Influenza, SARS-CoV-2, and routine childhood vaccines – trends in vaccine hesitancy in hospitalized children before and during the COVID-19 pandemic

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BACKGROUND

- Following the COVID-19 pandemic, there has been a decline or delay in routine childhood immunizations in the US and globally.[1]
- According to the CDC, influenza vaccine coverage remains sub-optimal.
- Although almost 1 in 15 US parents are hesitant about routine childhood vaccines, more than 1 in 4 are hesitant about the influenza vaccine.[2]
- Vaccine hesitancy (VH) is adversely affecting the public health response to the COVID-19 pandemic.
- Throughout the COVID-19 pandemic, VH with respect to influenza, SARS-CoV-2, and routine childhood immunizations has changed.
- Vaccinating children in the inpatient setting is an important opportunity for children who are at high risk for complications.

PURPOSE

- We aimed to determine trends in vaccine hesitancy with respect to influenza, SARS-CoV-2, and routine childhood vaccines prior to and during the COVID-19 pandemic.

METHODS

- Cross-sectional survey-based study.
- Convenience sample of English- and Spanish-speaking primary caregivers of children aged 6 months – 18 years admitted to general inpatient pediatric services from:
  - December 11, 2019 to January 31, 2020 (S1)
  - December 8, 2020 to April 5, 2021 (S2)
  - November 30, 2021 to March 15, 2022 (S3)
- Caregivers were excluded if they did not speak English or Spanish, if they had already enrolled in the study, if their child was in Child Protective Services custody, and if they were SARS-CoV-2 positive or had a SARS-CoV-2 PCR pending in order to protect study personnel.
- A 21-item survey was designed by the study team based on content expertise and adaptations from existing literature. The survey then underwent a validation process prior to use.
- We assessed VH using the validated Parent Attitudes about Childhood Vaccine (PACV) survey.
- Responses were summarized by frequencies with proportions, and compared by study seasons using chi square. Analysis was completed using Stata v15.

RESULTS

- 948 and 944 caregivers completed the influenza survey and PACV, respectively
- 94%, 91%, and 91% of parents answered that their children were up-to-date with their vaccines not including the influenza vaccine in S1, S2, and S3, respectively
- 73%, 68%, and 71% of children received or were going to receive their influenza vaccine in S1, S2, and S3, respectively
- Parents were consistently scared of their child getting the SARS-CoV-2 vaccine but fewer (49% versus 38%) in S3
- Based on PACV score, 13% of parents were vaccine hesitant in S1 vs. 17% in S2 vs. 19% in S3 (p=0.16)
- Fewer parents thought that influenza can be a dangerous infection in children and that otherwise healthy children can die from the flu after the pandemic (p<0.01). Decreased concern persisted or did not recover during the pandemic

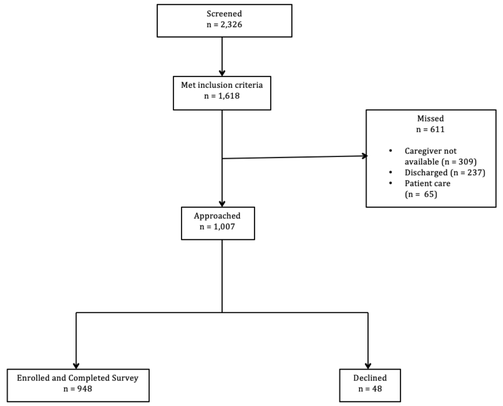

Fig 1: Participant flow chart from 2019-2022

Item	S1: 2019-2020 N (%) N = 269	S2: 2020-2021 N (%) N = 295	S3: 2021-2022 N (%) N = 384	p-value
Other than the flu shot, is your child up-to-date with all recommended immunizations?				
Yes	252 (93.7)	267 (90.5)	349 (90.9)	0.33
No/Unsure	17 (6.3)	28 (9.5)	35 (9.1)	
Has your child or will your child receive the influenza vaccine this season?				
Yes	197 (73.2)	199 (67.5)	271 (70.6)	0.60
No	52 (19.3)	67 (22.7)	76 (19.8)	
Unsure	20 (7.4)	29 (9.8)	37 (9.6)	
PACV score				
PACV score < 50	232 (86.6)	244 (83.0)	309 (80.9)	0.16
PACV score ≥ 50	36 (13.4)	50 (17.0)	73 (19.1)	

Table 1: Trends in routine immunizations, influenza vaccine uptake, and vaccine hesitancy

Characteristic	Total n (%) N = 948	S1: 2019-2020 N (%) N = 269	S2: 2020-2021 N (%) N = 295	S3: 2021-2022 N (%) N = 384	p-value
Reason for hospitalization[a]					
Pneumonia	90 (9)	39 (14)	12 (4)	39 (10)	**<0.01**
Asthma	66 (7)	23 (9)	10 (3)	33 (9)	**0.015**
Bronchiolitis	78 (8)	38 (14)	3 (1)	37 (10)	**<0.01**
Gastroenteritis	51 (5)	11 (4)	19 (6)	21 (5)	0.46
Other infection	417 (44)	127 (47)	126 (43)	164 (43)	0.45
Other non-infection	368 (39)	75 (28)	148 (50)	145 (38)	**<0.01**
Child age					
6-23 months	259 (27)	110 (42)	59 (20)	90 (23)	
24-59 months	152 (16)	29 (11)	39 (13)	84 (22)	**< 0.01**
5-18 years	532 (56)	125 (47)	197 (67)	210 (55)	
Household income					
$30,000 or less	369 (39)	108 (40)	113 (38)	148 (39)	
$30,001-50,000	164 (17)	38 (14)	67 (23)	59 (15)	0.12
$50,001-75,000	136 (14)	43 (16)	36 (12)	57 (15)	
$75,001 or more	275 (29)	79 (29)	78 (27)	118 (31)	
Race/ethnicity[a]					
White	335 (35)	99 (37)	107 (36)	129 (34)	0.65
Black or African American	185 (20)	55 (20	56 (19)	74 (19)	0.9
Hispanic/Latino	421 (44)	112 (42)	134 (45)	175 (46)	0.56
Asian	57 (6)	14 (5)	16 (5)	27 (7)	0.55
Native Hawaiian/ Pacific Islander	4 (0)	1 (0)	1 (0)	2 (1)	0.93
American Indian/ Alaska Native	11 (1)	4 (1)	2 (1)	5 (1)	0.63
Other	23 (2)	2 (1)	9 (3)	12 (3)	0.11

[a]Parents could select more than one answer choice, percentages might not add up to 100%

Table 2: Demographics of study population

Item	S2: 2020-2021 N (%) N = 295	S3: 2021-2022 N (%) N = 384	p-value
Have or will you receive the COVID-19 vaccine?			
Yes	146 (49.5)	274 (71.4)	**<0.01**
No/Unsure	149 (50.5)	110 (28.6)	
Did you receive the COVID-19 vaccine because it was mandated by your employer?			
Yes	-	34 (12.4)	
No	-	224 (81.8)	NA
Not applicable	-	16 (5.8)	
Has your child or will your child receive the SARS-CoV-2 vaccine?			
Yes	134 (45.4)	206 (53.6)	
No	81 (27.5)	104 (27.1)	**0.03**
Unsure	80 (27.1)	74 (19.3)	
I am scared of my child getting COVID-19.			
Strongly agree/agree	198 (67.1)	269 (70.1)	
I do not agree nor disagree	46 (15.6)	71 (18.5)	**0.08**
Strongly disagree/disagree	51 (17.3)	44 (11.5)	
I am scared of my child getting the COVID-19 vaccine.			
Strongly agree/agree	144 (48.8)	147 (38.3)	
I do not agree nor disagree	71 (24.1)	100 (26.0)	**0.02**
Strongly disagree/disagree	80 (27.1)	137 (35.7)	
The COVID-19 vaccine will play an important role in bringing the pandemic under control.			
Strongly agree/agree	171 (58.0)	210 (54.7)	
I do not agree nor disagree	86 (29.3)	126 (32.8)	0.59
Strongly disagree/disagree	38 (12.9)	48 (12.5)	

Table 3: Trends in caregiver attitudes regarding the COVID-19 pandemic and the SARS-CoV-2 vaccine

Item	S1: 2019-2020 N (%) N = 269	S2: 2020-2021 N (%) N = 295	S3: 2021-2022 N (%) N = 384	p-value
The flu can be a dangerous infection in children.				
Strongly agree/agree	226 (84.0)	209 (70.8)	270 (70.3)	
I do not agree nor disagree	28 (10.4)	65 (22.0)	75 (19.5)	**<0.01**
Strongly disagree/disagree	15 (5.6)	21 (7.1)	39 (10.2)	
I am scared of my child getting the flu.				
Strongly agree/agree	192 (71.4)	158 (53.6)	224 (58.3)	
I do not agree nor disagree	38 (14.1)	71 (24.1)	64 (16.7)	**<0.01**
Strongly disagree/disagree	39 (14.5)	66 (22.4)	96 (25.0)	
Children who are otherwise healthy can die from the flu.				
Strongly agree/agree	181 (67.3)	139 (47.1)	209 (54.4)	
I do not agree nor disagree	65 (24.2)	106 (35.9)	121 (31.5)	**<0.01**
Strongly disagree/disagree	23 (8.6)	50 (16.9)	54 (14.1)	
All children over 6 months of age should receive the flu shot every year.				
Strongly agree/agree	167 (62.1)	139 (47.1)	184 (47.9)	
I do not agree nor disagree	70 (26.0)	95 (32.2)	146 (38.0)	**<0.01**
Strongly disagree/disagree	32 (11.9)	61 (20.7)	54 (14.1)	
Children should get the flu shot in the hospital before they are discharged home.				
Strongly agree/agree	116 (43.1)	92 (31.2)	116 (30.2)	
I do not agree nor disagree	100 (37.2)	115 (39.0)	160 (41.7)	**<0.01**
Strongly disagree/disagree	53 (19.7)	88 (29.8)	108 (28.1)	
The flu shot does not work.				
Strongly agree/agree	33 (12.3)	31 (10.5)	37 (9.6)	
I do not agree nor disagree	98 (36.4)	112 (38.0)	130 (33.9)	0.56
Strongly disagree/disagree	138 (51.3)	152 (51.5)	217 (56.5)	
You can get the flu from the flu shot.				
Strongly agree/agree	96 (35.7)	106 (35.9)	112 (29.2)	
I do not agree nor disagree	87 (32.3)	100 (33.9)	127 (33.1)	0.17
Strongly disagree/disagree	86 (32.0)	89 (30.2)	145 (37.8)	

Table 4. Comparison of attitudes and knowledge regarding the influenza vaccine, S1 versus S2 versus S3

CONCLUSION

- Influenza vaccine uptake continues to be lower compared to routine childhood vaccines.
- During the COVID-19 pandemic, caregivers were less concerned about influenza than pre-pandemic. Misinformation about influenza and influenza vaccine persisted.
- Despite decreased fear in getting the vaccine, only slightly more than half of parents report vaccinating or intention to vaccinate their child against COVID-19 in 2021-2022.
- Our results suggest that VH in general may be increasing.
- Increased efforts, with strategies unique to the influenza and SARS-CoV-2 vaccines, are needed to increase immunization uptake.

REFERENCES

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