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Comparison of Pediatric Otolaryngology clinical and operative case volume among surgical specialties in the COVID-19 pandemic

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ABSTRACT

Objectives: To report changes in clinical and surgical volume impacting a Pediatric Otolaryngology division one year prior to and following the onset of the COVID-19 pandemic in comparison to five other pediatric surgical subspecialties.

Methods: The number of clinical visits and surgical cases per month for six pediatric surgical specialties (Otolaryngology, Orthopedic Surgery, Urology, Neurosurgery, Plastic Surgery, and General Surgery) for 12 months prior to the pandemic and 12 months following the onset of the pandemic was collected. Poisson regression analysis was performed for the number of visits and cases per season adjusting for specialty, season, staffing changes, and the pandemic to determine adjusted rate ratios (aRR) post-pandemic for the surgical fields compared to Otolaryngology.

Results: A percentage decrease in median visits per paired month (15.63%, IQR = 23.01, 1.66) and operative cases (19.86%, IQR = 29.39, 10.17) was seen for Pediatric Otolaryngology. Regression analysis showed a significant negative effect on the number of visits (aRR = 0.74, 95% CI = 0.70 – 0.77) and cases (aRR = 0.65, 95% CI = 0.60 – 0.71) due to the pandemic. While many of the other specialties had predicted reductions in volume (notably Orthopedics), they all experienced significant predicted increases in productivity following the pandemic compared to Otolaryngology.

Conclusions: These findings suggest that Pediatric Otolaryngology is particularly vulnerable to this change in clinical pattern, which could be due to a decline in community infections from mask wearing and social distancing, and may result in a longer-term volume deficit when compared to other pediatric surgical subspecialties.

1. Introduction

The emergence and spread of the severe acute respiratory syndrome coronavirus 2 and subsequent COVID-19 pandemic has provided significant challenges to healthcare systems worldwide. With the goal of preserving personal protective equipment and necessary resources to care for individuals who contract this disease, elective surgeries across the United States were initially curtailed, rescheduled, or canceled [1,2]. As state governments began to ease restrictions, however, it was believed that clinical volume and elective operative cases, would gradually return to pre-covid levels [3]. Unfortunately, with many areas continuing to report surges in infections one year into the pandemic, multiple restrictions, notably social distancing and mask wearing, have remained in place [4].

Given the uncertainty associated with a global pandemic, it is difficult to ascertain exactly when such restrictions will be lifted. At our institution, it seems that this ‘new normal’ continues to affect both clinical volume and case load, and there is little reporting post-quarantine on productivity across the surgical subspecialties. Pediatric Otolaryngology may be affected more so compared to other surgical fields, given that operative cases tend to be elective or result from the sequela of infections. Similarly, the need to see a pediatric otolaryngologist may be reduced due to the current limitations on social gatherings. We sought to report changes in our clinical and surgical volume

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2. Methods

2.1. Data collection and univariate analysis per month by specialty

Following IRB approval at the Children’s Hospital of New Orleans, the electronic medical record was queried to collect the total number of both completed clinical visits and surgical cases per month for six pediatric surgical specialties (Otolaryngology, Orthopedics, Urology, Neurosurgery, Plastic Surgery, and General Surgery) for 12 months prior to the pandemic from March 2019 to February 2020 and 12 months following the onset of the pandemic in Louisiana from March 2020 through February 2021 (months per specialty = 24; 144 specialty months in total). Due to institutional policy requesting confidentiality of hard count productivity data, descriptive results were reported as a percentage change in clinical visits and operative volume compared to the month of the year preceding the pandemic (paired n per specialty = 12). Initial descriptive statistics, including the median percentage change for visits and surgical cases per month along with the inter-quartile range were calculated. A univariate nonparametric analysis of the variance (Kruskal-Wallis test) for both the percentage change in clinical visits and cases was first performed to compare these changes between the subspecialties. Graphpad Prism (San Diego, CA) was used for analysis and statistical significance was set at a p-value of less than 0.05.

2.2. Multivariate analysis of clinical visits and cases using logarithmic-linear regression

As several factors can influence the number of visits or surgical cases in a given time period, a multivariate Poisson (logarithmic-linear) regression analysis was performed to investigate whether other surgical fields experienced changes in their clinical visits or surgical cases post-pandemic compared to Otolaryngology. A logarithmic-linear regression is useful as it can model count data in a Poisson distribution (such as the number of visits per a specific time period) in a linear format though the natural logarithm, analyze multiple variables for significance, and also account for interactions between the variables.

Two regression analyses were performed for the number of visits and cases (each separately as their own dependent outcome variable) over the 24 month period and were adjusted for number of full time equivalent (FTE) physicians in each division, surgical specialty, season (quarter), and period (pre-pandemic versus post-pandemic). To investigate if the 12 months following the pandemic had a specialty-specific effect, an interaction variable of specialty/post-pandemic period was created for each specialty and compared to Otolaryngology. Count data for visits and cases were aggregated into seasons/quarters for Spring (March, April, May), Summer (June, July, August), Fall (September, October, November), and Winter (December, January, February) to allow for fewer categorical variables in the models. This count data were entered for each specialty, along with the season/quarter, number of FTE physicians for that specialty, and period (pre- or post-pandemic) per quarter to create a total of 48 surgical specialty quarters. Coefficients for the variables were reported and the corresponding adjusted rate ratio (aRR) was calculated for interpretation of the results when appropriate.

2.3. Determination of full time equivalent physicians

A review of the subspecialty divisions was performed to determine the total number of FTE physicians at the start of the study period and then accounted for when there were staffing changes during the study period. A full time physician equivalent was equal to 1 unit. During the twenty-four month period, Plastic Surgery increased their FTE physicians by 1 in the Fall pre-pandemic, Urology increased 1 FTE in the Summer pre-pandemic, Orthopedics increased by 0.5 FTEs in the Spring post-pandemic, General Surgery increased by 1.5 in the Summer post-pandemic, and Otolaryngology increased by 2 FTEs (Summer post-pandemic and Fall post-pandemic). There were no changes for Neurosurgery.

3. Results

A percentage decrease in both median visits per paired month (−15.63%, interquartile range, IQR = −23.01, −1.66) and operative cases (−19.86%, IQR = −29.39, −10.17) was seen for Otolaryngology. Percent changes for the other surgical fields are shown in Table 1 and graphically by paired month for Otolaryngology in Fig. 1. Initial univariate analysis for a difference among the groups for the percentage change in clinic visits neared significance (P = .06) but did not show a difference for surgical volume (P = .09).

The results of the multivariate Poisson regression analysis for clinical visits and surgical cases are displayed in Tables 2 and 3 respectively. The model fit for each analysis was visually examined and deemed adequate. Specific descriptive statistics for median visits and surgical cases per specialty are omitted due to institutional policy requesting confidentiality of productivity data.

Regression analysis showed a statistically significant negative effect on the predicted number of visits (aRR = 0.74, 95% CI = 0.70 to 0.77) and cases (aRR = 0.65, 95% CI = 0.60 to 0.71) due to the pandemic for Otolaryngology. Additionally, all interaction effects for the surgical specialty/post-pandemic category were significant with positive coefficients, indicating rate increases, compared to Otolaryngology (Tables 2 and 3). The calculated adjusted rate ratios and the corresponding percentage change for the predicted number of visits and cases for each specialty due to the pandemic are shown in Table 4.

4. Discussion

These findings support that not only did the pandemic affect clinic volume and operative cases for Pediatric Otolaryngology, resulting in significant predicted decreases by 26% and 35% respectively, the field was also uniquely impacted. While many of the other specialties had predicted reductions in volume (notably Orthopedics), they all experienced significant relative increases in productivity following the pandemic compared to Otolaryngology. Initial univariate analysis for a difference among the groups did not reach significance in part because it cannot discriminate among the several independent factors (e.g. new hires) that influence the number of visits and cases.

Although it was not investigated in this study, we postulate these ongoing clinical changes are due in part to a decline in community infections from mask wearing and social distancing, as well as a smaller backlog in necessary surgeries [5]. Hatoun et al. recently showed a decreased prevalence for acute otitis media, upper respiratory infections, sinusitis, and pharyngitis during the pandemic in a large pediatric population of 375,000 children [6]. As a consequence of the
decrease in infections, fewer children would then meet criteria for surgeries such as tympanostomy tube placement or adenotonsillectomy.

Parental fears and concerns about taking their child to the doctor for elective evaluations during the pandemic, as well as a lower use of telemedicine among our specialty, could also be contributing factors [7, 8]. Telemedicine is challenging within the field of Otolaryngology, as much of our physical exam relies on cavity inspection that does not easily translate over a video screen. At our institution, only Urology had an established telemedicine practice, and was only implemented for Otolaryngology in the post-pandemic period.

Despite the initiation of vaccination and a recent relaxing of restrictions, herd immunity is not expected in the US until the second half of 2021 at the earliest, and current healthcare leaders suggest that mask wearing will be recommended into 2022 [9,10]. Thus, these changes in clinical volume may be sustained as states continue to uphold social distancing, or if mask wearing becomes more normalized in society.

Generalization of these results to other institutions limits this study, as it reviewed data from only one institution. Additionally, other factors which could account for changes in volume (such as COVID positivity rates, socioeconomic considerations, operating room availability) were not explored. However, our results may mirror others in the nation and call for Pediatric Otolaryngology divisions to strategically manage resources during this time period and recognize that our subspecialty may be more vulnerable to productivity changes during pandemics.

5. Conclusions

Clinical visits and surgical cases for Pediatric Otolaryngology appear to have been particularly vulnerable to COVID-19 restrictions and behavior modifications. This change in clinical pattern may be sustained in the future and result in longer-term volume deficit when compared to other pediatric surgical subspecialties.

Author contributions

Joel W. Jones: study conception and design, data collection, data
analysis, presentation of work, initial drafting of manuscript and revisions, final approval.

Jill N. D’Souza: study design, revision of manuscript, final approval of manuscript.

Belinda Mantle: study design, revision of manuscript, final approval of manuscript.

Jonathan M Joseph: initial drafting and revision of manuscript, final approval of manuscript.

Ellis M. Arjmand: study design, revision of manuscript, final approval of manuscript.

James S. McMurray: study design, revision of manuscript, final approval of manuscript.

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Relevant CONFLICT(S) of interest to declare

None.

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None.

Institutional review board approval

This study received approval by the Children’s Hospital of New Orleans institutional review board.

Statement of originality

This material has not been previously published and is not currently under consideration for publication elsewhere.

Declaration of conflicting interest

The authors declare that there is no conflict of interest with this study.

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