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Impact of a physician recommendation on COVID-19 vaccination intent among vaccine hesitant individuals

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ABSTRACT

Objective: To test the impact of varied physician recommendations on COVID-19 vaccine hesitancy.
Methods: We conducted a vignette-based experimental survey on Prolific, an online research platform. COVID-19 vaccine hesitant, adult panel members were assigned to one of five messages that varied by recommendation style (participatory vs explicit) and strategy (acknowledgement of concerns; comparison to the flu shot; statement that millions of people have already received it; emphasis on protecting others). Vaccine hesitancy was re-assessed with the question, "Would you get vaccinated at this visit?".
Results: Of the 752 participants, 60.1% were female, 43.4% Black, 23.6% Latino, and 33.0% White; mean age was 35.6 years. Overall, 33.1% of the initially "not sure" and 13.1% of the initially "no" participants became less hesitant following any recommendation. Among the "not sure" participants, 20.3% of those who received a participatory recommendation became less hesitant compared with 34.3%– 39.5% for the explicit recommendations. The "protect others" message was most effective among initially "no" participants; 19.8% become less hesitant, compared to 8.7% for the participatory recommendation.
Conclusion: A physician recommendation may reduce COVID-19 vaccine hesitancy.
Practice Implications: An explicit recommendation and "protect others" message appear to be important elements of a physician recommendation for COVID-19 vaccination.

1. Introduction

The COVID-19 pandemic has been devastating with nearly 1 million deaths in the United States (US) as of May 2022. [1] The magnitude of this human tragedy is counter-balanced by the remarkable and unprecedented scientific achievement of developing multiple, highly effective vaccines against COVID-19 less than one year following the first report of this new disease [2]. It is estimated that the US vaccination campaign prevented more than 275,000 deaths by the end of June 2021 [3]. Yet, a substantial proportion of eligible individuals in the US remain hesitant to be vaccinated against COVID-19, [4] leading to preventable deaths and hospitalizations, and continued strain on healthcare systems. Since June 2021, more than a month after COVID-19 vaccines became widely available to all adults in the US, [5,6] there have been more than 245,000 deaths due to COVID-19 [7]. Occurring almost exclusively among unvaccinated individuals, nearly all of these deaths may have been prevented [6].

There are reasons to expect that a strong recommendation from a physician or healthcare provider may be influential in increasing COVID-19 vaccine uptake and an important tool in fostering COVID-19 vaccine acceptance. Physicians and other healthcare providers are the most trusted source of information about the COVID-19 vaccine. [8,9] A recommendation from a physician has consistently been associated with higher rates of vaccine uptake for other vaccines such as the human papillomavirus (HPV) and influenza vaccines. [10–12] One recent study found that a provider recommendation for COVID-19 vaccination was associated with an increased likelihood of receiving at least one dose of a COVID-19 vaccine. [13] A presumptive style recommendation (e.g., "you are due for a flu shot") is associated with increased vaccine uptake compared with a participatory style recommendation (e.g., "are you interested in getting a flu shot?") for the influenza and HPV vaccines. [14–17] However, it is unknown whether communication strategies that

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are effective for other vaccines such as HPV and influenza can be translated to the COVID-19 vaccine. The unique context for the COVID-19 vaccine, including its rapid development, initial availability via Emergency Use Authorization, politicization, and unprecedented levels of misinformation suggest unique message strategies may be needed.

Our objective was to test a series of physician messages recommending COVID-19 vaccination among vaccine hesitant individuals to identify elements that increase intent to be vaccinated.

2. Methods

2.1. Study design

We conducted an experimental vignette-based survey as part of a larger study examining COVID-19 vaccination status, intent, knowledge and attitudes. Participants who responded "no" or "not sure" to the question, "If you could get vaccinated for COVID-19 today, would you?" were classified as vaccine hesitant and presented with a brief clinical vignette in which they were asked to imagine they were seeing their doctor for an annual exam. At the end of the visit, the doctor states that the COVID-19 vaccine is available, and the patient is eligible to receive it at that visit. Participants were then assigned to receive one of five brief physician messages recommending the COVID-19 vaccine, based on the last digit of their phone number. Vaccination intent was then immediately re-assessed.

2.2. Study participants and survey administration

Participants were sampled from Prolific Academic Ltd, an online platform for research participant recruitment, with over 70,000 active U.S participants. Prolific Academic Ltd provides a sample of predominantly English speaking participants that is more diverse and yields higher quality data than other crowdsourcing platforms [18]. It has been used in other published studies examining COVID-19 knowledge, perceptions, and vaccination intent [19–22]. Eligible panel members were (1) at least 18 years of age, (2) English speaking, and (3) U.S residents. We restricted the sample of panel members to those who identified as White, Black, or Latino to allow comparisons between these three groups. We oversampled Blacks and Latinos given the high levels of vaccine hesitancy in these two groups [23,24]. We aimed to achieve approximately equal numbers of White, Black, and Latino participants in our sample. We conducted preliminary testing of the questionnaire with a convenience sample to assess understandability and flow, and to elicit feedback on items and content in general.

The electronic survey was released on Prolific between January 12 – February 1, 2021 until we reached the target sample (n ~ 1800). Participants were informed that they would be asked to answer a series of questions assessing their views on COVID-19 when they signed up for the survey. After completing the survey, participants received $1.50 for their participation, an amount that was consistent with Prolific's recommendation. This study was reviewed and approved by the UMass Chan Medical School Institutional Review Board, the body that oversees human subjects research.

2.3. Survey instrument

To address the most common concerns cited by hesitant individuals about the safety and effectiveness of the COVID-19 vaccine, all physician messages included a statement that the vaccine is very safe and very effective [23]. In message #1, this statement was followed by, "What do you think?", consistent with a participatory-style recommendation. All other messages included an explicit recommendation ("I recommend that you get it"). The four messages with an explicit recommendation (messages 2–5) differed in the strategy used to encourage vaccination. Drawing on principles of empathic communication, persuasion, [25] and appealing to prosocial motivations, [26] the four strategies included (1) acknowledgement of concerns and reassurance that the physician personally reviewed the safety data; (2) comparison to the flu shot ("as safe as the flu shot"); (3) a statement that millions of people have already received the COVID-19 vaccine; and (4) emphasis on protecting others (Table 1).

In addition to the randomized message testing, the survey included items that assessed participants' intent to be vaccinated against COVID-19, knowledge and attitudes about COVID-19 and the COVID-19 vaccine, demographic characteristics, and an attention check. Some questions about the COVID-19 vaccine differed depending on participant vaccination intent. For example, respondents who indicated that they did not intend to get vaccinated were asked "Please tell us why you don't intend to get vaccinated". This question was modified to refer to being unsure for those who had indicated they were unsure whether they would get vaccinated and was not included for those who had indicated that they did intend to be vaccinated. Findings from some items unrelated to the message testing have been published elsewhere. [27].

2.4. Study outcome

The primary study outcome was reduction in vaccine hesitancy, assessed with the question, "Would you get vaccinated at this visit?", following exposure to one of the five physician messages. Response options included: *yes, no, not sure*. For participants whose initial vaccination intent was "not sure", a response of "yes" on re-assessment was defined as less hesitant. Responses of "not sure" or "yes" were defined as less hesitant for participants whose initial vaccination intent was "no".

Table 1
Content and Variation of Physician Recommendations.

Message Key	Message Shorthand	Full Message Content
Elective-style recommendation		
Message 1 (M1)	What do you think?	We have the COVID-19 vaccine available today and you're eligible to get it. This vaccine is very safe and very effective. **What do you think?**
Explicit or indicated-style recommendation		
Message 2 (M2)	As safe as the flu shot	We have the COVID-19 vaccine available today and you're eligible to get it. **This vaccine is as safe as the flu vaccine, and it's MORE effective. I recommend that you get it.**
Message 3 (M3)	Millions have already gotten it	We have the COVID-19 vaccine available today and you're eligible to get it. **I know it's new, but millions of people have already gotten it, and more people are getting it every day.** It's very safe and very effective. **I recommend that you get it.**
Message 4 (M4)	Acknowledge concerns, I've reviewed the studies	We have the COVID-19 vaccine available today and **I'd like you to get it. I know some people are concerned about the vaccine. I can understand feeling that way. I've reviewed the studies carefully and I am convinced that this vaccine** is very safe and very effective. **I believe that getting vaccinated would be a very good decision on your part.** I **strongly** recommend that you get it.
Message 5 (M5)	Protect others	We have the COVID-19 vaccine available today and you're eligible to get it. This vaccine is very safe and very effective. **It's the best way to protect the people you are close to from this virus and keep them healthy. I recommend that you get it.**

2.5. Analyses

Participant characteristics were summarized using frequencies and percentages. We used crosstabulations and chi-square testing to examine differences in selected participant characteristics (age, gender, race/ethnicity, educational attainment, and receipt of flu shot in the prior 5 years) according to message group to assess the success of the randomization. We conducted pre-planned pairwise comparisons to estimate differences in the impact of each message compared to each other message, using chi-square statistics. We examined and presented these separately for the initially "not sure" and initially "no" group because prior work suggested these groups would differ [23] and because the outcome for these groups is defined differently. We did not adjust for multiple comparisons because we wanted to maximize our ability to detect possible differences in communication strategies in this exploratory study, to be studied further in future randomized controlled trials. [28,29].

3. Results

There were 1706 participants who responded to the survey, after removing participants who failed the attention check (n = 93) and who did not respond to the initial vaccination intent question (n = 10). Of these, 756 (44.3%) were classified as vaccine hesitant, responding "not sure" (n = 341) or "no" (n = 415) to the question "If you could get vaccinated against COVID-19 today, would you?". Four participants who responded "no" to the initial vaccination intent question did not respond to the question re-assessing vaccination intent following exposure to a physician recommendation and are therefore not included in the analyses, resulting in a final analytic sample of 752 vaccine hesitant participants. Of these, 60.1% were female, 43.4% Black, 23.6% Latino, and 33.0% White, with a mean age of 35.6 years (range 18–73) (Table 2). There were no differences in age, gender, race/ethnicity, or educational attainment according to message group assignment (Supplemental Table 1). Among the participants with an initial vaccination intent of "not sure", significantly more of those assigned to receive the "acknowledge concerns, I've reviewed the studies" message had received a flu shot in the last 5 years compared with participants assigned to the other message groups (Supplemental Table 1). However, there was no association between receipt of flu shot in the last 5 years and the primary outcome, becoming less hesitant following a physician message (data not shown). There were no significant differences in receipt of flu shot according to message group among participants with an initial vaccination intent of "no".

3.1. Impact of messages

Among respondents with an initial vaccination intent of "not sure", overall 33.1% (113/341) became less hesitant following a physician message, indicating they would get vaccinated at that visit. The participatory style recommendation ("what do you think?") was the least effective message with 20.3% (14/69) of participants who received this message indicating they would get vaccinated. In comparison to the participatory style message, a greater proportion of participants became less hesitant after receiving each of the four messages with an explicit recommendation ("I recommend that you get it"), including 34.3% (23/67; p = .07) following the "acknowledge concerns, I've reviewed the studies" message, 36.4% (20/55; p = .05) following the "as safe as the flu shot" message, 39.5% (32/81; p = .01) following the "millions have already gotten it" message, and 34.8% (24/69; p = .06) following the "protect others" message (Fig. 1). There were no statistically significant differences in the proportion of participants who became less hesitant following each of the four messages that included an explicit recommendation (Fig. 1).

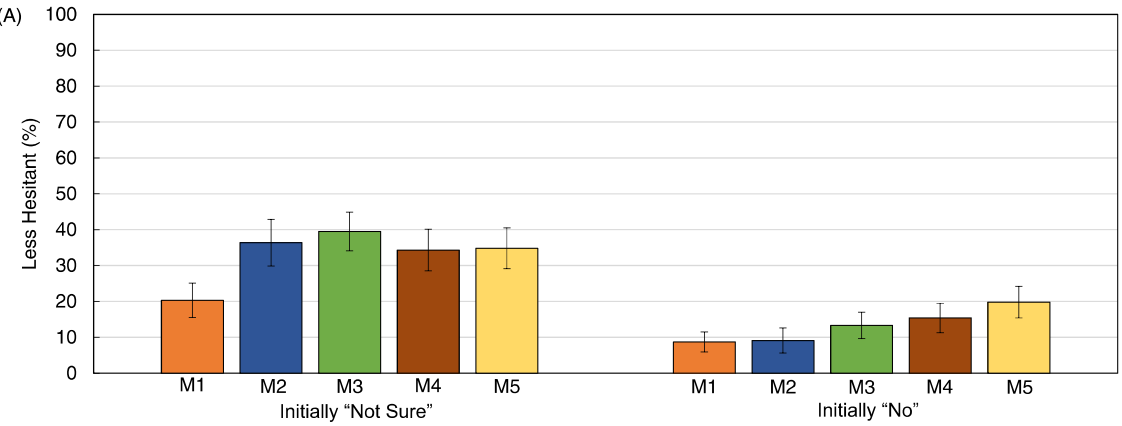
Of the 411 respondents with an initial vaccination intent of "no", 13.1% (54/411) became less hesitant following any of the physician messages, indicating they were either not sure or would get vaccinated at that visit. The "protect others" message was the most effective at reducing vaccine hesitancy among participants who initially responded "no" with 19.8% (16/81) becoming less hesitant after receiving this message, more than two-fold greater than following the participatory style recommendation ("what do you think?") (9/103, 8.7%; p = .03).

Table 2
Characteristics of COVID-19 Vaccine Hesitant Participants Assigned to Receive Physician Message.

Characteristic	Overall sample N = 752
Initial vaccination intent	341 (45.3)
Not sure	411 (54.7)
No	
Age[a]	190 (25.5)
18 – 24	184 (24.7)
25 – 34	191 (25.6)
35 – 44	107 (14.4)
45 – 54	58 (7.8)
55 – 64	15 (2.0)
65 or more	
Gender[a]	291 (39.0)
Male	449 (60.1)
Female	6 (0.8)
Other	1 (0.1)
Prefer not to say	
Race/ethnicity[a]	177 (23.6)
Latino	248 (33.0)
White	326 (43.4)
Black	
Education[a]	224 (29.9)
High school or less	365 (48.7)
Some college	160 (21.4)
4-year college or more	
Employment[a]	394 (52.5)
Employed	129 (17.2)
Unemployed	92 (12.3)
Student	64 (8.5)
Homemaker	28 (3.7)
Disabled	21 (2.8)
Retired	22 (2.9)
Other	
Household income[a]	242 (32.4)
Less than $30,000	255 (34.1)
$30,000 - $60,000	159 (21.3)
$60,000 - $100,000	67 (9.0)
More than $100,000	25 (3.3)
Prefer not to answer	
Geographic region	391 (52.0)
South	131 (17.4)
Midwest	120 (16.0)
West	110 (14.6)
Northeast	
Flu shot[a]	332 (44.2)
Ever, in the last 5 years	419 (55.8)
Not sure or no	
"In general, how would you rate your overall health?"[a]	69 (9.2)
Excellent	205 (27.3)
Very good	309 (41.2)
Good	137 (18.3)
Fair	30 (4.0)
Poor	
"In general, how would you rate your overall mental or emotional health?"[a]	91 (12.1)
	174 (23.2)
Excellent	225 (30.0)
Very good	185 (24.6)
Good	76 (10.1)
Fair	
Poor	

[a] Missing values for less than 1% of the sample (age, n = 7 missing; gender, n = 5 missing; race, n = 1 missing; education, n = 3 missing; employment, n = 2 missing; household income, n = 4 missing; flu shot, n = 1 missing; self-rated overall health, n = 2 missing; self-rated overall mental or emotional health, n = 1 missing).

(A)



(B)

	Initially "Not Sure"								Initially "No"						
		Became less hesitant		Pairwise message comparisons *P* value						Became less hesitant		Pairwise message comparisons *P* value			
Message	Total N	N	%	M1	M2	M3	M4		Total N	N	%	M1	M2	M3	M4
M1	69	14	20.3	--	--	--	--		103	9	8.7	--	--	--	--
M2	55	20	36.4	.05	--	--	--		66	6	9.1	.94	--	--	--
M3	81	32	39.5	.01	.71	--	--		83	11	13.3	.32	.43	--	--
M4	69	23	34.3	.07	.81	.52	--		78	12	15.4	.17	.26	.70	--
M5	67	24	34.8	.06	.86	.55	.96		81	16	19.8	.03	.07	.26	.47

Fig. 1. Impact of Randomly Assigned Physician Messages on COVID-19 Vaccination Intent.

(A) Proportion of participants who became less hesitant, according to initial COVID-19 vaccination intent and random message assignment. (B) Total number of participants assigned to each message group, number and proportion who became less hesitant, *p*-values of pairwise comparisons.

The "protect others" message was also more effective than the "as safe as the flu shot" message (6/66, 9.1%; $p = .07$) at reducing vaccine hesitancy, although this did not achieve statistical significance. There were no statistically significant differences in the proportion of participants who became less hesitant following exposure to the "acknowledge concerns, I've reviewed the studies", "what do you think", "as safe as the flu shot", or "millions have already gotten it" messages (Fig. 1).

4. Discussion and conclusion

4.1. Discussion

Our findings in this experimental vignette-based study of physician recommendations for COVID-19 vaccination suggest that a brief but explicit physician recommendation may reduce vaccine hesitancy among individuals who are unsure or do not intend to get vaccinated. Not surprisingly, the impact of a physician recommendation was greater among less hesitant ("not sure" as compared to "no") individuals. Nonetheless, reducing vaccine hesitancy among even 10% of the most hesitant individuals may still translate into meaningful increases in vaccination rates with resultant reduction in COVID-19 cases, hospital admissions, and deaths. Our findings are consistent with a recent survey that demonstrates an association between receipt of a healthcare provider recommendation for COVID-19 vaccination with receipt of at least one dose of a COVID-19 vaccine [13]. In this study, only about 40% of US adults had received a recommendation for COVID-19 vaccination, suggesting there may be missed opportunities for providers to promote COVID-19 vaccination. Encouraging physicians to provide an explicit recommendation is a promising means of increasing COVID-19 vaccine uptake in the United States [30]. A clear and effective recommendation from a trusted messenger, such as a healthcare provider, is especially important in the current context in which COVID-19 vaccines have been politicized and misinformation continues to spread [31].

In addition to demonstrating the potential for a physician recommendation to increase COVID-19 vaccine acceptance, our study provides evidence of which specific messages are most effective. Among the initially "not sure" participants, all of the messages that included an explicit recommendation were more effective than the participatory ("what do you think"?) message, and we did not find a difference between any of the four messages that included an explicit recommendation. This suggests that among individuals who are uncertain about whether to get vaccinated, an explicit unequivocal strong recommendation from a doctor may be the most essential element to increasing vaccination uptake. Our findings suggest a participatory approach is less effective at promoting COVID-19 uptake, consistent with what is known about other vaccines, such as influenza and HPV [14–17] particularly among less hesitant (initially "not sure") individuals. At the same time, an explicit recommendation was not more effective than other messages among the more hesitant (initially "no") participants, indicating a need for alternative communication strategies with more vaccine hesitant individuals, such as motivational interviewing [32,33].

"It's the best way to protect others" was the only message that was significantly more effective at reducing vaccine hesitancy among the most hesitant individuals (i.e., those who intended not to get vaccinated

at the start of the survey). This is consistent with the findings of another experimental survey that compared the impact of a "risk-to-others" versus "safety-for-others" message on vaccination intent. Although the authors found no significant differences between these messages in the overall study population, among Hispanic and non-white respondents, the "safety-for-others" message significantly increased intent to be vaccinated. [34] A more recent study testing the impact of persuasive messages on COVID-19 vaccination intent similarly found a prosocial message that emphasized protecting others in the community increased vaccination intent [35] Collectively, these findings suggest that a "protect others" message may be particularly effective and highlights the need for additional studies to determine how best to tailor messages according to specific characteristics such as race or degree of vaccine hesitancy.

The main strengths of this study include demonstrating the potential for a physician recommendation to reduce vaccine hesitancy and providing empiric evidence of specific physician messages that are most effective and can be easily adopted into practice. The vignette-based study design afforded a high degree of experimental control over the physician messages which would have been impossible to achieve in real-world practice.

Our study has limitations. Our findings must be interpreted in the context of the study timing, as the COVID-19 vaccine was only approved for Emergency Use Authorization. It has been documented that a larger proportion of individuals who were initially less hesitant ("wait and see") have subsequently been vaccinated against COVID-19 than those who were initially more hesitant ("definitely not") [36]. Therefore, the population of individuals who remain unvaccinated at the present time may be most similar to the initially "no" group in the current study. We were unable to assess whether the impact of physician messages in practice would parallel the impact in the hypothetical scenarios described here. In practice, the quality of the patient-provider relationship, and whether the patient has a regular provider, would likely influence the impact of the message. We are limited in our ability to draw robust inferences given the multiple comparisons. It is possible that the impact of the messages might have differed had they been tailored to a specific individual's main concern about the vaccine. Despite these limitations our results are consistent with other studies.

5. Conclusion

In conclusion, these findings provide evidence that a recommendation from one's doctor can reduce COVID-19 vaccine hesitancy. This highlights the important role of physicians in overcoming COVID-19 vaccine hesitancy and extends what is known about effective physician-patient communication about vaccination.

Practice implications

A communication approach that combines an explicit recommendation with a "protect others" message may be the most effective strategy for physicians to foster COVID-19 vaccine acceptance.

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CRediT authorship contribution statement

Kimberly A. Fisher: Conceptualization, Methodology, Investigation, Writing – original draft, Supervision, Funding acquisition. **Ngoc Nguyen**: Investigation, Formal analysis, Writing – review & editing, Visualization. **Hassan Fouayzi**: Formal analysis, Writing – review & editing. **Sonal Singh**: Formal analysis, Writing – review & editing. **Sybil Crawford**: Formal analysis, Writing – review & editing. **Kathleen M. Mazor:** Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors have no competing interests to report.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pec.2022.09.013.

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