COVID-19 and Influenza Vaccine Acceptance and Hesitancy Among Caregivers of Children with Cancer

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Abstract

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Introduction:

Children with cancer are immunocompromised and at increased risk for complications from infections including COVID-19 and influenza. Vaccination is recommended, but caregiver perceptions in this high-risk group are not well understood.

Methods:

We conducted a cross-sectional survey of English- and Spanish-speaking caregivers of pediatric oncology patients at a large urban pediatric hospital from March to June 2022. The survey addressed COVID-19 and influenza vaccine knowledge, attitudes, and experiences and included validated questions to identify vaccine hesitancy. Caregiver survey responses were linked to their child's electronic health record data. COVID-19 vaccine acceptance, defined as documented or caregiver-reported vaccine receipt or intention to vaccinate if age-ineligible at survey administration, was the primary outcome. Influenza vaccine acceptance was a secondary outcome. Associations between survey responses and COVID-19 or influenza vaccine acceptance were assessed using multivariable logistic regression.

Results:

Of 441 eligible caregivers, 100 (23%) responded. COVID-19 vaccine acceptance was 71%, influenza vaccine acceptance was 82%, and 57% of caregivers were identified as vaccine hesitant. Vaccine hesitancy was significantly negatively associated with COVID-19 vaccine acceptance. Perceived vaccine safety, efficacy, prior influenza vaccination, and pandemic-related concern about cancer were positively associated with COVID-19 vaccine acceptance.

Conclusion:

Caregiver perceptions strongly influenced COVID-19 and influenza vaccine acceptance. Specific and provider-driven communication strategies are needed to address ongoing vaccine hesitancy in this uniquely at-risk population.

Introduction

Pediatric cancer patients are particularly vulnerable to infectious diseases due to immunosuppressive treatments and frequent exposures, often in the healthcare setting.[1] Vaccination against preventable viral infections, including COVID-19 and influenza, is critical to protect this population from severe illness and to avoid disruptions in cancer care. Unfortunately, vaccine access, missed opportunities, and vaccine hesitancy remain significant barriers to achieving high immunization rates in this high-risk population.[2]

Vaccine hesitancy, defined as a motivational state of being conflicted about or opposed to getting vaccinated, persists among caregivers of children with cancer.[3] Contributing factors include concerns about vaccine safety, perceived low risk of viral disease, and mistrust in public health messaging. Prior research has identified that lower parent-reported COVID-19 exposure risk, concerns about vaccine side effects, and lower income were significant factors related to COVID-19 vaccine hesitancy among caregivers of children with cancer.[4] Other caregiver concerns include worries about the effectiveness of the COVID-19 vaccine, logistical challenges, and the overall limited availability of relevant information.[5] In one study, 21% of caregivers expressed hesitancy to vaccinate themselves against COVID-19, and 29% were hesitant to have their children, with a history of cancer, receive the COVID-19 vaccine.[6] Another study noted that 24% of parents of pediatric oncology patients were not vaccinated against COVID-19 themselves due to fears of side effects.[7] Another study found that caregivers were more likely to be vaccinated against COVID-19 than their children with cancer or bone marrow transplant (88% of caregivers vaccinated versus 48% of children, with reasons cited including treatment-related ineligibility, age restrictions, and vaccine hesitancy.[8]

Studies also suggest that caregivers' intentions to vaccinate childhood cancer survivors were highly influenced by concerns specific to their child's cancer history and health literacy related to vaccines in general.[9,10] Frequent information-seeking and higher health literacy positively impacted vaccine intentions. These studies highlight the importance of providing specific and reliable information to improve vaccine acceptance. Overall, the literature suggests that addressing vaccine hesitancy in this population requires targeted communication strategies, emphasizing the safety and efficacy of vaccines via conversations with trusted healthcare providers.[11, 12]

Caregiver decision-making about vaccination is multifaceted and influenced by a range of beliefs, contextual factors, and prior experiences. Previous studies have primarily explored caregiver attitudes and intentions related to vaccination, yet few have directly linked these perceptions to documented vaccine behaviors. In addition, as caregivers may hold differing views toward specific vaccines, it is important to explore how views toward COVID-19 and influenza vaccines may diverge, and whether receipt of one predicts acceptance of the other[13]. This may be especially relevant for newly introduced vaccines, such as when the COVID-19 vaccine was first authorized for children.[14] This study addresses these gaps by examining both COVID-19 and influenza vaccine

acceptance among caregivers of children with cancer, using linked survey and electronic health record (EHR) data. COVID-19 vaccine acceptance served as the primary outcome, and influenza vaccine acceptance as a secondary outcome. This approach provides a comprehensive understanding of how beliefs, behaviors, and contextual factors intersect, offering insights to inform tailored strategies for improving vaccine acceptance in pediatric oncology settings.

Methods

Study Design, Population, and Setting

This was a cross-sectional survey study conducted among caregivers of pediatric oncology patients at Seattle Children's Hospital, a large US urban academic medical center. Eligible participants were English- or Spanish-speaking caregivers of children under age 18 years who received cancer care at the hospital between June 2018 and May 2021. This study was reviewed and approved by the Seattle Children's Hospital Institutional Review Board.

Study Procedures

The study was conducted between March and June 2022. Eligible caregivers were identified using electronic health record (EHR) data, and recruitment was carried out via email and postal mail. Caregivers were invited to complete an online survey hosted on REDCap, a secure web-based data capture platform designed to support research studies.[15] Participants were required to confirm informed consent prior to survey completion. A $10 gift card incentive was offered upon survey completion. Caregiver survey responses were linked to select patient-level EHR data for their child using unique identifiers.

Survey Instrument and Data Collection

The survey instrument was developed through an iterative process and informed by prior studies of caregiver vaccine perceptions.[16,17,18] It included items on COVID-19 and influenza vaccine knowledge, attitudes, and behaviors as well as sources of vaccine information and trust in providers. Vaccine hesitancy was identified using the validated 4-item short form of the Parent Attitudes about Childhood Vaccines (PACV) survey (Supplemental Materials).[19,20,21]

Demographic (age and role of caregiver, self-reported race and ethnicity,) were collected from the survey instrument while clinical (cancer diagnosis; COVID-19 and influenza vaccine administration dates), and visit (clinical encounter dates), insurance status) data were abstracted from the hospital's EHR for the caregiver's child with cancer. Vaccine administration data included doses given at hospital-affiliated locations as well as doses administered at outside facilities (both in and out of state) and also those captured via the state immunization information system (IIS) data integrated into the EHR.

Measures

The primary outcome was COVID-19 vaccine acceptance, defined as EHR-documented or caregiver-reported receipt of at least one dose of a COVID-19 vaccine, or caregiver intention to vaccinate if the child was not yet eligible for vaccination (i.e., COVID-19 vaccine was not yet available for the child's age group). The secondary outcome was influenza vaccine acceptance, defined as EHR-documented or caregiver-reported receipt of the influenza vaccine during the prior season (August 2020-May 2021, a period in which all patients were age-eligible). Influenza vaccine acceptance was not assessed for the 2021-2022 respiratory season. Vaccine hesitancy was defined as a PACV score of two or higher on the PACV-4 form, as previously validated.[14]

Analyses

Descriptive statistics were used to summarize caregiver and patient characteristics, survey responses, and COVID-19 and influenza vaccine acceptance. Bivariate associations between demographic and clinical variables, survey responses, and COVID-19 or influenza vaccine acceptance were examined using chi-square or Fisher's exact tests for categorical variables and t-tests for continuous variables. Multivariable logistic regression models were constructed to identify independent predictors of COVID-19 and influenza vaccine acceptance, adjusted for variables associated with the outcome at $P < 0.10$ in bivariate analysis. Older caregiver age was significantly associated with greater acceptance of the COVID-19 and influenza vaccine for the child and was adjusted for in both regression models for COVID-19 vaccine acceptance and influenza vaccination respectively. For the small group of out of state patients without EHR-documented vaccine status, caregiver report was used as the endpoint and a sensitivity analysis was performed. Analyses were conducted using Stata version 13.0 (StataCorp, College Station, TX) with significance set at $p<0.05$.

Results

Of 441 eligible caregivers, a total of 100 caregivers participated (response rate: 23%). Of participants, 88% were mothers and 64% held a college degree or higher. The children under their care were predominantly between the ages of 5 and 12 years, and the most common cancer diagnoses were leukemia or lymphoma at 64% (Table 1). Overall, 57% of caregivers were identified as vaccine hesitant.

COVID-19 Vaccine Acceptance

Of the 100 caregivers who participated, 71 (71%) accepted COVID-19 vaccination for their child with cancer. This included 49 (49%) whose child had an EHR-documented COVID-19 vaccine, 13 (13%) who reported that their child had received the vaccine, but lacked EHR documentation, and 9 (9%) who intended to vaccinate their child once age-eligible. Among all children, 88 (88%) had documentation of COVID-19 vaccination status available in the EHR. Of the 12 without EHR-documented vaccination status, 5

were from out of state, where immunization records may not have been fully integrated into the hospital's EHR system.

Certain caregiver beliefs were associated with COVID-19 vaccine acceptance (Table 2). Caregivers who expressed more worry about COVID-19 had higher odds of accepting the COVID-19 vaccine (AOR: 4.0, 95% CI: 1.5–10.3). Positive perceptions of the COVID-19 vaccine were among the strongest positive predictors: caregivers who believed the vaccine was effective (AOR: 21.3, 95% CI: 6.8–67.1) and safe (AOR: 65, 95% CI: 12.7–332.2) were significantly more likely to accept COVID-19 vaccine for their child. Conversely, caregiver vaccine hesitancy was associated with substantially lower odds of COVID-19 vaccine acceptance (AOR: 0.1, 95% CI: 0.03–0.4).

Certain caregiver and child characteristics and behaviors were associated with COVID-19 vaccine acceptance (Table 2). A diagnosis of leukemia or lymphoma was associated with higher odds of COVID-19 vaccine acceptance (AOR: 3.6, 95% CI: 1.4–9.3), while solid tumor diagnoses (AOR: 0.3, 95% CI: 0.1–0.9) were associated with lower acceptance. Caregivers were more likely to accept COVID-19 vaccination for their child if another household member had been vaccinated (AOR: 19.8, 95% CI: 3.7–104.4) or if they had accepted the influenza vaccine for their child in the 2020-2021 season (AOR: 4.5, 95% CI: 1.5–13.8).

Among caregivers who accepted the COVID-19 vaccine, the most cited reasons were protection of their child (65%) and return to normal activities (58%) and healthcare provider recommendation (56%) (Figure 1). Among caregivers who declined COVID-19 vaccination for their child, the most common reasons were concerns that the vaccine was too new (66%), concerns about vaccine safety (48%) and vaccine efficacy (38%). The majority of caregivers (88%) reported gathering information about the COVID-19 vaccine from healthcare providers, making this the most cited source of information. Other frequently reported sources included traditional media (56%) and family or friends (46%); only 24% reported gathering information from social media.

Influenza Vaccine Acceptance

Overall, 82 caregivers (82%) had accepted influence vaccine for their child with cancer in the 2020-2021 season). Of these, 64 (78%) had EHR-documented influenza vaccine receipt, while 18 (22%) only had caregiver reported receipt. Of the latter, 10 were from out of state.

Several attitudes and beliefs predicted influenza vaccine acceptance (Table 3). Caregivers who expressed worry about influenza illness (AOR: 5.6, 95% CI: 1.5–21.8) and who believed the influenza vaccine was important (AOR: 27.4, 95% CI: 6.9–108.8), effective (AOR: 3.8, 95% CI: 1.3–11.6), and safe (AOR: 6.5, 95% CI: 1.5–27.5) were significantly more likely to have accepted influenza vaccine for their child. No strong associations were observed between vaccine hesitancy, clinical diagnosis, or previous ICU admission and influenza vaccine acceptance.

Discussion

This study describes COVID-19 and influenza vaccine acceptance among caregivers of children with cancer at the time of introduction of COVID-19 vaccination in the pediatric population. COVID-19 vaccine acceptance was relatively high within the study population (71%). Influenza vaccine acceptance was slightly higher (82%) than for COVID-19, suggesting that some caregivers may be more familiar or comfortable with seasonal vaccines.

Comparing caregiver attitudes toward COVID-19 and influenza vaccination, our findings suggest both overlapping and distinct patterns in vaccine perceptions. Acceptance rates were high for both vaccines in the study population, and caregiver beliefs about vaccine safety and efficacy were strongly associated with acceptance in both cases. These findings are consistent with prior literature among pediatric oncology caregivers and mirror patterns seen in broader pediatric populations, underscoring the importance of these perceptions in shaping vaccine behavior.[3,15] Motivations for vaccination likely varied for COVID-19 and influenza as caregivers frequently cited return to normalcy and school or activity requirements as drivers for COVID-19 vaccination, factors less relevant to seasonal influenza. Our results also confirmed that caregiver concern about the COVID-19 pandemic's impact on their child's cancer significantly predicted vaccine acceptance. Previous research has also shown that heightened risk perception is a major motivator of vaccine acceptance, especially among caregivers of medically vulnerable children.[4]

These distinctions suggest that while some messaging strategies may be effective across both vaccines, tailored approaches may be needed to address the concerns associated with each particular vaccine. Importantly, prior receipt of the influenza vaccine was a significant predictor of COVID-19 vaccine acceptance, further illustrating how past vaccine behavior may inform future decision-making. This suggests that vaccine education efforts might benefit from building trust, by referencing previous positive vaccination experiences.

Despite the overall high rates of vaccine acceptance, 57% of caregivers were identified as vaccine hesitant. This is higher than what has been described previously in the general pediatric population, where rates of parental vaccine hesitancy generally range between 15% and 30%.[13,22] This disconnect suggests that hesitancy and behavior do not always align, and that caregivers may proceed with vaccination even in the context of concern. Several factors may help explain this pattern. For some caregivers, initial hesitancy may be mitigated by reassurance from trusted healthcare providers, particularly when clinicians address specific concerns about vaccine safety or necessity in the context of the child's immunocompromised status. Caregiver may also choose to vaccinate their child despite lingering doubts due to institutional requirements (e.g., school mandates) or a strong desire to resume normal activities, as shown by the survey responses in this population. Additionally, caregivers may weigh their concerns against a heightened perception of their child's vulnerability to severe illness, ultimately concluding that the benefits of vaccination outweigh the risks.

Even within the oncology population, significantly higher rates of COVID-19 vaccine acceptance were seen in leukemia and lymphoma patients compared to those with solid tumors. This could be due to greater perceived vulnerability to infection, more immunosuppressive treatment regimens, and more frequent healthcare encounters among hematologic cancer patients. These circumstances may have increased caregiver awareness of infection risks and opportunities for provider-driven vaccine counseling.

Healthcare providers were cited as the most trusted source of vaccine information, emphasizing their important role in influencing caregiver decision-making. Provider recommendations, especially when clear, confident, and personalized, can be a key drive of reducing vaccine hesitancy, especially with the rollout of new vaccines or policies.[23] This corresponds to previous findings that caregivers trust provider guidance more than governmental messaging, a dynamic that is particularly relevant during times of vaccine-related misinformation and politicization.[5]

The timing of this study also carries important implications. Data were collected during the spring of 2022, a period when public debate around COVID-19 vaccination was intense.[24] These conditions may have amplified safety concerns or politicized caregiver responses. However, the politicization of public health recommendations continues, exemplified by recent disagreements between vaccine advisory groups and US Food and Drug Administration decisions. These dynamics continue to shape caregiver trust and contribute to broader patterns of vaccine hesitancy. Also, during the study period, influenza activity was also unusually low due to pandemic-related mitigation measures.[25] This may have reduced caregiver perception of influenza risk and contributed to lower urgency around influenza vaccination, though vaccine acceptance remained high in this population.

Several limitations should be noted. The study was conducted at a single academic center with a highly educated caregiver sample, which may limit generalizability. Caregivers who chose to participate may differ from those who did not, introducing potential selection bias. Although we linked survey responses to available EHR data, we relied on caregiver reporting of vaccination status for some children. Thus, our findings may be subject to recall bias. Some of the children without EHR-documented vaccine status were from out of state, which may have limited our ability to fully capture their vaccination history due to cross-jurisdictional gaps in IIS integration with the EHR. This was a relatively small group of patients and there was no difference in findings on further sensitivity analysis. Additionally, the relatively small sample size limited power to detect more subtle associations or subgroup effects.

Despite these limitations, the study's strengths include its use of validated measures of vaccine hesitancy, its integration of EHR-documented vaccine administration, and its focus on a high-risk, understudied population. By linking caregiver beliefs to actual vaccine behaviors, this study adds to a growing body of evidence that can inform targeted communication strategies in pediatric oncology.

Conclusion

COVID-19 vaccine acceptance among caregivers of pediatric cancer patients was shaped by perceived safety, efficacy, prior vaccination behavior, and trust in healthcare providers. Although vaccine acceptance was high, significant levels of hesitancy persisted. Personalized discussions between families and their healthcare providers that address safety concerns and emphasize the protective benefits of vaccines are essential. Tailored messaging for COVID-19 and influenza vaccines should account for the unique barriers associated with each vaccine. Future multicenter studies should explore evolving caregiver attitudes in the context of changing public health risks, vaccine policies, and disease patterns.

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TABLE 1. Study Population Characteristics (n=100)

Category	% (n)
Patient Characteristics	
Age	
0–4 years	29 (29)
5–11 years	53 (53)
12–18 years	21 (21)
Sex: Male	65 (65)
Insurance	
Private	72 (72)
Public	28 (28)
Race/Ethnicity	
White	86 (86)
Asian	12 (12)
Native American/Alaska Native	6 (6)
Black/African American	1 (1)
Native Hawaiian/Pacific Islander	1 (1)
Other	5 (5)
Ethnicity: Hispanic/Latinx	13 (13)
Clinical Characteristics	
Leukemia/Lymphoma	66 (66)
Solid tumor/sarcoma	18 (18)
Brain cancer	10 (10)
Other oncologic diagnosis	4 (4)
ICU stay during cancer treatment	51 (51)
Caregiver Respondent Characteristics	
Relation to patient	
Mother	88 (88)
Father	11 (11)
Grandparent	1 (1)
Age	
25–34	21 (21)
35–44	52 (52)
45 and older	27 (27)
Highest level of education attained	
Did not answer	1 (1)
High school	8 (8)
Some college or 2-year degree	27 (27)
4-year degree	24 (24)
More than 4-year college degree	40 (40)
Preferred household language: English	92 (92)

TABLE 2. Factors associated with COVID-19 vaccine acceptance among caregivers of children with cancer

Category	n (%)	Accepted Vaccine n (%)[a]	Adjusted OR (95% CI)[b]
Sample			
	100 (100)	71 (71)	--
Attitudes			
I am worried about COVID-19. [c]	64 (64)	49 (76.6)	**4.0 (1.5–10.3)**
Patients who have cancer are more likely to get very sick from COVID-19 compared to people of similar age who do not have cancer. [c]	81 (81)	63 (77.8)	2.0 (0.7–6.1)
The COVID-19 vaccine does a good job of preventing COVID-19. [c]	73 (73)	64 (87.7)	**21.3 (6.8–67.1)**
The COVID-19 vaccine is safe. [c]	89 (89)	76 (85.4)	**65.0 (12.7–332.2)**
My child's cancer diagnosis has made me more likely to accept vaccines for my child. [c]	15 (15)	14 (93.3)	2.9 (0.6–14.6)
The COVID-19 pandemic has made me more concerned about my child's cancer diagnosis. [c]	40 (40)	29 (72.5)	1.6 (0.6–4.0)
Vaccine Behaviors			
A member of the child's household has had COVID-19.[d]	40 (40)	29 (72.5)	1.6 (0.6–4.0)
An additional household member has received the COVID-19 vaccine.[d]	88 (88)	67 (76.1)	**19.8 (3.7–104.4)**
Flu vaccine received in 2020-2021 season (EHR- documentation or parental report)	82 (82)	58 (70.7)	**4.5 (1.5–13.8)**
My child is up-to-date with recommended vaccinations.[d]	80 (80)	59 (73.8)	2.3 (0.8–7.2)
Vaccine Hesitancy [e]	57 (57)	32 (56.1)	**0.1 (0.0–0.4)**
Clinical Characteristics			
Leukemia/lymphoma	66 (66)	51 (77.3)	**3.6 (1.4–9.3)**
Brain tumor	10 (10)	7 (70)	0.8 (0.2–3.7)
Solid tumor/sarcoma	18 (18)	9 (50)	**0.3 (0.1–0.9)**
Other oncologic diagnosis	5 (5)	1 (20)	0.1 (0.0–1.4)
My child had an ICU stay during their cancer treatment.[d]	51 (51)	36 (70.6)	0.8 (0.3–2.1)

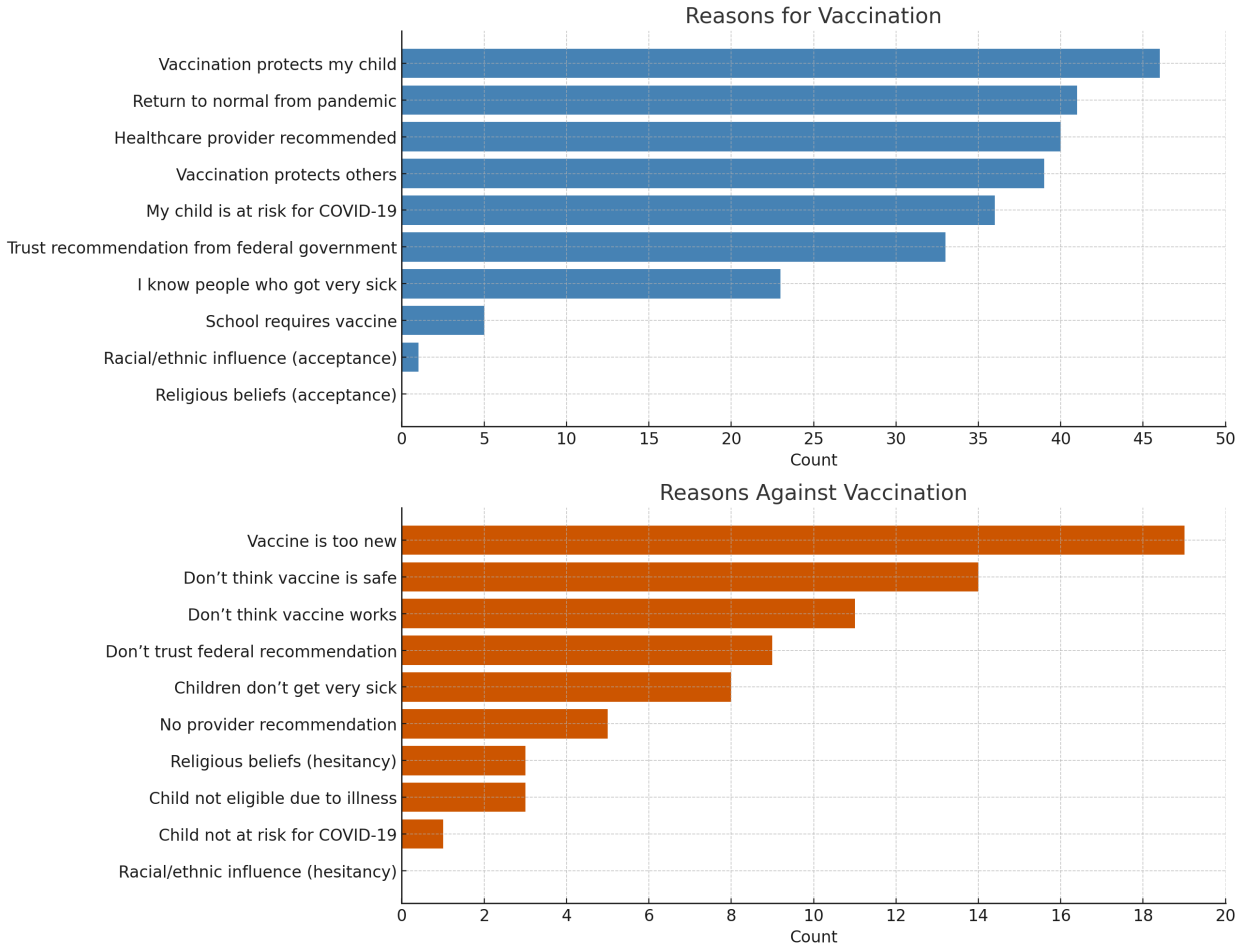
[a] % calculated among respective respondents to the particular question. [b] Model was adjusted for age of respondent. [c] Response option: 'Agree' or 'Strongly Agree' to statement (vs. 'Disagree' or 'Strongly Disagree'). [d] Response option: 'Yes' (vs. 'No' or 'Not Sure'). [e] Vaccine hesitancy calculated based upon responses to the validated short form of the Parent Attitudes about Childhood Vaccines (PACV) survey (4 items).

TABLE 3. Factors associated with influenza vaccine acceptance among caregivers of children with cancer

Category	n (%)	Accepted Vaccine n (%)[a]	Adjusted OR (95% CI)[b]
Sample	100 (100)	82 (82)	--
Attitudes			
I am worried about the flu. [c]	49 (49)	46 (93.9)	**5.6 (1.5–21.8)**
Getting the flu vaccine is important for my child's health. [c]	82 (82)	76 (92.7)	**27.4 (6.9–108.8)**
The flu vaccine does a good job of preventing the flu. [c]	73 (73)	64 (87.7)	**3.8 (1.3–11.6)**
The flu vaccine is safe. [c]	89 (89)	76 (85.4)	**6.5 (1.5–27.5)**
My child's cancer diagnosis has made me more likely to accept vaccines for my child. [c]	15 (15)	14 (93.3)	3.5 (0.4–29.6)
Vaccine Behaviors			
My child is up-to-date with recommended vaccinations [d]	80 (80)	68 (85)	2.2 (0.6–7.4)
Vaccine Hesitancy [e]	57 (57)	44 (77.2)	0.4 (0.1–1.4)
Clinical Characteristics			
Leukemia/lymphoma	66 (66)	57 (86.4)	2.1 (0.7–6.1)
Brain tumor	10 (10)	7 (70)	0.4 (0.1–1.9)
Solid tumor/sarcoma	18 (18)	14 (77.8)	0.8 (0.2–2.7)
Other oncologic diagnosis	5 (5)	3 (60)	0.5 (0.1–3.5)
My child had an ICU stay during cancer treatment [d]	51 (51)	42 (82.4)	0.9 (0.3–2.6)

[a] % calculated among respective respondents to the particular question. [b] Model was adjusted for age of respondent. [c] Response option: 'Agree' or 'Strongly Agree' to statement (vs. 'Disagree' or 'Strongly Disagree'). [d] Response option: 'Yes' (vs. 'No' or 'Not Sure'). [e] Vaccine hesitancy calculated based upon responses to the validated short form of the Parent Attitudes about Childhood Vaccines (PACV) survey (4 items).

Figure 1. Caregiver-reported reasons for accepting or declining COVID-19 vaccination for children with cancer



Note: Reasons for vaccination were reported only by caregivers had accepted the COVID-19 vaccine for their child. Reasons for not vaccinating were reported only by caregivers who did not accept the vaccine for their child.

Supplemental Materials

SA. Survey Instrument

First, we would like to ask some questions about COVID-19.

Q1. I am worried about COVID-19.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

Q2. Patients who have cancer are more likely to get very sick from COVID-19 compared to people of similar age who do not have cancer.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

Q3. Has anyone in your household had COVID-19?

☐ Yes ☐ No ☐ Not sure

Next, we would like to ask some questions about COVID-19 vaccination.

Q4. Getting the COVID-19 vaccine is important for my child's health.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

Q5. The COVID-19 vaccine does a good job of preventing COVID-19.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

Q6. The COVID-19 vaccine is safe.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

Q7. Has your child gotten at least one dose of a COVID-19 vaccine?

☐ Yes [ASK Q7A] ☐ No [ASK Q7B-Q7C] ☐ Not sure [SKIP TO Q8]

Q7a. Why did your child get the COVID-19 vaccine? *Select all that apply*.

☐ My child is at risk for COVID-19.
☐ I know people who have gotten very sick from COVID-19.
☐ COVID-19 vaccination will help protect my child.
☐ COVID-19 vaccination will help protect others.
☐ My child's healthcare provider recommended that he/she get the vaccine.
☐ My child's school is planning to require the vaccine for my child.
☐ It is the best way to return to normal from the pandemic.

☐ I trust the vaccine recommendations from the federal government.
☐ My racial and/or ethnic experiences influenced my decision to vaccinate my child.
☐ My religious beliefs influenced my decision to vaccinate my child.
☐ Other_____(*Specify*)

Q7b. Why has your child not gotten the COVID-19 vaccine? *Select all that apply.*
☐ My child is not eligible for COVID-19 vaccination due to his/her age. [ASK Q7C]
☐ My child is not eligible for COVID-19 vaccination due to his/her illness. [ASK Q7C]
☐ I don't think my child is at risk for COVID-19.
☐ I don't think children get very sick from COVID-19.
☐ I don't think the vaccine is safe.
☐ I don't think the vaccine works.
☐ I think the vaccine is too new.
☐ My child's healthcare provider has not recommended that he/she get the vaccine.
☐ I do not trust the vaccine recommendations from the federal government.
☐ My racial and/or ethnic experiences influenced my decision not to vaccinate my child.
☐ My religious beliefs influenced my decision not to vaccinate my child.
☐ Other_____(*Specify*)

Q7c. Do you plan to have your child get the COVID-19 vaccine when he/she is eligible?
☐ Yes ☐ No ☐ Not sure

Q8. Has anyone else in your household gotten the COVID-19 vaccine?
☐ Yes ☐ No ☐ Not sure

Q9. Where have you gathered information about the COVID-19 vaccine? *Select all that apply.*
☐ Healthcare provider ☐ Family or friends
☐ Television or newspapers ☐ Social media (Facebook, Twitter, etc.)
☐ Medical journals ☐ Other: _____ (*Specify*)
☐ Have not gathered information

Next, we would like to ask some questions about influenza ("flu") and flu vaccine.

Q10. I am worried about the flu.
☐ Strongly agree ☐ Agree ☐ Disagree
☐ Strongly disagree

Q11. Has the COVID-19 pandemic changed your worry about the flu?

☐ Yes, I am more worried about the flu.
☐ Yes, I am less worried about the flu.
☐ No, it has not changed my worry about the flu.

Q12. Getting the flu vaccine is important for my child's health.

☐ Strongly agree ☐ Agree ☐ Disagree
☐ Strongly disagree

Q13. The flu vaccine does a good job of preventing the flu.

☐ Strongly agree ☐ Agree ☐ Disagree
☐ Strongly disagree

Q14. The flu vaccine is safe.

☐ Strongly agree ☐ Agree ☐ Disagree
☐ Strongly disagree

Q15. Did your child receive a flu vaccine in the 2020-2021 season (August 2020-May 2021)?

☐ Yes ☐ No ☐ Unsure [SKIP TO Q17]

Q16. Did the COVID-19 pandemic change your mind about getting a flu vaccine for your child?

☐ Yes, it made me more likely to get the flu vaccine for my child.
☐ Yes, it made me less likely to get the flu vaccine for my child.
☐ No, it did not change my mind.

Next, we would like to ask some questions about shots in general.

Q17. Is your child up-to-date with recommended vaccinations?

☐ Yes ☐ No ☐ Not sure

Q18. Have you ever delayed having your child get a shot for reasons other than illness, allergy, or a recommendation from a cancer specialist?

☐ Yes ☐ No

Q19. Has your child ever had a serious reaction after getting a vaccine?

☐ Yes ☐ No ☐ Not sure

Q20. How concerned are you that a shot might not prevent the disease?

☐ Very concerned ☐ Somewhat concerned ☐ Not sure ☐ Not too concerned
☐ Not at all concerned

Q21. Overall, how hesitant about childhood shots would you consider yourself to be?

☐ Very hesitant ☐ Somewhat hesitant ☐ Not sure ☐ Not too hesitant
☐ Not at all hesitant

Q22. I trust the information I receive about shots.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly disagree

Q23. I am able to openly discuss my concerns about shots with my child's healthcare providers.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly disagree

Q24. All things considered, how much do you trust your child's healthcare providers? *Please answer on a scale of 0 to 10, where 0 is Do Not Trust At All and 10 is Completely Trust.*

$\square^{0}$ $\square^{1}$ $\square^{2}$ $\square^{3}$ $\square^{4}$ $\square^{5}$ $\square^{6}$ $\square^{7}$ $\square^{8}$ $\square^{9}$ $\square^{10}$

Next, we would like to ask some questions about your child and their health.

Q25. What category best describes your child's diagnosis?

☐ Leukemia/Lymphoma ☐ Brain cancer ☐ Primary bone cancer ☐ Neuroblastoma
☐ Other cancer _____ (Specify) ☐ None of the above [Skip to Q29]

Q26. Has your child's diagnosis changed your view on vaccines?

☐ Yes, it has made me more likely to accept vaccines for my child.
☐ Yes, it has made me more likely to decline vaccines for my child.
☐ No, it has not changed my view on vaccines.

Q27. Has the COVID-19 pandemic changed your concern about your child's cancer?

☐ Yes, I am more concerned about my child's cancer.
☐ Yes, I am less concerned about my child's cancer.
☐ No, it has not changed my concern about my child's cancer.

Q28. Has your child been admitted to the intensive care unit during their cancer treatment?

☐ Yes ☐ No

Finally, we would like to ask some general questions about yourself and your household. We hope to use this information to help provide equitable care and resources to patients and families regarding COVID-19 vaccination.

Q29. What is your relationship to the child?

☐ Mother ☐ Father ☐ Other _____ (Specify)

Q30. How old are you?

☐ 18-24 years ☐ 25-34 years ☐ 35-44 years ☐ 45 years or older

Q31. What is the highest level of education that you have completed?

☐ Some high school, but not a graduate ☐ High school graduate or GED

☐ Some college or 2-year degree ☐ 4-year college degree

☐ More than 4-year college degree

Q32. Are you Hispanic or Latinx?

☐ Yes ☐ No

Q33. What is your race? *Select all that apply.*

☐ American Indian or Alaska Native ☐ Asian

☐ Black or African American ☐ Native Hawaiian or Other Pacific Islander

☐ White ☐ Other _____ (*Specify*)

Q34. What language is spoken most often in the patient's household?

☐ English ☐ Spanish ☐ Other _____ (*Specify*)

_____

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