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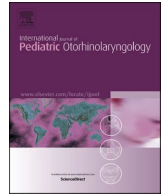
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## International Journal of Pediatric Otorhinolaryngology

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# Changes to the practice of pediatric otolaryngology as a consequence of the COVID-19 pandemic

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## ABSTRACT

**Background:** The COVID-19 pandemic has shifted medical practice globally. The objective of this study was to examine the changes to the practice of pediatric otolaryngology internationally due to the COVID-19 pandemic and examine potential contributors.

**Method:** An online survey was designed to assess practice demographics, patterns of COVID-19 related restrictions in communities, and changes to practice and referrals. This was disseminated via an international Covid-19 WhatsApp™ group of pediatric otolaryngologists.

**Results:** There were 45 respondents of 177 group members (25.4%) from 15 countries. The mean estimated time spent under strictest lockdown measures was 16.2 ( $\pm 10.7$ ) weeks (range: 1–45 weeks). Operating room time was reduced for 82.9%, with an average reported reduction of 41.5%. Almost all (>75%) of respondents reported reduced referrals for five common conditions: otitis media with effusion (average reported decrease – 56.1%); acute otitis media (average decrease 62.8%); acute mastoiditis (average decrease 66.6%); recurrent pharyngotonsillitis (average decrease 51.0%); and peritonsillar abscess (average decrease 52.1%). COVID-19 cases per million population significantly influenced the acuity of referrals received ( $p < .05$ ). No conditions were reported as increased in frequency and the acuity of most conditions was reported as unchanged by the majority of respondents.

**Conclusion:** The measures taken to reduce the spread of COVID-19 have resulted in many changes to pediatric otolaryngology practice and the referral patterns of common conditions. Some of these changes may have enduring sequelae.

## 1. Introduction

The outbreak of coronavirus disease 2019 (COVID-19) in December 2019, has been declared a public health emergency of international concern by the World Health Organization (WHO) [1]. Since then, new variants have been identified with an increasing need to consolidate global efforts and curb viral transmission [2]. The COVID-19 pandemic has led to unprecedented changes across the world in all aspects of life.

Resounding changes to medical practice due to the pandemic have been noted worldwide. Numerous studies have reported practice changes to specialties such as urology, rheumatology, interventional

radiology, ophthalmology, and psychiatry [3–7]. Otolaryngology is a high-risk specialty as it requires close contact with upper respiratory tract mucous, secretions, droplets and aerosols during procedures and surgery [8]. Therefore, infection prevention and control measures for this specialty are essential [8]. Indeed, a global survey of pediatric otolaryngologists regarding access and usage of personal protective equipment (PPE) during the pandemic demonstrated notable shifts from the pre-pandemic era [9]. Compared to pre-pandemic usage of surgical masks during low-risk procedures, respondents chose N95 masks as the most prevalent form of PPE, regardless of aerosol generating risk [9]. In addition to operational changes cited in the literature, disease

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presentation during the pandemic has also seen changes. For instance, a study based in Italy, analyzed patient flow at the pediatric emergency department during lockdown and found an overall decrease in patients and a significant decrease in non-complicated acute otitis media presentations [10].

In the pediatric population, few studies have been conducted on practices and management of COVID-19 [11]. Specifically, there is a paucity of literature regarding practice changes in paediatric otolaryngology due to the COVID-19 pandemic. As with adults, the practice of paediatric otolaryngology involves examining and operating in anatomical locations with high levels of aerosol generation and transmission of COVID-19 to treating clinicians, especially from the asymptomatic patient populations, including children [12]. Precautionary measures include assuming patients are suspected COVID-19 cases until proven otherwise, PPE, and changes to procedural principles to prioritize urgent cases for high-risk procedures such as intubation [12]. The objective of this study was to examine changes to the practice of pediatric otolaryngology internationally due to the COVID-19 pandemic, examine potential contributors, and forecast lasting changes.

## 2. Materials and methods

### 2.1. Survey development

A questionnaire consisting of 31 items was developed by the study authors to capture the impact of the COVID-19 pandemic on the international practice of pediatric otolaryngology, referral patterns, and examine potential contributors (Appendix A). The questionnaire consisted of 4 sections: practice demographics, COVID-19 restrictions in the community, general changes to practice, and condition-specific changes to practice. The practice demographics section collected information pertaining to location and type of practice. COVID-19 restrictions in the community were assessed at the strictest, most lenient, on average, and at the time of survey deployment. Restrictions were classified as either: no restrictions, school closures, gym closures, non-essential business closures, restaurant closures, restrictions on social gatherings, “stay at home” order, suspension of in person clinical visits, limitation of in person visits to just “urgent/emergent”, cancellation of non-urgent operating rooms (ORs), other limitation of OR or clinics (specify). General practice changes were assessed by surveying hospital mandated OR and clinic changes, OR and clinic time, virtual clinic volume, and PPE access. Condition-specific changes to practice examined referral volumes compared to the pre-pandemic time period (i.e., percent increase, decrease, or no change) for 54 specific conditions common in pediatric otolaryngology. Conditions were categorized as either ear, nose, oral cavity/oropharynx, airway, or neck.

For condition-specific changes to practice, four pediatric otolaryngologists (EG, MH, JS, and PH) classified the surveyed pediatric otolaryngology conditions according to the following condition type: congenital anomaly, foreign body, infection/inflammatory, mass/malignancy, neurologic or functional issues, and traumatic. Each pediatric otolaryngologist independently classified the 54 common pediatric otolaryngology conditions. Inter-rater agreement of 75.0% or greater was achieved for 41 conditions. Of the 13 remaining conditions for which consensus of 75.0% or greater, was not obtained, following deliberations with co-raters, consensus was reached for an additional condition (i.e., velopharyngeal insufficiency), while the remaining 12 conditions were classified as “Other”. Final agreement was achieved for classification of condition type on all 54 pediatric otolaryngology conditions.

### 2.2. Survey dissemination

The study authors used the Qualtrics survey platform to disseminate the survey [13]. An online link to the survey was shared via an international COVID-19 WhatsApp™ group of pediatric otolaryngologists.

Participation was voluntary, anonymous, and participants could withdraw from the study at any point. Responses were collected from April 23, 2021 to May 19, 2021.

### 2.3. Data analysis

A descriptive analysis of the study outcomes was undertaken. Summary statistics, including means with respective standard deviations and frequency statistics, were calculated for the appropriate variable types. Study variables that were explored included: practice demographics, COVID-19 restrictions in the community, general changes to practice, and condition-specific changes to practice.

For condition-specific changes to practice, referral volumes trends for each condition were classified as the following: No change (i.e., >50% respondents reported no change in volume of cases), Almost all decreased (>75% respondents reported a decrease in volume of cases), Most decreased (50–75% of respondents reported a decrease in volume of cases), Increased (>25% of respondents reported an increase in volume of cases). Frequency statistics for volume trends for each condition type (congenital anomaly, foreign body, infectious/inflammatory, mass/malignancy, neurologic or functional issue, traumatic and other) were calculated.

In addition to descriptive statistics, Pearson chi-square analyses were conducted to evaluate the association between level of restriction reported during the majority of the pandemic (lenient, strict, average) and referral pattern for each pediatric otolaryngology condition (increase, decrease, or no change). Data were analyzed using the statistical package for the social sciences (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp). Statistical significance was determined a priori at the alpha level of 0.05.

## 3. Results

### 3.1. Demographics

Forty-five responses were received from the group of 177 self-identified pediatric otolaryngologists (25.4% response rate), from 15 countries, and 35 unique cities (Table 1). All were practicing in an academic (61.4%) or hybrid community-academic (38.6%) setting. Half (51.2%) reported practicing in a further subspecialty, most commonly airway (33.3% of respondents).

### 3.2. Pandemic related restrictions

When local public health measures were most strict, over 90.0% of respondents reported that their community mandated gym, school, restaurant and non-essential business closures, and had restrictions on the size of social gatherings. 82.2% reported a “stay at home” order was in effect. No respondents reported an absence of restrictions at the peak of the pandemic. Mean (standard deviation, SD) time spent with strictest measures in place was of 16.2 (10.7) weeks, with a range from 1 to 45 weeks.

When measures were most lenient, 20.0% of respondents had no restrictions in place. The most common remaining restriction reported when public health measures were minimal were restrictions on social gatherings in 62.2% of communities. Again, there was a wide range of time spent in the most lenient state, with a mean (SD) of 19.9 (12.6) weeks, and a range from 2 to 48 weeks.

For the majority of the pandemic, restrictions in place in different communities varied. Most commonly reported public health measures during “average” restrictions were restrictions on social gatherings (82.2%), restaurant closures (44.4%), and non-essential business closures (40.0%). Mean (SD) time spent in “average” restriction state was 23.0 (14.9) weeks, with a range from 0 to 68 weeks. At the time of the survey, most (38.6%) stated the restrictions present were average for their community, with 27.3% in the most lenient, and 25.0% at the most

**Table 1**  
Geographic distribution of respondents.

Country	N (%)
United Kingdom	10 (22)
Birmingham	
Bristol	
Cambridge	
Liverpool	
London	
Manchester	
Portsmouth	
Southampton	
Australia	8 (18)
Brisbane	
Perth	
Sydney	
Canada	8 (18)
Edmonton	
Halifax	
London	
Montreal	
Toronto	
Vancouver	
Winnipeg	
Ireland	3 (7)
Dublin	
Malaysia	3 (7)
Kuala Lumpur	
Kuching	
United States	3 (7)
Cincinnati	
New York	
Salt Lake City	
Spain	2 (4)
Barcelona	
Chile	1 (2)
Santiago	
Columbia	1 (2)
Bogota	
France	1 (2)
Lille	
Israel	1 (2)
Nahariya	
Kuwait	1 (2)
Kuwait City	
South Africa	1 (2)
Cape Town	
Thailand	1 (2)
Chiang Mai	
Wales	1 (2)
Cardiff	

strict when surveyed. Restrictions when measures were most strict, average, and most lenient, are displayed in Fig. 1.

### 3.3. Condition-specific changes

Changes to specific otolaryngology conditions varied by respondent. These differences are summarized in Table 2. Almost all (>75%) of respondents reported a decrease in presentations and consultations for the following conditions, all coded as “inflammatory/infectious”: otitis media with effusion (mean decrease 56.1%); acute otitis media (mean decrease 62.8%); acute mastoiditis (mean decrease 66.6%); recurrent pharyngotonsillitis (mean decrease 51.0%); and peritonsillar abscess (mean decrease 52.1%). Most (50–75%) of respondents noted a decrease in seven other inflammatory conditions, detailed in Table 2.

The majority of conditions queried in the survey were reported to be unchanged by >50% of respondents. A “No change” trend in referral volume during the pandemic was observed for all congenital anomaly, foreign body, mass/malignancy, neurologic or functional issues and traumatic conditions (Table 2). Furthermore, 80.0% of conditions classified as “Other” were reported to be unchanged by the majority of survey respondents, while obstructive sleep apnea and intensive care unit airway consults were evenly split, with respondents nearly equally reporting increase, no change and decrease at their institution.

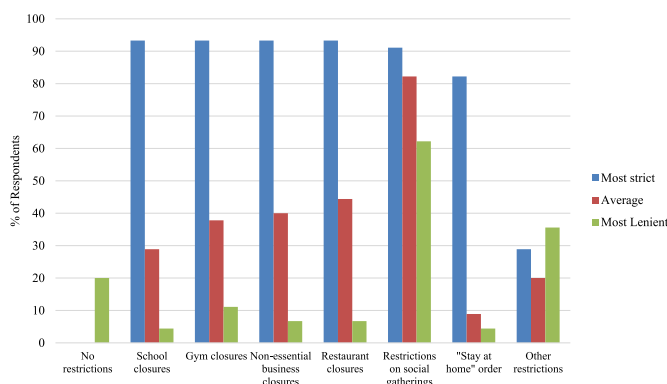
No condition was felt to be increased by the majority of surveyed pediatric otolaryngologists. However, those conditions with the highest proportion of respondents (>25%) reporting an increase were foreign bodies of the ear and nose. Foreign body airways were reported to be unchanged by >50% of respondents. Fig. 2 displays the change in disease incidence observed by pediatric otolaryngologists.

### 3.4. Referral patterns and level of restrictions during the majority of the pandemic

Over the majority of the pandemic, most referral patterns of conditions surveyed did not have a statistically significant relationship with the level of restrictions in the community, with the exception of four conditions (Fig. 3). Otitis media was felt to be decreased by 85.7% and 87.5% of respondents who reported strictest and average restrictions during the majority of the pandemic, respectively ( $\chi^2(4) = 11.52, p = .02$ ). Conversely, for respondents who reported minimal restrictions during the majority of the pandemic, only 37.5% reported a decrease in the incidence of otitis media. Acute mastoiditis presentations decreased according to 91.7% of respondents who reported having strictest restrictions during the majority of the pandemic, 100.0% decrease for those whose community experienced average restrictions the majority of the pandemic, and 50.0% decrease for those who reported minimal restrictions the majority of the pandemic ( $\chi^2(2) = 11.18, p = .004$ ). Similarly, 61.5% of respondents reported a decrease in deep space neck abscesses for respondents who reported strict measures the majority of the pandemic, 64.7% of those with average restrictions, and 14.3% who reported minimal restrictions in their community the majority of the pandemic ( $\chi^2(4) = 12.19, p = .02$ ). Finally, patterns of cervical lymphadenitis/abscesses in communities with strictest, average, and minimal measures in place the majority of the pandemic, decreased 38.5%, 58.8%, and 0.0%, respectively ( $\chi^2(4) = 10.35, p = .04$ ).

### 3.5. Changes to hospital practice

The vast majority of survey respondents reported changes to their practice mandated by their hospital. Operations were restricted to urgent/emergent only in 91.1%. Changes in PPE were mandated in 86.7% of cases. Other common changes included preoperative COVID screening (80.0%) and testing (80.0%) for patients, and changes in airway management (62.6%). The majority (82.9%) of respondents experienced a decrease in OR time. The average time lost for ORs was 41.5%. Interestingly, 14.6% of respondents experienced an increase in



**Fig. 1.** Public health restrictions mandated during the pandemic when measures were most strict, average, and most lenient. Respondents were surveyed regarding community public health measures at different time points over the COVID-19 pandemic.

**Table 2**  
Pediatric otolaryngology conditions during the COVID-19 pandemic.

Condition type	Condition	Decreased (%)	No Change (%)	Increased (%)	Frequency Category	
Infectious or Inflammatory	Otitis media with effusion	77.5	17.5	5.0	Almost all decreased (>75%)	
	Acute otitis media	84.2	10.5	5.3	Almost all decreased (>75%)	
	Acute Mastoiditis	86.5	13.5	0.0	Almost all decreased (>75%)	
	Recurrent pharyngotonsillitis	77.5	15.0	7.5	Almost all decreased (>75%)	
	Peritonsillar abscess	77.8	19.4	2.8	Almost all decreased (>75%)	
	Intracranial complications of mastoiditis	73.0	24.3	2.7	Most decreased (50–74%)	
	Otitis externa	51.5	45.5	3.0	Most decreased (50–74%)	
	Recurrent acute sinusitis	68.4	23.7	7.9	Most decreased (50–74%)	
	Orbital complications of sinusitis	71.8	15.4	12.8	Most decreased (50–74%)	
	Chronic sinusitis	57.9	36.8	5.3	Most decreased (50–74%)	
	Adenoid Hypertrophy	51.4	40.5	8.1	Most decreased (50–74%)	
	Recurrent Croup	64.9	29.7	5.4	Most decreased (50–74%)	
	Deep space neck abscesses	55.3	34.2	10.5	Most decreased (50–74%)	
	Recurrent Pneumonia	48.4	51.6	0.0	No change in >50%	
	Bacterial Tracheitis	47.2	50.0	2.8	No change in >50%	
	Recurrent Respiratory Papillomatosis	12.9	80.6	6.5	No change in >50%	
	Non-tuberculous neck abscesses	20.6	70.6	8.8	No change in >50%	
	Cervical lymphadenitis/abscesses	42.1	52.6	5.3	No change in >50%	
	Nasal Polyps	26.9	65.4	7.7	No change in >50%	
	Mass/malignancy	Turbinate hypertrophy	34.4	53.1	12.5	No change in >50%
Allergic Rhinitis		24.1	62.1	13.8	No change in >50%	
Non-allergic rhinitis		22.2	70.4	7.4	No change in >50%	
Mass/malignancy		Thyroid masses	3.8	80.3	15.4	No change in >50%
		Head and neck malignancy	7.4	74.1	18.5	No change in >50%
Neurologic or Functional issue		Velopharyngeal insufficiency	8.3	87.5	4.2	No change in >50%
		Dysphagia	3.1	81.3	15.6	No change in >50%
		Drooling	10.0	76.7	13.3	No change in >50%
Traumatic		Cholesteatoma – Acquired	26.1	65.2	8.7	No change in >50%
		Epistaxis	12.5	52.6	25.0	No change in >50%
		Nasal fracture/trauma	26.5	58.8	14.7	No change in >50%
Congenital anomaly		Cholesteatoma – Congenital	16.7	77.8	5.6	No change in >50%
		Congenital anomalies ear	16.7	83.3	0.0	No change in >50%
		Choanal Atresia	7.4	88.9	3.7	No change in >50%
		Other congenital anomalies of the nose	7.7	84.6	7.7	No change in >50%
		Ankyloglossia	15.4	76.9	7.7	No change in >50%
		Unilateral vocal fold paralysis	8.6	85.7	5.7	No change in >50%
		BVFP	3.1	93.8	3.1	No change in >50%
		Laryngeal cleft	3.0	84.8	12.1	No change in >50%
		Congenital neck cysts	11.1	83.3	5.6	No change in >50%
	Lymphovascular anomalies	6.3	87.5	6.3	No change in >50%	
Foreign body	Foreign body ear	20.0	46.7	33.3	Even split	
	Foreign body nose	14.7	50.0	35.3	No change in >50%	
	Foreign body airway	11.8	64.7	23.5	No change in >50%	
Other	TM Perforation	46.7	53.3	0.0	No change in >50%	
	Hearing loss	30.0	60.0	10.0	No change in >50%	
	Septal Deviation	18.5	77.8	3.7	No change in >50%	
	Obstructive sleep apnea/sleep-disordered breathing	42.1	34.2	23.7	Even split	
	Ranula/Salivary gland problem	19.4	74.2	6.5	No change in >50%	
	Intensive care unit airway consults	33.3	47.2	19.4	Even split	
	Laryngomalacia	14.3	62.9	22.9	No change in >50%	
	Hoarseness	12.1	81.8	6.1	No change in >50%	
	Subglottic Stenosis	17.1	71.4	11.4	No change in >50%	
	Acute airway obstruction requiring intubation	25.0	66.7	8.3	No change in >50%	

OR time, averaging a 41.7% increase. Access to PPE during the pandemic was a concern for 70.5% of respondents.

Almost all (95.5%) respondents reported having changes mandated to their outpatient clinical practice. The most common changes reported included decreased patient volumes (88.9%), changes in PPE for nasopharyngeal scopes (86.7%), changes to room cleaning practices (82.2%), and increased time between patients (71.1%). Most surgeons (80.6%) lost clinic time, with an average loss of 41.7% of time reported. Again, 13.9% had an increase in clinic time, with 32.0% increased time reported on average.

### 3.6. Virtual care

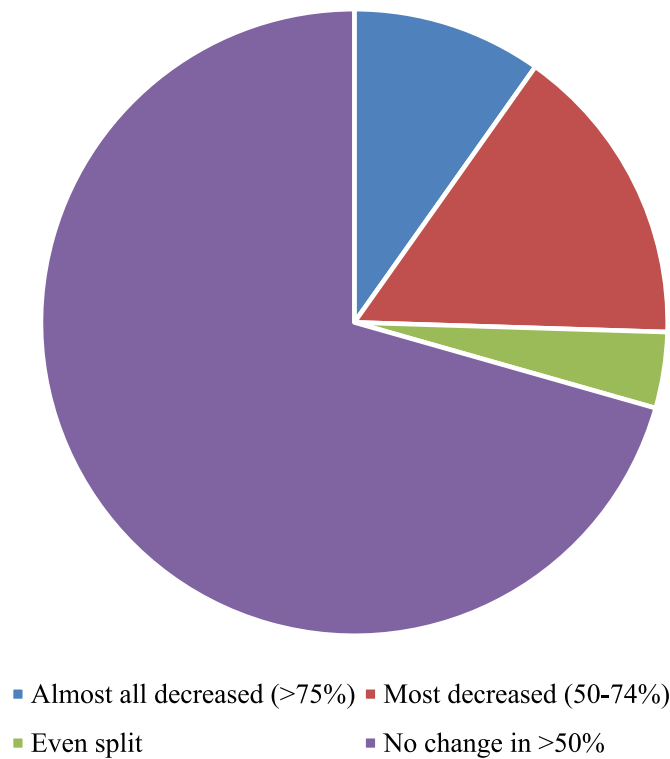
Prior to the pandemic, pediatric otolaryngologists reported either

none (75.0%) or less than one quarter of their time (25.0%) was spent delivering care virtually. At the height of the pandemic, 68.1% of surgeons reported spending more than half of their time delivering care virtually, and only 11.4% delivered virtual care less than a quarter of the time (Fig. 4). Most respondents expect to reduce their volume of virtual care significantly after the pandemic ends (81.8% anticipate spending 25% or less of their time in virtual care post-pandemic).

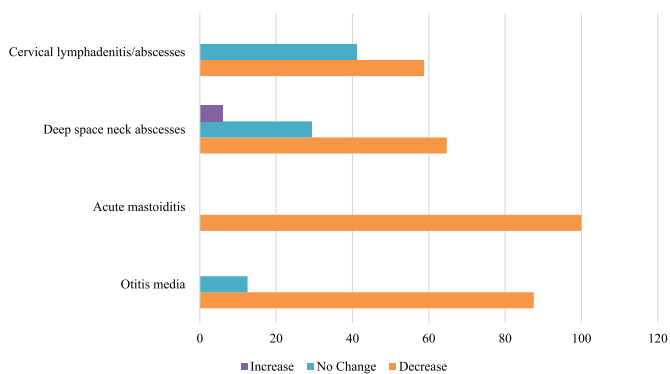
## 4. Discussion

Our international survey yielded forty-five responses from pediatric otolaryngologists of varying practice and subspecialty. To our knowledge, this is the first study to survey pediatric otolaryngologists internationally and assess practice changes due to the COVID-19 pandemic.





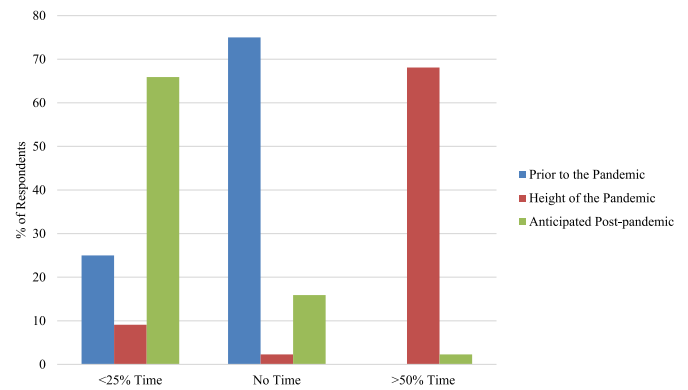
**Fig. 2. Changes in Disease Incidence for Pediatric Otolaryngology Conditions.** All surveyed conditions were organized by changes in frequency observed over the COVID-19 pandemic.



**Fig. 3. Referral pattern changes of infectious/inflammatory conditions under average restrictions.** Four statistically significant conditions decreased over the pandemic and the observed changes over the majority of the pandemic under average restrictions are presented.

There was considerable variability in the pandemic related restrictions across jurisdictions with a wide range in length of time spent in level of restriction and varying public health measures at each level. With only 20.0% reporting no restrictions during lenient periods, changes in community measures represent a stark change from the pre-pandemic era. As the most common public health measure over the majority of the pandemic included restrictions on social gathering, restaurant closures, and non-essential business closures, the decreased level of contact between individuals could provide insight in regard to changes in disease presentations seen during the pandemic.

In particular, the majority of respondents described a decrease in five inflammatory/infectious conditions including otitis media with effusion, acute otitis media, acute mastoiditis, recurrent pharyngotonsillitis, and peritonsillar abscess. The implementation of social distancing,



**Fig. 4. Changes in Virtual Care Delivery.** Respondents assessed their use of virtual care prior to and at the height of the pandemic. Anticipated future use of virtual care was also recorded.

school closures, and improved hygiene measures may have played a key role in the reduction of infectious and contagious disease presentations. Alternatively, parental hesitancy to seek care during the pandemic given the necessary contact with the upper aerodigestive tract during physical examination may have influenced referral patterns. Hatoun et al. recently demonstrated a reduction in acute otitis media, upper respiratory infections, sinusitis, and pharyngitis after social distancing in a cohort of 375,000 children [14]. The lack of a majority consensus supporting the decrease in prevalence of other infectious/inflammatory conditions could be related to the differences in public health measures observed across the world in addition to variances in population demographics. Additionally, while respiratory virus prevalence has decreased, studies have demonstrated differences in specific viral incidence [15]. In a study based in Finland, social restrictions were associated with a decline in influenza and respiratory syncytial virus [14]. However, non-pharmaceutical interventions, including face masks or improved hygiene measures, were not effective in preventing the spread of rhinovirus in children [16]. As viral upper respiratory tract infections have a casual role with eustachian tube obstruction and abnormal middle ear pressure, the global and regional prevalence of different viruses of varying virulence could play a role in the incidence of conditions in pediatric otolaryngology [17].

The vast majority of surveyed conditions exhibiting changes were infectious and inflammatory, which supports the hypothesis that social distancing and hygiene control decreased incidence of infectious and contagious conditions. As conditions such as congenital anomaly, mass/malignancy, and neurologic or functional issues are not rooted in infectious disease, the incidence of presentation were not remarkably different from the pre-pandemic era. Notably, foreign body incidence comprised the highest proportion of respondents reporting an increase in any condition though this was not statistically significant. The onset of COVID-19 initiated an upheaval of way of life across the world. With school closures and remote work, parents may have had difficulty managing work from home responsibilities at the same time as constantly supervising their young children, who are more prone to foreign body ingestion.

When examining the relationship between referral patterns and level of community restrictions over the majority of the pandemic, findings supported the hypothesis that increased public health measures relate to the reduction in infectious/inflammatory conditions. In contrast to lenient restrictions, >50% of respondents under average and/or strict measures for most of the pandemic reported a decrease in otitis media, acute mastoiditis, deep space neck abscesses, and cervical lymphadenitis/abscesses. School-age children are a chief culprit involved in the transmission of contagious illness, which primarily occurs within the school setting. With frequent handwashing measures, school closures, social distancing, and mask wearing the decrease in incidence of



common childhood contagious conditions is natural.

Hospital practices were greatly limited according to survey respondents. Most pediatric otolaryngologists experienced decreases in efficiency and limitations in access to resources such as PPE. Decreases in patient volumes, clinic and OR time could represent several implications for patients and surgeons. Decreases in incidence of illness could indicate decreased need for treatment or parental hesitancy to seek medical care. Otherwise, loss of clinic and OR time could imply backlogs in waiting lists that prevent timely care to be offered to patients. Additionally, a decrease in infections could indicate that fewer children meet criteria for surgery, therefore the loss of OR time may not put strain on patient wait lists [18]. The few respondents that experienced increases in OR and clinic time may signify regional differences in hospital mandates or outliers to the general trend.

The practice of pediatric otolaryngology saw significant changes to the use of virtual care. Not only did surgeons report utilizing telemedicine much more at the height of the pandemic compared to pre-pandemic, the forecasted use of virtual care post-pandemic is greater than baseline. This anticipated increase could suggest rises in physician comfort levels with using virtual care. Indeed, studies present high rates of patient satisfaction with telemedicine in otolaryngology [19]. Narrative comments from survey respondents echoed the value of virtual consults in the future.

The implications of this study extend to future resident training, as common conditions in pediatric otolaryngology may decrease in incidence. Narrative comments supported the long-term continued use of masks and wearing PPE when examining patients. With enduring changes that promote hygiene and lessen disease transmission, the field of pediatric otolaryngology may see fewer cases of common conditions such as acute otitis media, leading to decreased exposure to clinical and surgical management, including tympanostomy tube placement. Conversely, overly stringent hygiene measures may give way to an increase in incidence of allergic and autoimmune conditions in the future.

This study has limitations. As a survey study, the results are susceptible to recall bias and subjectivity. Moreover, this survey presents data from a snapshot in time and it is important to note that jurisdictions differed in the phase of the pandemic than the time of dissemination.

## 5. Conclusion

The COVID-19 pandemic introduced major changes to the practice of pediatric otolaryngology, with notable changes seen in the decreased incidence of infectious/inflammatory conditions in relation to public health measures. The global changes fuelled by the pandemic has potential to alter resident training and common disease presentations. Moreover, hospital mandates placed restraints on physician practices and has possible implications for wait lists. Virtual care has become more prevalent and will likely continue to play a role in the practice of pediatric otolaryngology.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijporl.2021.111021>.

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