booster vaccine if it was

Table 2. Unadjusted and adjusted association of demographic characteristics with booster hesitancy, clustered by site.

Demographic characteristics	Unadjusted	Adjusted
	OR (95% CI)	aOR (95% CI)
Age (y)	-	-
18-34	Ref	Ref
35-49	1.11 (0.63-1.95)	1.16 (0.99-1.36)
50-64	0.88 (0.49-1.58)	0.74 (0.54-1.01)
≥65	0.88 (0.42-1.86)	0.77 (0.29-2.08)
Gender		
Woman	1.85 (1.18-2.92)	1.66 (0.99-2.80)
Man	Ref	Ref
Race and ethnicity		
Asian	0.28 (0.04-1.26)	0.21 (0.05-0.93)
Black	1.06 (0.60-1.87)	1.38 (0.67-2.85)
Hispanic/Latino	2.28 (1.23-4.34)	1.59 (0.82-3.09)
Mixed/Other	0.44 (0.19-0.97)	0.40 (0.11-1.45)
White	Ref	Ref
Primary language: non-English (Ref: English)	2.95 (1.58-5.82)	2.35 (1.49-3.71)
≤High-school education (Ref: >high-school education)	0.98 (0.63-1.54)	0.82 (0.43-1.57)
Unhoused (Ref: housed)	0.69 (0.36-1.34)	0.84 (0.30-2.38)
Uninsured (Ref: insured)	1.61 (0.76-3.55)	1.77 (0.55-5.74)
Political affiliation		
Democrat	Ref	Ref
Republican	3.57 (1.46 - 9.48)	6.07 (4.21 - 8.75)
Other	1.74 (1.02 - 2.98)	1.78 (1.14 - 2.77)
Lack primary care (Ref: have primary care)	0.83 (0.51 - 1.35)	0.70 (0.37 - 1.34)

aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; Ref, reference.

offered to them (ie, booster hesitant). In the multivariable analysis, we found the following statistically significant associations with booster vaccine hesitancy: Asian versus White race (aOR 0.21, 95% CI 0.05 to 0.93); non-English versus English primary language (aOR 2.35, 95% CI 1.49 to 3.71); and Republican versus Democrat party affiliation (aOR 6.07, 95% CI 4.21 to 8.75) (Table 2). The most common reasons for booster vaccine hesitancy were a preference to wait for more information (25%), concerns about side effects and safety (24%), and the response “I don’t need one because I’m fully vaccinated” (20%) (Table 3).

LIMITATIONS

Although we used the best practice methods for survey design and development, our survey tool has not been independently validated; we cannot guarantee that

questions asked were measuring the intended concept; however, we reviewed each question extensively with the Patient Community Advisory Board to maximize comprehension. Given the nature of survey-type research, our results are also likely subject to elements of spectrum, social desirability, and selection bias, with the latter most likely leading to the underestimation of the true prevalence of booster vaccine hesitancy. Attitudes toward booster vaccines likely represent an average of effects over the 6-month study period. All participating EDs were affiliated with bicoastal, urban, academic medical centers. Approximately 15% of participants were Spanish speaking, more than half completed some college, the vast majority completed their initial series, and less than 10% identified as Republican; these demographics may have undercaptured the prevalence of booster hesitancy, which is likely higher in rural, nonacademic ED populations.

Table 3. Reasons for booster vaccine hesitancy among participants with full initial series*.

	All, n (%)	Lack Primary Care, n (%)	Have Primary Care, n (%)
Reasons	167 (%)	51 (%)	116 (%)
Prefer to wait for more information	41 (24.6)	14 (27.5)	27 (23.3)
Have concerns about side effects and safety	40 (24.0)	11 (21.6)	29 (25.0)
Do not need one because already fully vaccinated	34 (20.4)	7 (13.7)	27 (23.3)
Bad side effects from initial vaccination	24 (14.4)	4 (7.8)	20 (17.2)
Have not received the vaccine owing to a medical reason	17 (10.2)	8 (15.7)	9 (7.8)
Not yet eligible for booster	13 (7.8)	5 (9.8)	8 (6.9)
Already had the COVID-19 infection	12 (7.2)	3 (5.9)	9 (7.8)
Not worried about getting COVID-19 infection	11 (6.6)	2 (3.9)	9 (7.8)
General mistrust of the vaccines	11 (6.6)	2 (3.9)	9 (7.8)
Tired of getting vaccines	9 (5.4)	2 (3.9)	7 (6.0)
Do not want it	7 (4.2)	1 (2.0)	6 (5.2)
Heard media stories that gave doubt about the booster vaccine	6 (3.6)	2 (3.9)	4 (3.4)
Have not received the opportunity	6 (3.6)	2 (3.9)	4 (3.4)
Not mandated by job	4 (2.4)	1 (2.0)	3 (2.6)
Physician recommended against it	3 (1.8)	1 (2.0)	2 (1.7)
Other	3 (1.8)	2 (3.9)	1 (0.9)
Unsure	2 (1.2)	0 (0.0)	2 (1.7)

*Research staffs were instructed to record responses as free text unless they were worded exactly as one of the listed choices. Free text was therefore used in 48% of responses for reasons underlying booster hesitancy. The responses above include the original answer choices as well as free-text categorized responses based on investigator consensus.

Our study was also limited by the quantitative nature of our survey (Appendix E1). For example, we were not able to determine why participants who completed their full initial series did not have the opportunity to receive a booster vaccine. However, our subsequent work will be exploring these issues further.

DISCUSSION

In this multisite study of adult ED patients in the first half of 2022, almost half of the participants reported not having received COVID-19 booster vaccination. Of the nonboosted participants with their initial vaccine series, more than one third stated that lack of opportunity to receive one was the primary reason for not being vaccinated and more than half expressed hesitancy toward receiving a booster vaccine. The Asian race was associated with decreased booster hesitancy, whereas non-English language and Republican party affiliations were associated with increased hesitancy. We also found that Hispanic/Latino ethnicity and an age of 35 to 49 years had borderline significant associations with higher hesitancy. Common reasons for booster hesitancy included concerns about side effects and safety, lack of a perceived need for a booster vaccine after a full initial series, and a preference to wait for more information.

Our estimate of boosted adults (57%) was slightly higher than that of the CDC report of 51.4%, as of August 7, 2022,¹ possibly because our study population was older than the general US population. In July 2022, the Kaiser Family Foundation COVID-19 Vaccine Monitor, a comprehensive source of insight into the US public's attitudes toward vaccination, reported that the most common reasons for not obtaining a booster among nonboosted adults were feeling sufficient protection from initial vaccination/prior infection and simply not wanting a booster, with Democrats being more likely than Republicans to get vaccinated.⁵ These findings are consistent with those of our study. However, in contrast to the Kaiser Family Foundation, our study population also reported concerns about booster side effects/safety and a desire for more information. This difference might have arisen because our ED population had relatively low access to primary care where that type of basic information might be provided.

Booster vaccinations reduce COVID-19 infection, transmission, and in-hospital mortality.⁶ As new COVID-19 variants emerge, the need for booster vaccination will continue, although the medical community may debate about the optimal timing of its administration.⁷ Curbing the negative health and societal consequences of the

pandemic will likely depend on the public's willingness to receive booster vaccinations. To ensure that existing global health disparities are not exacerbated further, we must address booster vaccine hesitancy among communities that have been disproportionately affected by the pandemic. Prior work has suggested that culturally tailored communications, including endorsement from same-race medical professionals, show promise in reducing vaccine hesitancy in communities with high mistrust.⁸ These might prove especially useful for Spanish-speaking, Hispanic/Latino populations in which there is both a language and cultural barrier. Additionally, political party affiliation might be another important consideration when designing tailored communications.

For populations with limited access to primary care, the ED presents an opportunity to administer vaccines to those willing to accept them and provide educational vaccine messaging to those who are vaccine hesitant. In this regard, we conducted surveys and interviews with ED patients who were hesitant to receive their initial COVID-19 vaccine; we then developed tailored messaging platforms (videos, flyers, and scripts for ED-provider messages) to address their concerns.⁹ In a multisite cluster randomized controlled trial, we found that implementation of these vaccine-messaging platforms resulted in more vaccine acceptance and uptake in unvaccinated ED patients. Intervention effect sizes were especially pronounced in Hispanic/Latino participants and those who lacked primary care.¹⁰

This trial's success supports the development of similar interventions to address COVID-19 booster vaccine hesitancy in underserved ED populations. Our finding that participants with their initial vaccine series either desired more information about boosters or believed that they did not need a booster highlights the need to adapt messaging to specific concerns regarding booster vaccines. The top messages that might change booster-hesitant participants' perspectives might include explanations as to why boosters are necessary after the primary series, information about safety and side effects, and explicit data on how much protection boosters provide. By addressing the lack of opportunity for vaccination in patients whose only health care access occurs in EDs and providing messaging to booster-hesitant patients, ED-based COVID-19 booster vaccine delivery and messaging programs may increase booster vaccine uptake in underserved ED populations.

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