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Associations between demographic factors and pediatric otolaryngology access disparities in the COVID-19 era

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ABSTRACT

Objectives: To assess the impact of demographic factors and telehealth on access to pediatric otolaryngology care during the COVID-19 pandemic, as measured by attendance.

Methods: Retrospective, observational study of all referrals to pediatric otolaryngology at a single, tertiary care pediatric hospital system in the US. All referrals placed to pediatric otolaryngology from March through December 2020 were compared with referrals between March and December 2019. Data on patient demographics, date of referral, duration between referral and appointment, appointment type, and diagnosis acuity were collected. A multivariate linear regression was used to evaluate the impact of the patient age, ethnicity, language, insurance, diagnosis acuity, time to appointment, and appointment type on attendance.

Results: This study included 1988 referrals placed between March 16th-December 31st, 2020 and 3704 referrals placed between March 16th-December 31st, 2019. In 2020, attendance proportions were significantly higher at 72% compared to 62% during 2019 (p < 0.001). In 2020, there was a significantly shorter duration between referral and appointment, averaging 10 days as compared to 26 days in 2019 (p < 0.001). Overall, Black and Hispanic patients, children over the age of one, publicly insured patients, and those with longer wait times were less likely to attend their appointments. Primary language and use of telehealth did not predict attendance.

Conclusion: Early evidence has found significant healthcare access and outcome disparities across ethnicities during the COVID pandemic. However, there is limited data evaluating the effect of demographic factors or telehealth on access to pediatric otolaryngology care. This study identifies age, race and insurance type as predictors of access to pediatric otolaryngologic care, as measured by attendance.

1. Introduction

Coronavirus disease 2019 (COVID-19), first described in December 2019, has had an unprecedented worldwide impact on modern history. Unsurprisingly, it has presented major challenges to the healthcare delivery system worldwide, resulting in major shifts in the way healthcare can safely be delivered to patients. One such shift has been the rapid adoption of telehealth [1], which has allowed for timely medical care while reducing the amount of travel and the number of individuals entering a healthcare facility. In many countries worldwide, we have seen a rapid adoption of telehealth over the last year, with some healthcare systems reporting increases of over 4000% in little over a month [2]. However, despite best attempts to make healthcare accessible and safe during this period, one of the persistent challenges during the COVID-19 era is the widening of health disparities across racial and ethnic identities and socioeconomic status.

Particular focus has been drawn to Black and Hispanic communities who have been disproportionately affected by the COVID pandemic in the United States [3]. In the early stages of the pandemic, communities with larger proportions of people of color had higher rates of hospitalizations and mortality [4], which was partially attributed to differences in access to care. Within the realm of pediatric otolaryngology, a large systematic review performed prior to the pandemic identified that healthcare disparities exist across socioeconomic status, insurance type, and race [5]. Given these known challenges with care equity prior to COVID, we sought to investigate how these pre-existing healthcare disparities may be exacerbated during the pandemic and to understand how the adoption of telehealth might mitigate these differences. To date, there is no published literature describing overall pediatric otolaryngology healthcare access beyond the early months of the COVID...
pandemic. This study aims to elucidate what effect, if any, patient demographic and insurance factors had on a patient’s ability to receive specialized pediatric otolaryngologic care during the first nine months of the COVID-19 pandemic. Furthermore, we hope to understand the impact of clinical structure, including the adoption of telehealth, on providing care in an ethnically and socioeconomically diverse area.

2. Methods

We performed a retrospective review of referral pattern data through electronic medical records at a single tertiary care pediatric otolaryngology division. The institutional human subjects research committee reviewed and approved the project. Data were collected on all referrals to the pediatric otolaryngology clinic between March 16th and December 31st, 2020, during which time, significant changes were made to the structure of the clinic in response to a rise of COVID cases. March 16th marked the start of the regional Shelter-in-Place orders. In response, for the first time, the clinic offered patients the opportunity to choose between in-person consultations and telehealth video consultations. We collected data on patient age, gender, ethnicity, primary language, insurance type, appointment acuity, and time between date of referral and clinical encounter. Additionally, we collected data on the type of encounter selected by the patients. Visits were categorized as telehealth or in-person, and attendance was categorized as attended, or missed. Duplicate referrals, defined as referrals made for the same patient within a 48 hour period, were removed. Some patients had more than one referral placed during the two year time frame. Only the first referral for each patient was included in the analysis, so each referral represented one individual patient.

A power calculation was performed to determine the sample size needed to determine a 5% change in attendance, which had been determined to be the meaningful difference that would prompt evaluation of the referral process and operations budget. To detect a 5% change in attendance with 80% power, we would need 1605 referrals in both 2019 and 2020.

Data were organized using Microsoft Excel (2016) and imported into STATA (StataCorp, College Station, Texas 77845 USA) for statistical analysis. The patient demographic proportions in 2019 and 2020 were compared using chi-squared tests or ANOVA, and means were analyzed using t-tests. Statistical significance was set at a probability value of less than 0.05 for all analyses. A multivariate linear regression was used to evaluate the impact of the following variables on attendance: patient age, ethnicity, language, insurance, diagnosis acuity, time between referral and appointment, and year. A second multivariate linear regression was performed on the 2020 data to assess the impact of patient age, ethnicity, language, insurance, time to appointment, and appointment type—either in-person or telehealth-on attendance.

3. Results

Between March 16th and December 31st, 2020, 2399 referrals were placed to the Pediatric Otolaryngology Clinic. During the same interval in 2019, 4525 referrals were placed. Duplicate referrals, multiple referrals, referrals that did not meet inclusion criteria, and referrals missing attendance data were removed. In total, 3704 patients in 2019, and 1988 patients in 2020, for a total of 5692 patients, were included in the analysis, to obtain adequate power. Multiple referrals were placed

Table 1
Demographic distribution of referrals in 2019 and 2020.

| Characteristic          | Total (N = 5692) | 2019 (n = 3704) | 2020 (n = 1988) | p-value* | p-value† |
|-------------------------|------------------|-----------------|-----------------|----------|----------|
| Age                     |                  | N (%)           | N (%)           |          |          |
| Infant (age ≤ 0)        | 643 (11.3)       | 362 (9.8)       | 281 (14.1)      | <0.001   | n/a      |
| Toddler (1-3y)          | 1092 (19.2)      | 775 (20.9)      | 317 (15.9)      |          |          |
| Child (4-12y)           | 2954 (51.9)      | 1954 (52.8)     | 1000 (50.3)     |          |          |
| Teenager (13-18y)       | 1003 (17.6)      | 613 (16.5)      | 390 (19.6)      |          |          |
| Gender                  |                  |                 |                 |          |          |
| Female                  | 2454 (43.1)      | 1601 (43.2)     | 853 (42.9)      |          |          |
| Male                    | 3238 (56.9)      | 2103 (56.8)     | 1135 (57.1)     |          |          |
| Ethnicity               |                  |                 |                 |          |          |
| Hispanic, all races     | 1953 (34.3)      | 1191 (32.2)     | 762 (38.3)      | <0.001***| <0.001   |
| Non-Hispanic Black      | 520 (9.1)        | 322 (8.7)       | 198 (10.0)      |          |          |
| Non-Hispanic Asian      | 416 (7.3)        | 217 (5.9)       | 199 (10.0)      |          |          |
| Non-Hispanic White      | 693 (12.2)       | 390 (10.5)      | 303 (15.2)      |          |          |
| Other                   | 805 (14.1)       | 517 (14.0)      | 288 (14.5)      |          |          |
| Unknown                 | 1305 (22.9)      | 1067 (28.8)     | 238 (12.0)      |          |          |
| Primary language        |                  |                 |                 |          |          |
| English                 | 3957 (69.5)      | 2525 (68.9)     | 1405 (70.7)     | 0.76**   |          |
| Non-English             | 1622 (28.5)      | 1053 (28.4)     | 569 (28.6)      |          |          |
| Missing                 | 113 (2.0)        | 99 (2.7)        | 14 (0.7)        |          |          |
| Insurance               |                  |                 |                 |          |          |
| Public insurance        | 3157 (55.5)      | 2046 (55.2)     | 1111 (55.9)     | 0.115**  | 0.12     |
| Private insurance       | 1269 (22.3)      | 854 (23.1)      | 415 (20.9)      |          |          |
| Missing                 | 1266 (22.2)      | 804 (21.7)      | 462 (23.2)      |          |          |
| Acuity                  |                  |                 |                 |          |          |
| Non-acute               | 4599 (80.8)      | 3159 (85.3)     | 1440 (72.4)     | 0.003**  |          |
| Acute                   | 545 (9.6)        | 340 (9.2)       | 205 (10.3)      |          |          |
| Missing                 | 548 (9.6)        | 205 (5.5)       | 343 (17.3)      |          |          |
| Attended                |                  |                 |                 | <0.001   | n/a      |
| Yes                     | 3743 (65.8)      | 2313 (62.4)     | 1430 (71.9)     | <0.001***|          |
| No                      | 1949 (34.2)      | 1391 (37.6)     | 558 (28.1)      |          |          |
| Time to appt, Median (IQR) days | 18 (7, 40) | 26 (10, 48) | 10 (5, 21) | <0.001*** |

* p-values calculated using chi-square tests unless otherwise indicated.  † p-value calculated without missing/unknown.  ‡ p-value calculated using Wilcoxon rank sum test.
for 379 patients across both years. The demographics of our population are described in Table 1.

In 2020, the attendance proportion was significantly higher at 72% compared to 62% during 2019 (p < 0.001). In 2020, there was a significantly shorter duration between referral and appointment date, averaging 10 days as compared to 26 days in 2019 (p < 0.001). In 2020, there was a larger proportion of referrals under the age of 1 year as compared to 2019 (p < 0.001). Our multivariate regression of the 4147 patients with complete data are outlined in Table 2. Across both 2019 and 2020, Black and Hispanic patients (p < 0.001, p = 0.001), children over the age of one (p = 0.001–0.27), publicly insured patients (p < 0.001), and those who had longer wait times (p < 0.001) were less likely to attend their appointments. Across both years, Black patients were 35% as likely (95% CI: 0.23–0.53, p < 0.001), and Hispanic patients were 52% as likely (95% CI: 0.36–0.76, p = 0.001) to attend their appointments as compared to Caucasian patients. Privately insured patients were 1.7 times as likely to attend their appointments as compared to Caucasian patients. Privately insured patients were 1.7 times as likely to attend their appointments (95% CI: 1.20–2.19, p < 0.001) as compared to publicly insured patients. Primary language did not predict attendance. In 2020, Black patients (p = 0.006), publicly insured patients (p < 0.001), and those with longer wait times (p < 0.001) were less likely to attend appointments (Table 3). Black patients were 43% as likely (95% CI: 0.24–0.79, p = 0.006) to attend their appointments, but Asian patients were 295% as likely (95% CI: 1.20–7.23, p = 0.018) to attend their appointments as compared to White patients. Telehealth was not associated with improved attendance.

4. Discussion

Healthcare delivery is facing extraordinary challenges in the setting of a global pandemic. In response, there has been rapid expansion of telehealth. The COVID pandemic has revealed disparities in both healthcare access and outcomes worldwide. To date, there has been minimal study of pediatric otolaryngology healthcare accessibility and no studies to our knowledge evaluating healthcare access and telehealth utilization over the entire course of the 2020 pandemic. One study published earlier this year evaluated rates of rescheduling of pediatric otolaryngology telehealth visits over the first 6 weeks of the pandemic, but did not evaluate overall attendance, arguably a stronger indicator of healthcare access [6].

This study identified race, patient age, insurance type, and more prompt appointments as predictors of access to pediatric otolaryngologic care, as measured by attendance. We saw an overall increase in the attendance proportion during the shelter-in-place era when compared to the proportion seen during the same time frame one year prior. Unsurprisingly, the overall number of referrals in 2020 was dramatically lower than 2019. Parents may have faced more challenges to see their pediatrician, therefore filtering for higher perceived acuity referrals leading to higher attendance. It is possible that the increase in proportion of children under one year of age and increase in higher acuity diagnoses reflects this filtering for higher perceived acuity patients being referred to the clinic.

The overall attendance at our institution across both years was 66% which may have been due to challenges with transportation, work conflicts, challenges arranging childcare, limitations in health literacy or other factors that were present prior to the pandemic. There is still room for improvement in healthcare access beyond the additional challenges that the pandemic has raised.

Ethnicity has previously been described as a significant predictor of clinic attendance, with Hispanic and Black patients being less likely to attend appointments [7–9], which is in line with our findings. In our study cohort, Hispanic patients were 52% as likely to attend their clinic visits than their Caucasian counterparts, and Black patients were 35% as likely. During the COVID pandemic, Black patients were 43% as likely to attend appointments compared to Caucasian patients. In contrast, Asian patients were nearly three times as likely to attend appointments as compared to Caucasian patients. Historically, the literature has shown that patients covered by Medicaid or similar government managed insurance policies are less likely to attend than those with private insurance [10–12]. This holds true in our pediatric population as well, including during the current pandemic. Patients with private insurance were about two times as likely to attend than those with public insurance.

Despite addressing anticipated barriers to clinic attendance such as fear of entering hospital spaces, concerns regarding public transportation, and challenges with childcare of siblings, introduction of telehealth visits was not associated with increased attendance. Telehealth does have some limitations particular to otolaryngology, as the provider is unable to fully examine a child’s ears, nose, and throat. Concern for this limitation may have led to lower attendance. In the literature, providers have reported positive experiences with telehealth visits, particularly for visits where education is the primary goal [13,14]; however, families may view telehealth differently. Technical difficulties are common, with parents having trouble setting up the video conferencing, particularly in our ethically, linguistically, and socioeconomically diverse patient population. However, telehealth may have allowed for more prompt scheduling which did correlate with attendance. Even as social distancing restrictions relax, we imagine this modality will continue to play a central role in providing care to patients living far

| Table 3 | Multivariate linear regression evaluating impact of telehealth on attendance in 2020. |
|---------|-----------------|
| Visit Type | Odds Ratio | 95% CI | p-value |
| In-person | Baseline | 1.34 | (0.85, 2.17) | 0.202 |
| Telehealth | Baseline | 1.34 | (0.85, 2.17) | 0.202 |
| Age | | | | |
| Infant (<1y) | Baseline | 0.77 | (0.42, 1.40) | 0.389 |
| Toddler (1-3y) | Baseline | 0.62 | (0.37, 1.03) | 0.065 |
| Child (4-12y) | Baseline | 0.71 | (0.40, 1.26) | 0.241 |
| Teenager (13-18y) | Baseline | 0.43 | (0.24, 0.79) | 0.006 |
| Ethnicity | | | | |
| White | Baseline | 1.26 | (<0.001) | 0.018 |
| Black | Baseline | 2.95 | (1.20, 7.23) | 0.018 |
| Asian | Baseline | 0.87 | (0.50, 1.51) | 0.613 |
| Hispanic | Baseline | 1.40 | (0.76, 2.17) | 0.195 |
| Insurance | | | | |
| Public | Baseline | 0.62 | (0.37, 1.03) | 0.065 |
| Private | Baseline | 0.71 | (0.40, 1.26) | 0.241 |
| Time to Appointment | | | | |
| Baseline | 1.26 | (0.78, 2.07) | 0.44 |
| Baseline | 2.17 | (1.20, 7.23) | 0.018 |

Table 2

Multivariate linear regression evaluating factors predicting attendance.

| Year | Odds Ratio | 95% CI | p-value |
|------|------------|--------|---------|
| 2019 | Baseline | 2019 | 1.14 | (0.93–1.40) | 0.195 |
| 2020 | Baseline | 2020 | 1.14 | (0.93–1.40) | 0.195 |

| Age | | | | |
| Toddler (1-3y) | Baseline | 0.61 | (0.40, 0.95) | 0.027 |
| Child (4-12y) | Baseline | 0.51 | (0.34, 0.77) | 0.001 |
| Teenager (13-18y) | Baseline | 0.52 | (0.34, 0.81) | 0.004 |

| Ethnicity | | | | |
| White | Baseline | 0.35 | (0.23, 0.53) | <0.001 |
| Black | Baseline | 1.23 | (0.73, 2.07) | 0.44 |
| Asian | Baseline | 0.52 | (0.36, 0.76) | 0.001 |

| Insurance | | | | |
| Public | Baseline | 1.73 | (1.36, 2.17) | <0.001 |
| Private | Baseline | 19.01 | (11.05, 32.70) | <0.001 |
from their specialty providers. As demonstrated in our population, significant challenges still remain with access despite the use of telehealth. There are limitations to the conclusions from this study. There was a significant proportion (18%) of referrals which were excluded due to incomplete or inconclusively categorized attendance data which may have led to a bias in the results. The increase in Caucasian, Black, Hispanic, and Asian proportions in 2020 may reflect true changes in demographic trends; however, all the ethnic groups increased in proportion as the proportion of “unknown” and “other” ethnicities decreased, which may have been due to the adoption of a new electronic medical record between the two data collection windows, resulting in a difference in obtainable demographic data. More data is needed to be able to elucidate the cause of these trends.

With this retrospective data, we cannot determine causation for these changes in demographic distribution or attendance. The lack of association identified between telehealth and attendance may have represented an underpowered study, for data was only used during the nine month Shelter-in-Place orders. Furthermore, the study only represents one healthcare system’s experience, within an urban, tertiary care center in which 70% of patients have public insurance which may not hold true for other systems with vastly different resources, referral patterns and patient population.

This study illustrates that the delivery of prompt pediatric otolaryngology care is greatly limited by families’ ability to attend both in-person and telehealth appointments. More specifically, certain populations, namely Black, Hispanic, and publicly insured patients, may face particular challenges obtaining specialized surgical care, regardless of the presence or absence of a global pandemic. Through the introduction and rapid adoption of telehealth, providers have been able to continue safe care for patients during these unprecedented times. Still, telehealth has not increased the likelihood of families attending these appointments. Further research is needed to identify and address the barriers to both in-person and telehealth visits that disproportionately impact underserved and vulnerable patients.

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