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## Telemedicine utilization by pediatric ophthalmologists during the COVID-19 pandemic

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**Understanding provider perspectives on telemedicine adoption during the COVID-19 pandemic can help inform best practices for delivering pediatric ophthalmic care safely and remotely. In this online survey distributed to two national pediatric ophthalmology list-servs, respondents in July-August 2020 (n = 104) compared with respondents in March-April 2020 (n = 171) were more likely to report not using and not planning on using telemedicine. The July-August respondents who did not use telemedicine were concerned about the limitations in care provided, challenges with implementation, and perceived negative effects on the doctor-patient relationship. These findings demonstrate a lack of sustained uptake of telemedicine in the first 6 months of the pandemic and concerns that should be addressed to facilitate integration of this approach in pediatric ophthalmic care.**



The onset of the COVID-19 pandemic during late 2019 prompted widespread stay-at-home orders and public health guidance urging telehealth over in-person visits.<sup>1,2</sup> In response to the pandemic, many ophthalmology providers limited in-person ophthalmic care to urgent visits and increased telemedicine options during spring 2020, with gradual resumption of elective care beginning in July 2020.<sup>3,4</sup> While telemedicine is not new in ophthalmology,<sup>5</sup> the pandemic created a need for widespread, immediate adoption across all ophthalmic specialties, including pediatric ophthalmology. Modifications in prior licensing restrictions and insurance coverage requirements<sup>3,4,6</sup> were intended to facilitate uptake of telemedicine; however, telemedicine utilization in ophthalmology during the pandemic is not well researched. This

study aimed to compare telemedicine utilization among pediatric ophthalmologists in the United States between two time points during the COVID-19 pandemic (March-April 2020 and July-August 2020).

### Methods

This study received approval from the Johns Hopkins University School of Medicine Institutional Review Board and adhered to the guidelines of the Declarations of Helsinki.

### Survey

An online survey (Qualtrics XM, Provo, UT) regarding telemedicine practice patterns was developed and distributed via two national pediatric ophthalmology list-servs. Pediatric ophthalmologists working in the United States were invited to complete the survey. The survey was conducted at two time points: March 23 to April 2, 2020, and July 30 to August 14, 2020, which corresponded with widespread office shutdowns (March survey) and with easing of stay-at-home restrictions and resumption of in-person office visits (July survey).

Demographic and practice characteristics assessed include age, gender, state of practice, practice type (academic, private, other), geographic patient composition, and pre-pandemic clinic volume. The primary outcome was telemedicine utilization at the time of survey completion; respondents selected from four choices: (1) "Yes," (2) "No, and I do not plan to," (3) "No, but I am making plans to," and (4) "Unsure." In the July survey, respondents who did not report current telemedicine use were presented an open-ended question eliciting reasons for non-utilization.

### Statistical and Qualitative Analysis

The Fisher exact test was used to compare characteristics between March and July respondents. Univariable and multivariable multinomial logistic regression models were used to examine the association between characteristics and the usage of telemedicine, expressed as relative risk (RR) ratios. Covariates were included in the adjusted models at a threshold of  $P < 0.25$ . All analyses were conducted using Stata/SE 15.1 (StataCorp, College Station, TX). Significance level was set at  $P < 0.05$ .

Qualitative analysis was performed on the free text answering why July respondents did not use telemedicine. Two researchers independently coded the responses and refined the codebook through iterative discussion. Themes and subthemes regarding the reason for not using telemedicine were developed through inductive thematic analysis and tabulated.

### Results

Of 353 surveys, we excluded 60 responses (17%) with incomplete data, and 1 (0.3%) that did not indicate respondent profession; 3 (0.8%) orthoptists, and 14 (4%) international members or those who practiced outside of the United States were also excluded. A total of 171 March survey responses and 104 July responses were analyzed.

On average, respondents were  $51 \pm 11$  years of age (mean and standard deviation); 148 respondents (54%) identified as female. Most respondents, representing all

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Table 1. Multinomial logistic regression for telemedicine utilization for all March-April 2020 and July-August 2020 respondents (n = 275)<sup>a</sup>

Outcome <sup>b</sup>	Characteristic	Univariable		Multivariable	
		RR ratio (95% CI)	P value	RR ratio (95% CI)	P value
No, and I do not plan to use telemedicine	Female (vs not)	0.96 (0.51-1.82)	0.91		
	Age (years)				
	30-40	Ref		Ref	
	40-50	1.65 (0.47-5.79)	0.44	0.96 (0.21-4.54)	0.96
	50-60	3.75 (1.18-11.94)	0.03	2.56 (0.65-10.05)	0.18
	60-70	2.06 (0.59-7.19)	0.26	1.96 (0.44-8.70)	0.38
	>70	1.35 (0.12-14.73)	0.81	1.16 (0.07-19.98)	0.92
	Practice region <sup>c</sup>				
	Northeast	Ref		Ref	
	Midwest	0.87 (0.31-2.46)	0.79	1.67 (0.46-6.03)	0.43
	South	1.11 (0.51-2.39)	0.80	2.77 (1.03-7.47)	0.04
	West	0.26 (0.08-0.85)	0.03	0.32 (0.09-1.21)	0.09
	Practice type				
	Private	1.99 (0.97-4.10)	0.06	2.31 (0.87-6.16)	0.09
	Academic	Ref		Ref	
	Other	1.83 (0.56-6.04)	0.32	3.46 (0.74-16.06)	0.11
	Patient location				
	% Primary state	1.02 (1.00-1.04)	0.08	1.08 (0.90-1.29)	0.43
	% Adjacent state	0.98 (0.96-1.01)	0.15	1.07 (0.88-1.29)	0.52
	% Other state	0.87 (0.76-1.00)	0.05	Omitted	
No, but I am making plans to use telemedicine	Pre-COVID average daily patient volume	1.02 (0.99-1.05)	0.24	1.02 (0.98-1.06)	0.42
	July vs March respondents	8.66 (3.81-19.70)	<0.001	11.59 (4.53-29.65)	<0.001
	Female (vs not)	1.09 (0.61-1.95)	0.77		
	Age (years)				
	30-40	Ref		Ref	
	40-50	0.73 (0.33-1.63)	0.45	0.79 (0.31-1.96)	0.61
	50-60	0.50 (0.22-1.15)	0.10	0.70 (0.26-1.86)	0.48
	60-70	0.46 (0.19-1.13)	0.09	0.50 (0.18-1.40)	0.19
	>70	0.60 (0.10-3.44)	0.57	0.45 (0.06-3.15)	0.42
	Practice region <sup>c</sup>				
	Northeast	Ref		Ref	
	Midwest	2.63 (1.06-6.53)	0.04	2.20 (0.78-6.19)	0.14
	South	1.44 (0.65-3.23)	0.37	0.99 (0.40-2.44)	0.98
	West	1.06 (0.43-2.60)	0.91	0.93 (0.34-2.55)	0.89
	Practice type				
	Private	0.81 (0.45-1.47)	0.49	0.86 (0.41-1.83)	0.70
	Academic	Ref		Ref	
	Other	0.46 (0.12-1.74)	0.25	0.47 (0.11-2.01)	0.31
	Patient location				
	% Primary state	0.99 (0.98-1.00)	0.14	1.03 (0.96-1.11)	0.38
	% Adjacent state	1.01 (1.00-1.02)	0.10	1.04 (0.97-1.13)	0.28
	% Other state	0.99 (0.93-1.04)	0.66	Omitted	
	Pre-COVID average daily patient volume	0.98 (0.96-1.02)	0.33	0.97 (0.94-1.01)	0.15
	July vs March respondents	0.05 (0.01-0.21)	<0.001	0.05 (0.01-0.20)	<0.001

CI, confidence interval; RR, relative risk.

<sup>a</sup>Covariates included at level  $P < 0.25$ .<sup>b</sup>"Unsure" excluded due to small cell sizes.<sup>c</sup>Other territories excluded due to small number (n = 2).

United States regions, reported working in either private practice (n = 148 [54%]) or academic medical centers (n = 106 [39%]). Other than slight differences in patient geographic composition, there were no significant differences between March and July respondent characteristics (eTable 1).

### Telemedicine Utilization

In the March survey, 121 respondents (71%) reported institutional guidelines for telemedicine utilization, 32

(19%) reported none, and 18 (11%) were unsure. In the July survey, 75 (72%) indicated that their institution had guidelines, 26 (25%) reported no guidelines, and 3 (3%) were unsure.

Of the March respondents, 95 (56%) reported "Yes" to using telemedicine, 8 (5%) responded "No, and I do not plan to," 64 (37%) reported "No, but I am making plans to," and 4 (2%) were unsure. In the July survey, 59 (57%) responded "Yes," 43 (41%) responded "No, and I do not plan to," and 2 (2%) responded "No, but I am making plans

to.” On univariable analysis, July respondents had 8.66 (95% CI: 3.81-19.70) times higher risk of responding “No, and I do not plan to” relative to “Yes,” compared with March respondents ( $P < 0.001$ ). Additionally, July respondents were much less likely to respond “No, but I am making plans to” relative to “Yes,” compared with March respondents (RR ratio = 0.05; 95% CI: 0.01-0.21;  $P < 0.001$ ). These results remained significant after adjustment in a multivariable model. See [Table 1](#).

Of 45 July respondents who were not using telemedicine, the majority did not wish to use or continue telemedicine. Commonly reported reasons included limitations in the quality of the examination/visit, technical challenges, time inefficiencies, perceived negative effects on the doctor-patient relationship, and low interest from staff and patients ([eSupplement 1](#), available at [jaapos.org](http://jaapos.org)). Others reported no longer needing to use telemedicine, because they could return to seeing patients in person upon adopting new safety precautions.

## Discussion

This study demonstrated that, as time passed in the pandemic and practices were able to resume in-person visits, pediatric ophthalmologists were dramatically less likely to use telemedicine. Although many had tried telemedicine, the reported inferior quality of the examination was a major reason for discontinuing its use. These results are consistent with studies before the pandemic showing low confidence by ophthalmologists in providing remote ophthalmic care with telemedicine<sup>7</sup> and low telemedicine adoption in ophthalmology relative to other specialties during the pandemic.<sup>8</sup> Waivers instituted during the pandemic addressed some previously identified barriers to using telemedicine in ophthalmology (eg, reimbursement)<sup>5,6</sup>; nevertheless, ophthalmologists in our study still expressed low confidence in providing quality care through telemedicine, challenges in implementation, and barriers to doctor-patient relationships. Because virtual options will likely remain important as the pandemic continues to ebb and flow, more work is needed to better integrate telemedicine for remote ophthalmic care and to learn from existing models of teleophthalmology.<sup>9,10</sup>

This study was limited by the low response rate. We could not ascertain whether respondents overlapped in

the two surveys. Additionally, only the July survey contained the open-ended question about reasons for non-utilization. Nevertheless, we were able to gather responses from diverse practices across the United States at two different time points that generally coincided with practice shutdowns and reopenings. The qualitative results from July respondents who were less likely to use telemedicine can inform further research investigating provider attitudes and adaptations to telemedicine during a pandemic or other clinical shutdowns.

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## Supplementary Data

### eSupplement 1

eTable 1. Demographics and practice characteristics of March-April 2020 and July-August 2020 respondents

Characteristic	March respondents (n = 171)	July respondents (n = 104)	P value <sup>b</sup>
Age years, mean ± SD	50 ± 11	52 ± 10	0.12
30-39, no. (%)	35 (20)	14 (13)	0.06
40-49, no. (%)	51 (30)	21 (20)	
50-59, no. (%)	44 (26)	43 (41)	
60-69, no. (%)	35 (20)	23 (22)	
70-79, no. (%)	6 (4)	3 (3)	
Sex, no. (% female)	94 (55)	54 (52)	0.60
Practice region, <sup>a</sup> no. (%)			0.24
Northeast	34 (20)	32 (31)	
Midwest	31 (18)	14 (13)	
South	70 (41)	35 (34)	
West	35 (20)	22 (22)	
Other US territories	1 (1)	1 (1)	
Practice type, no. (%)			0.08
Academic	67 (39)	39 (38)	
Private	92 (54)	56 (54)	
Other (including both academic and private)	12 (7)	9 (9)	
Patient location (%), mean ± SD			
Primary state	81 ± 28	87 ± 18	0.04 <sup>c</sup>
Adjacent state	16.5 ± 26	12 ± 17	0.08 <sup>c</sup>
Other state	2.5 ± 6.5	1.4 ± 2.5	0.05 <sup>c</sup>
Pre-COVID-19 average daily patient volume per ophthalmologist, median (IQR)	30 (24,35)	30 (24,36)	0.88 <sup>c</sup>

IQR, interquartile range; SD, standard deviation.

<sup>a</sup>States grouped into regions using the US Census categorizations.

<sup>b</sup>Using *t*-test or Fisher exact test.

<sup>c</sup>Using unequal variance as indicated.