Pre-Surgical COVID-19 Incidence in Relation to Public Health Initiatives and Community Perceptions

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Introduction

The absolute impact of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 pandemic upon healthcare facilities across the United States may take years to quantify (if even possible), and organizational or regional comparisons, in terms of preventive and remedial efficiencies, would be inequitable. Given the increasing prevalence of COVID-19, and in compliance with governmental directives at that time, the Shriners Hospitals for Children (SHC; an organization dedicated to provide care for children regardless of the family's ability to pay) ceased elective surgeries between March and May 2020. As surgical services resumed in mid-May, preadmission testing for COVID-19 was required of all patients scheduled for elective outpatient or inpatient surgery. Testing for COVID-19 served to ensure that the health of patients presenting for elective procedures was optimal and to prevent suffering from both the viral infection and added stress of a surgical procedure, which may have led to unforeseen negative outcomes. Furthermore, testing also safeguarded the wellbeing of the healthcare team providing care to these patients. Patients who tested positive had their surgeries rescheduled for a later date in accordance with mandated precautions put forth by the Centers for Disease Control and Prevention (CDC).

During this time, media reports were robust with accounts of regional disparities in the prevalence of COVID-19, as well as the public implementation of and personal adherence to COVID-19 restrictions in communities across the United States. To further understand regional variation in infection control measures, and best care practices and the health of the pediatric patients served within the SHC system, the incidence of COVID-19 was assessed with data from 10 Shriners hospitals.

Pre-Surgical COVID-19 Testing

The electronic medical records of patients who were tested for COVID-19 (with test results recorded) and scheduled for elective surgery between May 18 to July 22, 2020 (10 weeks) were reviewed. During this time frame, the alpha variant was the predominant, if not the only, variant circulating,[1] and vaccination approval would not occur until August 2021,[2] with vaccination for children to follow in October 2021.[3] Data elements extracted included age; sex; race; ethnicity; COVID-19 test date, type, and result; type of surgery; and COVID-19-related symptoms (ie, if positive test result). Statistical analysis including chi-square, Fisher's exact, and Wilcoxon rank sum test with statistical significance set at $P<.05$ (two-sided) was performed using SAS software version 9.4 (SAS Institute Inc, Cary, NC).

A total of 1281 patients were tested for COVID-19 and scheduled for elective surgery during the 10-week review period, with 1269 (99.1%) testing negative and 12 (0.9%) testing positive. Of these 12, 7 were from Shriners hospitals located in the western region (Honolulu, Pasadena, and Portland), 3 from the central region (Chicago, Salt Lake, Shreveport, and Texas), and 2 from the eastern region (Ohio, Philadelphia, and Springfield). There were no COVID-19-related symptoms observed or reported for any patients tested. All positive results were considered asymptomatic cases, which, in turn, were potential sources of infectivity. Table 1 presents demographic information and descriptive statistics for the patient sample and by region.

There appeared to be an association between region and COVID-19 test result between the western and central regions (odds ratio 3.9, 95% confidence interval 1.0001 to 15.1; relative risk 3.8, 95% confidence interval 0.99 to 14.8) but it did not reach the level of statistical significance. Other regional comparisons between the west and east, and central and east were not significant (see Table 2). Sex, race, or ethnicity was not associated with COVID-19 test result, and patients who tested positive versus negative were not significantly different in terms of age.

Table 1. Demographic Information and Descriptive Statistics of the Pediatric Patient Sample by Region												
	Overall (N=1281)			**Western Region (N=380)**			**Central Region (N=625)**			**Eastern Region (N=276)**		
Age (years; mean, st. dev., range)	10.3	5.5	0 to 22.5	9.8	5.5	0.13 to 21	10.6	5.5	0 to 22.5	10.5	5.5	0 to 22
Sex	**n**	**%**		**n**	**%**		**n**	**%**		**n**	**%**	
Female	653	51		197	51.8		319	51		137	49.6	
Male	628	49		183	48.2		306	49		139	50.4	
Race	**n**	**%**		**n**	**%**		**n**	**%**		**n**	**%**	
American Indian or Alaska Native	12	0.9		7	1.8		3	0.5		2	0.7	
Asian	135	10.5		87	22.9		31	5		17	6.2	
Black or African American	113	8.8		8	2.1		73	11.7		32	11.6	
Native Hawaiian/Other Pacific Islander	56	4.4		53	14		2	0.3		1	0.4	
White	732	57.1		182	47.9		382	61.1		168	60.9	
Declined	14	1.1		-	-		-	-		14	5.1	
Multiple	11	0.9		2	0.5		5	0.8		4	1.5	
Other	59	4.6		12	3.2		16	2.6		31	11.2	
Unknown	149	11.6		29	7.6		113	18.1		7	2.5	
Ethnicity (missing=1)	**n**	**%**		**n**	**%**		**n**	**%**		**n**	**%**	
Hispanic Latino	222	17.3		71	18.7		120	19.2		31	11.3	
Non-Hispanic Latino	874	68.3		268	70.5		400	64		206	74.9	
Declined	11	0.9		-	-		-	-		11	4	
Multiple	1	0.1		-	-		1	0.2		-	-	
Other	51	4		7	1.8		30	4.8		14	5.1	
Unknown	121	9.5		34	9.00		74	12		13	4.7	
Surgery Type	**n**	**%**		**n**	**%**		**n**	**%**		**n**	**%**	
Cleft lip/palate	107	8.4		9	2.4		88	14.1		10	3.6	
Dental	89	7		75	19.7		12	1.9		2	0.7	
Neurologic	2	0.2		-	-		-	-		2	0.7	
Orthopedic	950	74.2		274	72.1		488	78.1		188	68.1	
Physical Medicine & Rehabilitation (PM&R)	6	0.5		-	-		-	-		6	2.2	
Plastic	68	5.3		4	1.1		-	-		64	23.2	
Urologic	4	0.3		-	-		-	-		4	1.5	
Other	55	4.3		18	4.7		37	5.9		-	-	
COVID-19 Testing	**n**	**%**		**n**	**%**		**n**	**%**		**n**	**%**	
Type												
In-vitro diagnostic	1	0.1		-	-		-	-		1	0.4	
Isothermal nucleic acid amplification	253	19.8		-	-		177	28.3		76	27.5	
Nasopharyngeal swab/washing	164	12.8		-	-		-	-		164	59.4	
Polymerase chain reaction (PCR)	699	54.6		305	49		305	48.8		14	5.1	
Rapid COVID amplified probe	18	1.4		-	-		-	-		18	6.5	
Not listed	2	0.2		-	-		-	-		2	0.7	
Other	143	11.2		-	-		143	22.9		-	-	
Unspecified	1	0.1		-	-		-	-		1	0.4	

Table 1. Demographic Information and Descriptive Statistics of the Pediatric Patient Sample by Region (continued)												
	Overall (N=1281)			Western Region (N=380)			Central Region (N=625)			Eastern Region (N=276)		
	n	%		n	%		n	%		n	%	
Result												
Negative	1269	99.1		373	98.2		622	99.5		274	99.3	
Positive	12	0.9		7	1.8		3	0.5		2	0.7	
Symptoms												
No	1281	100		380	100		625	100		276	100	
Yes	0	0		0	0		0	0		0	0	

Data: electronic Medical Records from 10 Shriners Hospitals for Children hospitals.

Table 2. Regional Variation in Positive COVID-19 Test Results				
Region	Test Result		Total	
	Positive	Negative		
West (vs Central)				Fisher's exact test (two-sided) *P* = .048
Yes	7 (70)	373 (37.5)		OR: 3.8910; 95% CI: 1.0001 to 15.1385
No	3 (30)	622 (62.5)		RR (C1): 3.8377; 95% CI: 0.9984 to 14.7517
	10	995	1005	RR (C2): 0.9863; 95% CI: 0.9718 to 1.0010
West (vs East)				Fisher's exact test (two-sided) *P* = .50
Yes	7 (77.8)	412 (63.7)		OR: 1.9964; 95% CI: 0.4114 to 9.6885
No	2 (22.2)	235 (36.3)		RR (C1): 1.9797; 95% CI: 0.4146 to 9.4529
	9	647	656	RR (C2): 0.9917; 95% CI: 0.9748 to 1.0088
Central (vs East)				Fisher's exact test (two-sided) *P* = .64
Yes	3 (60)	623 (69.4)		OR: 0.6597; 95% CI: 0.1096 to 3.9704
No	2 (40)	274 (30.6)		RR (C1): 0.6613; 95% CI: 0.1111 to 3.9357
	5	897	902	RR (C2): 1.0025; 95% CI: 0.9911 to 1.0140

Conclusion

Previous studies involving other children's hospitals in the United States reported geographical variability in the prevalence of COVID-19 (ie, east higher than west[4]), and a pooled prevalence of 0.65%, during comparable timeframes. [5] The overall (0.9%), western (1.8%; 7/380) and eastern (0.7%; 2/276) regional incidence rates indicated that COVID-19 was slightly higher within this SHC pediatric population and regional variability was reversed compared to other studies (ie, west higher than east [and central]). In addition, patients in the western (versus central) region were more than 3 times as likely to have tested positive. This particular finding could simply be reflective of the region(s) examined during that specific time, but not indicative of regional invariability concerning COVID-19 as reflected by differing results that were observed as compared to prior studies.

From a public health perspective, civic responses to COVID-19 ranged along a proactive-passive continuum (ie, variable adherence to public policies such as sheltering in place, mask mandates, limited gathering sizes, and such[6]), which corresponded with varying rates of COVID-19 between United States communities. This development was unfortunate when considered within the control and prevention milieu needed to slow this pandemic (ie, higher compliance with public health mandates had the potential to decrease COVID-19 spread). However, the overall 0.9% positivity rate found across 10 Shriners hospitals was comparable with that reported among other pediatric hospitals,[4,5] and supported the relative efficacy of public health initiatives enacted in response to COVID-19 within the regions assessed. The effectiveness of public health measures in limiting the prevalence of COVID-19 depended upon a local community's acceptance and compliance, which, in turn, seemingly differed as well. Moreover, the low regional incidence rates highlighted the similarity of infectivity among SHC's, and other pediatric, patients despite demographic differences (eg, race or socioeconomic status, which was deemed significant by other studies).[4-7]

This study's primary limitation concerns the retrospective collection of data from medical records, which was performed by different individuals at 10 Shriners hospitals. Although medical

records were maintained within the same electronic system, data integrity depended on the quality of documentation both into and from them. However, the data elements of interest were standardized entries and/or accessible via scanned documents within the medical records. The pediatric patients included in this review may not fully represent the general pediatric population, which limits the generalizability of findings, for example, to those who were scheduled for elective (vs. urgent) surgery and with comparable demographic characteristics. In addition, although COVID-19 testing methodology varied within and between regions (eg, data heterogeneity), the respective precision of the different testing methods supported data integrity.

Given that the prevalence of COVID-19 appears to be low in this SHC pediatric population, pre-surgical testing seems to be an effective tool in identifying (a)symptomatic incidence. This routine practice allows for the optimization of these patients' health prior to surgery, and helps to protect their families, patient peers, and hospital staff against COVID-19 infection. Institutional efficacy and patient well-being are thereby advanced with having direct knowledge of hospital-specific COVID-19 incidence and regional prevalence rates (versus estimates), which can be weighed alongside publicly available databases (eg, state or county government, or John Hopkins University), and in conjunction with current public health initiatives in order to help determine effective policy with regards to hospital operations during the pandemic.

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