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Influenza Vaccination During COVID-19 in a Rural Community: A Cross-sectional Survey

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Abstract

Vaccination behavior is an informative metric for assessing flu seasons and is especially important to understand for the 2020–2021 flu season, which coincided with the COVID-19 pandemic. This study aimed to estimate flu vaccine behavior and assess vaccine perceptions during the pandemic season. Using a cross-sectional descriptive study design, we conducted an online survey to assess vaccination behavior and perceptions of both COVID-19 and the flu. Patients were identified as recently seen by providers in an academic internal medicine practice (n = 827) and surveys were distributed as messages in the Epic electronic medical record system. We found that 88.3% of respondents (188/206) had received their flu vaccination for the season at the time of their survey response in December 2020–February 2021. Of those that had not yet received the flu vaccine, only 13.6% indicated they planned on getting one. 12.5% of respondents said they had changed their flu vaccine plans due to the COVID-19 pandemic. Looking at differences from past season's behavior, more individuals switched to getting the flu vaccine than those that switched to not getting the vaccine this season. The most frequently cited reasons for not receiving the flu vaccination were concerns about side effects and not being in a priority group. Changes in flu vaccination behavior from previous seasons represent a net positive in the direction of vaccine acceptance. Barriers to vaccination were identified and results from this study provide more information on vaccine perceptions, beliefs, and behavior, which can benefit future vaccination programs.

Keywords Influenza Vaccines · COVID-19 · Surveys and Questionnaires · Vaccination Refusal · Cross-sectional studies

Introduction

The yearly public health challenge of mitigating the flu season was complicated for the 2021–2022 season due to the concurrent COVID-19 pandemic. Encouraging vaccination is an important aspect of preparing for the flu season, as vaccination is the best practice for preventing the flu [1, 2]. Despite this, overall flu vaccination rates for individuals in the United States lag behind national goals, with only 45.3% of adults vaccinated for the 2018–2019 flu season as compared to the goal of 70% vaccination [3, 4].

Some past flu seasons have occurred during simultaneous pandemics, most recently in 2009 when a pandemic H1N1 flu virus became prevalent outside of the normal flu season [5]. However, no previous flu season of note has occurred with the simultaneous pandemic being caused by a virus other than influenza. The Centers for Disease Control and Prevention (CDC) strongly recommended the flu vaccine for the 2020–2021 season, but restrictions to public travel and access to healthcare due to the overlapping COVID-19 pandemic likely influenced vaccination behavior [6].

Predicting flu vaccination requires an assessment of multiple factors, such as perceived social circle vaccination and provider recommendation [7, 8]. While provider recommendation is typically a strong vaccination promoter, this can only occur if a patient visits the doctor during the vaccination period; this season, outpatient visits significantly decreased in frequency due to state COVID-19 closure policies [9].

Despite the large impact that perceptions have on vaccine behavior, they are not the sole predictor of vaccine uptake. Most adults in the United States view the influenza vaccine positively, with majorities reporting it as safe (86.3%) and

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effective (73.0%), numbers which are not commensurate with the percentage of adults receiving the vaccine [10].

Studies have attempted to quantify the influence of different barriers to flu vaccination on specific demographic groups, but no one model for vaccination behavior has proven consistent across populations [11]. This suggests that behavior models should instead focus on more specific community types, such as this study's rural setting, to avoid overgeneralization. While many studies exist that have assessed general perceptions of flu vaccinations, the unique challenges to vaccination presented in a pandemic season have not yet been fully examined.

This study aims to estimate flu vaccine uptake and analyze vaccine hesitancy for the 2020–2021 flu season, as well as to assess the impact of the concurrent COVID-19 pandemic on such behaviors.

Methods

For this study, a cross-sectional online survey was developed. The survey created for this study was adapted from two previously used surveys: the CDC National 2009 H1N1 Survey [12] and a published survey on COVID-19 perceptions [13]. The CDC conducts a yearly National Flu Survey which is used to estimate vaccine coverage for adults and children in the United States. The National 2009 H1N1 Flu Survey (NHFS) was specifically modified to analyze flu vaccine coverage during a pandemic season.

Survey questions on COVID-19 come from a published study aimed at determining COVID-19 perceptions early in the pandemic [13]. The survey collected information on self-reported knowledge, attitudes, and behaviors related to the COVID-19 pandemic.

The two surveys were adapted and modified to produce this study's Flu Vaccination Survey, which includes an informed consent page, four questions on COVID-19 perceptions, nine or ten questions on flu vaccine beliefs and past and future behavior, and eight demographics questions. Questions asked about flu vaccination vary based on a participant's preceding answers; for example, if they say they have already received the flu vaccine, they will not be asked questions about their likelihood to get vaccinated. The survey was built in Microsoft Forms and made accessible through a participant hyperlink.

Participant identification and survey distribution were performed through Epic, the electronic medical record software used at a rural academic health system in the northeastern United States. Eligible participants were identified via an Epic report on patients aged 18 years old or older seen in an Internal Medicine outpatient clinic during the 30-day period from 11/2/2020 through 12/1/2020, excluding those with impairment criteria identified via ICD-10 (International Classification of Diseases, Tenth Revision) codes (Table 1). The report included a patient's medical record number (MRN), first and last name, date of their last visit (which may have been for in-person or virtual visits and for primary, urgent or consultative care), provider seen, age, and patient portal status (active or inactive).

Eligible participants for this study are the patients identified in the Epic report who have active patient portal accounts and did not see an author during their last visit. Eligible participants were sorted numerically by ascending MRN. An online random number generator [14] was used to randomize patients by MRN, providing the order in which surveys were delivered. Due to the exploratory nature of the study, a pre-specified sample size was not used.

Survey distribution was performed through the online patient portal associated with Epic. The survey invitation comprised of the customized but non-individualized smart phrase ".FLUVACSURVEY", which automatically expanded into the survey invitation that read: "You are invited to participate in a short, online survey about flu vaccination this season. To continue, please click the link below: [LINK]". Patients were notified by email that they had received a new message in the patient portal. If the patient was interested in participation and clicked the link, it opened in their web browser to the consent page of the Microsoft Form. The form recorded all answers for each respondent and noted questions with no response. It also counted people who opened the survey but declined to consent. Due to question non-response and the variable number of questions from the survey's flow, results were analyzed as

Table 1 Epic report criteria

Criterion	Include	Exclude
Age	18 years old or older	Less than 18 years of age
Primary language	English	Non-primary English speakers
Cognitive impairment (ICD-10 code: G30, G31)	Non-cognitively impaired	Cognitively impaired
Visual impairment (ICD-10 code: H54)	No severe visual impairment	Severe and uncorrectable visual impairment

This chart shows the inclusion and exclusion criteria utilized in the Epic report for patients seen in the Internal Medicine outpatient clinic

percentage of response. Surveys with only partial responses were included in the analysis.

The non-author providers in the host internal medicine office were informed about the study by email and during a resident research conference. This study was reviewed and approved by the local Institutional Review Board. Data was analyzed using descriptive statistics performed in Microsoft Excel.

Results

The Epic report was run for the period from 11/2/2020 through 12/1/2020 and identified 1244 patients, of which 827 were deemed eligible and had surveys planted between 12/8/20 and 1/5/21 (Fig. 1). Survey results were collected from 12/8/20 to 2/15/21 (n = 206).

Of the 206 respondents, 189 consented and provided answers to the survey questions (response rate = 22.9%). Question non-response did occur and results were analyzed based on the percentage of responses to a specific question.

Demographically, respondents represented the expected racial diversity of the surrounding community. For instance, 96.8% identified their race as White, while 1.1% identified as Asian and 1.1% identified as Black or African American; this is similar to the US Census data for Bradford County Pennsylvania, where the study was conducted, viz. 96.9% White, 0.7% Asian and 0.8% Black

[15]. The average age was 64 years old (range 29–88) and 67.4% of respondents were female. The majority (63.6%) of respondents were either retired, unemployed, unable to work, or homemakers (n = 187). Of respondents who were employed and indicated their industry, 49.2% were healthcare workers (31/63; Fig. 2).

166 of 188 respondents (88.3%) had received their flu vaccination for the season prior to their survey response. Of the 22 that had not yet received the flu vaccine, only 3 (13.6%) indicated they planned on getting one. 19.67% of respondents (36 of 183) were required by work or school to receive the flu vaccination. Looking at past behavior, 85.7% of respondents (151 out of 176) said they got the flu vaccine every year. Among these prior vaccinators, only 4 (2.6%) had not yet gotten the vaccine at the time of taking this survey.

Of the 6 respondents who get the flu vaccine either every year or in some years and had not gotten it yet this year, 3 said they did not plan on getting the flu vaccine. On the flip side, of the 19 respondents who never or rarely got the flu vaccine, 5 had gotten the flu vaccine this year.

When asked if they had changed their flu vaccine plans due to the COVID-19 pandemic, 12.5% (22) said yes, with 20 (90.9%) of that group having gotten the flu vaccine. The most common reasons given for not yet receiving a flu vaccine were concerns about side effects or sickness (8) and not being in a priority group (5).

Fig. 1 Participant flow chart. This flow chart shows considerations for qualifying patients. Exclusions were initially made using the Epic report, but additional exclusions were made via a chart search prior to sending out surveys
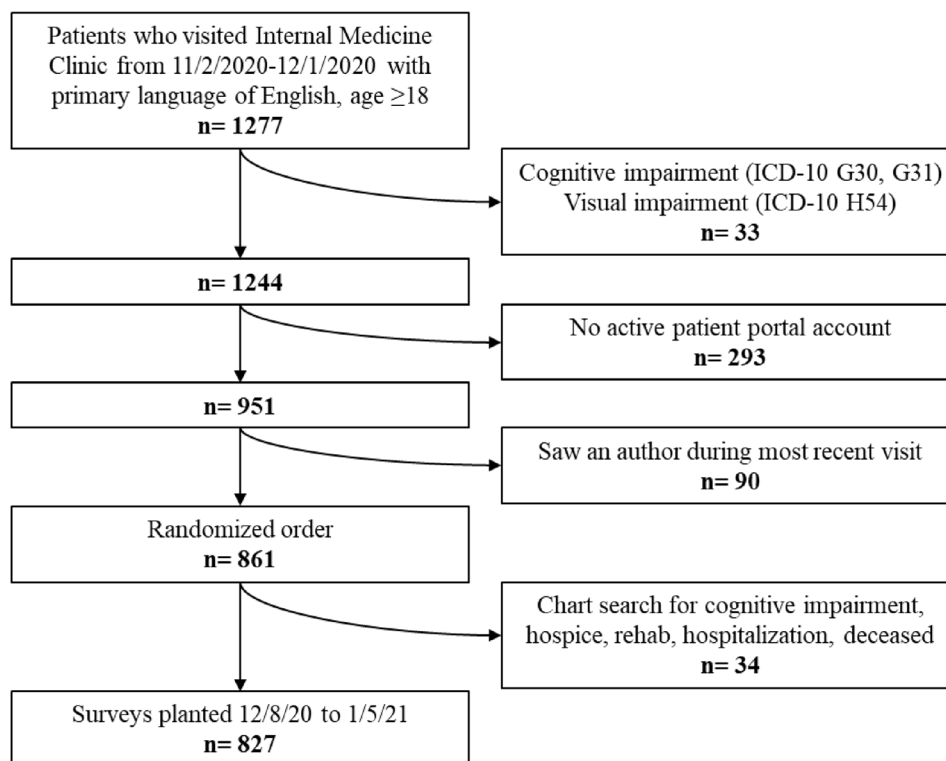
In what business or industry do you work?
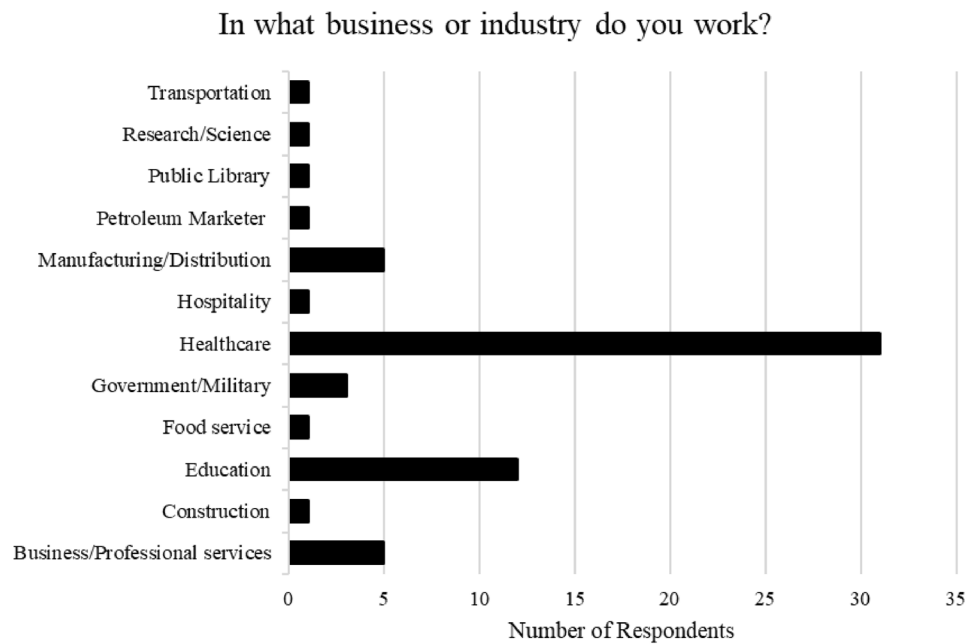
Discussion

Most respondents received the flu vaccine this season, suggesting an overall positive view of vaccinations during the COVID-19 pandemic. Many community members work for the local healthcare system (Fig. 2) which may influence the high rates of flu vaccination. Retirees in the sample population may have also worked in healthcare, but past industry information was not collected for those not currently employed. Community composition does not explain the differences observed from previous year's vaccination plans, suggesting a trend in vaccination that may be more generalizable to other communities. In deviating from past seasons' behavior, more individuals switched to getting the flu vaccine than those that switched to not getting the vaccine this season. This represents a net positive in the direction of vaccine acceptance. The respondents were already largely compliant with flu vaccination in past years; it is not known if a more diverse group would have had larger numbers for changes in vaccine uptake.

Common reasons reported for vaccination refusal were concerns about side effects or sickness and not being in a priority group. Research on flu vaccination has shown that in pandemic seasons, confidence (worry about safety, lack of belief in vaccine effectiveness, mistrust of officials) and complacency (low worry or perceived risk) are the primary barriers to vaccination [11]. Our findings are in line with this, showing a lack of confidence in vaccine safety and complacency from not identifying as high-risk. Conversely, past behavior predicted vaccine uptake; people who had previously received flu vaccines largely continued to do so [11].

A survey-based study performed in May 2020 quantified flu vaccine intention early on in the COVID-19 pandemic and suggested that the public health situation would encourage previous non-vaccinators to reassess their behavior and consider getting a flu vaccine [16]. Our study looks at this intention and self-reported vaccine uptake during the period of flu vaccination, providing empirical data for vaccination behavior and supporting the predictions of this previous study. Similar findings were observed in the United Kingdom in which individuals nationwide who had previously gone unvaccinated accepted the influenza vaccination at higher rates due to the COVID-19 pandemic [17].

The survey distribution method of an online study through the patient portal does limit the study population. In the chosen sample for this study, only 76.4% of patients fitting the participant criteria had an active patient portal account (Fig. 1). Patients with limited health literacy are less likely to enroll in online patient portals even when internet access is present, representing a significant population not represented in survey results [18]. In addition, no reminder messages were sent out following survey placement, which likely limited our response rate. The low response rate (22.9%) and small sample size (189) are limitations of our study.

Additional limitations include question non-response and misunderstanding of presented questions. Non-responses can result in fewer total questions being asked if succeeding questions are based on a question's answer. The high rate of question non-response creates difficulty for comparing questions, as the total number of respondents varies per question. In addition, the previously performed surveys [12, 13] from which our survey was adapted were created

for telephone interviews. Because of this limitation, some recorded answers may be the result of a question misunderstanding. The survey format has limited answer choices, which can lead a participant to choose an answer that is not entirely accurate to their experience or to skip the question.

Due to the anonymous nature of the data collection for this survey, we could not verify a respondent's flu vaccination status. Additionally, we were unable to determine how respondents may have differed from non-respondents in our sample. Several healthcare professionals use the site of this study for primary care and would have been included in the sample; if they participated in the study the results may be less generalizable to primary care sites with smaller numbers of healthcare staff.

Although the study was intended to assess uptake of vaccination against influenza, its timing overlapped with the interim recommendations of the Advisory Council on Immunization Practices for administration of Pfizer [19] and Moderna [20] COVID-19 vaccines, which were issued on 12/12/20 and 12/19/20, respectively. The effect of this unintended coincidence on our study is not known.

Benefits of the study format were reflected in its widespread distribution. While survey placement was performed manually, the electronic delivery system allowed for a sizable patient pool to be reached. Although the study was conducted in a single rural center, its findings may improve understanding of the lower flu vaccination rate in rural centers in November 2020 reported from a nationwide study [21].

This study provides additional information for the study of vaccine behavior, both in terms of COVID-19 and influenza. Influenza will continue to be a yearly challenge and improving flu vaccine acceptance is the best way to mitigate this threat. Future studies can utilize the common reasons for vaccine refusal identified by this study to inform quality improvement initiatives to increase vaccine acceptance.

This study can also inform future research surrounding the COVID-19 vaccine. Deaths in the United States caused by COVID-19 surpassed 500,000 individuals as of March 2021 [22]. With vaccine acceptance standing as the large hurdle against the control of this public health threat, understanding vaccine behavior is of utmost importance. Although the incidence of COVID-19 was higher in rural areas than in urban areas in October 2020 [23], adult COVID-19 vaccination coverage was lower in rural than in urban counties as of mid-April 2021 [24]. The vaccination behavior described in this study focuses on a rural community and can provide insight into vaccination barriers specific to these areas.

A recent study examined three determinants of COVID-19 vaccine acceptance: the perceived probabilities of protection against the disease, minor side effects, and serious adverse reactions. It was found that the probability of vaccine efficacy has the largest effect on vaccine acceptance among these three factors, while the probability of minor side effects does not have a significant impact on vaccine behavior [25]. This is contrary to the flu vaccination behavior described in this study, where fear of side effects was found to be the largest barrier to vaccination. The visibility of COVID-19's burden of disease is much greater than that of influenza, which may explain the difference in vaccine predictors.

Identifying barriers to vaccination is beneficial for future flu seasons as well as for implementing pandemic vaccination plans. Results from this study can aid future vaccination programs by providing information on vaccine perceptions, beliefs, and behavior.

Declarations

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