Outpatient otolaryngology in the era of COVID-19: A data-driven analysis of practice

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Funding Support: None

Conflict of Interest: The authors declare that there is no conflict of interest.

Journal: Otolaryngology-Head and Neck Surgery

Words: 2958

Keywords: COVID-19; Telehealth; Finances; Otolaryngology; Healthcare
Abstract

Introduction

Coronavirus Disease 2019 (COVID-19) has induced a prioritization of acute care and telehealth, affecting the quantity of patients seen and the modality of their care.

Study Design

Retrospective review

Setting

Single institution study conducted within the Division of Otolaryngology at the Yale School of Medicine.

Subjects and Methods

Data on all outpatient appointments within the Division of Otolaryngology was obtained from administrative records of billing and scheduling from March 16 to April 10, 2020. For comparison, a corresponding time period from 2019 was also utilized.

Results

3,665 of 5,913 (62.0%) scheduled visits were seen between March 18 and April 12, 2019 in comparison to 649 of 5,044 (12.9%) scheduled visits seen during the corresponding COVID-19-affected period. The majority of completed visits performed in weeks 1 and 2 were in-person, while the majority in weeks 3 and 4 were via telehealth. Among sub-specialties, a larger proportion of completed visits in 2020 were performed by pediatric and head and neck oncology otolaryngologists in comparison to general/specialty otolaryngologists (p<0.001). Older adults (65+) were less likely to have telehealth visits compared to younger adults (18-84) (45.6% vs. 59.6%; p=0.003).

Conclusions

This manuscript has been accepted for publication in Otolaryngology-Head and Neck Surgery.
A major decrease in the completion rates of scheduled visits was seen in the COVID-19-affected
time period, though this was not proportional among subspecialties. An associated increase in
telehealth visits was observed. After COVID-19-related hospital policy changes, approximately
two weeks passed before telehealth visits surpassed in-person visits, though this was not true
among older adults.
Introduction

Coronavirus Disease 2019 (COVID-19), the illness caused by a novel coronavirus identified in December 2019, was first observed in clusters of patients in Wuhan, Hubei Province, China.\textsuperscript{1,2} In January 2020, the World Health Organization (WHO) declared COVID-19 to be a Public Health Emergency of International Concern (PHEIC) and ultimately a pandemic in March 2020.\textsuperscript{2,3} The virus’s particularly high rate of transmission prompted implementation of various widespread restrictions, including bans on international travel and government-mandated lockdowns, in an attempt to contain its spread.\textsuperscript{4} Nonetheless, by March 2020, well over 50,000 people in 25 countries had confirmed cases of COVID-19, and patients with severe respiratory symptoms were associated with a higher rate of fatality.\textsuperscript{5}

As healthcare systems grapple with increasing numbers of patients, attempts to protect both patients and providers, in addition to preserving personal protective equipment (PPE), has elicited a necessary triaging of care. This has taken form in rescheduling non-acute appointments and utilizing telehealth programs.\textsuperscript{6} Otolaryngologists may be particularly at risk due to a high viral load in the upper aerodigestive tract and the risk of aerosolization inherent to common otolaryngologic procedures. In light of this, there has been a widespread shift among otolaryngologists towards minimizing direct patient interaction in non-acute settings.\textsuperscript{7,8} Several otolaryngology (ENT) divisions and departments have documented their subjective response to this changing landscape, but little objective measurement on COVID-19’s impact has been reported.\textsuperscript{9,10}
Herein we discuss the affect COVID-19 has had on our institution. The primary objectives were to examine the quantitative change in patient visits, and the modality in which they were completed, over the first month of the virus’s impact within the United States, in comparison to the prior year. Secondarily, we analyzed trends in weekly visitations, differences among otolaryngology sub-specialties, and disparities among patients of varying ages.

**Methods**

*Setting*

This was a single institution study conducted within the entirety of the Division of Otolaryngology at the Yale School of Medicine. This is an academic tertiary care center, but also includes community clinics. The geographical area of our clinics and patients are throughout southern Connecticut. This study was exempted from review by the Yale Human Investigation Committee due to secondary research on existing datasets.

*Time Period & Data*

As the focus of study was on COVID-19’s impact on otolaryngology services, we queried the first four weeks of the crisis during which departmental functions were impacted – from March 16, 2020 to April 10, 2020 (henceforth referred to as the 2020 period). As a comparison group, we queried the corresponding time period from the previous year – March 18, 2019 to April 12, 2019 (henceforth referred to as the 2019 period). Data on all outpatient appointment within the ENT division was obtained from administrative records of billing and scheduling.

*Variables*
The data utilized consisted of the following variables: date of scheduled appointment, completion status of that appointment, reason for cancellation (if it was canceled), type of appointment (in-person or telehealth), provider name, and patient age. Dates were grouped into weeks 1-4 for each respective time period. Appointment completion status was grouped into completed, cancelled, no show, or left without being seen. If the appointment was cancelled, cancellation reasons were grouped into COVID-19 and non-COVID-19 administrative-directed cancellations, or patient-directed cancellations. In order to qualify as a COVID-19 administrative-directed cancellation, the appointment must have been in 2020 and must have a cancellation reason of “crisis planning” or “bump.” No instances of the former reason existed in 2019, though 12/108 (11.1%) “bumps” occurred in 2019 (which were categorized as non-COVID-19 administrative-directed cancellation). “Video” or “telephone” visits were determined to be telehealth visits, and all other visit types were grouped as in-person.

Provider name was utilized to categorize appointments by subspecialty into the following: pediatric otolaryngology, head and neck oncology, general/specialty otolaryngology (which included general otolaryngology, otologists, laryngologists, rhinologists, and facial plastic surgeons), speech and language pathology (SLP), audiology, and advanced practice providers (nurse practitioners and physician assistants). Physician categorization was determined a priori based on hospital service work-flow and institutional clinic distribution at our academic center. Patients were grouped into functional age cohorts – ≤2, 3-10, 11-17, 18-44, 45-64, 65-79, and ≥80 years.

Statistical Analysis
Descriptive statistics are presented for scheduled appointments within each time period, characterizing the number of completed and canceled visits overall, as well as stratified by week, specialty, and age. We also provide descriptive statistics analyzing the evolution in use of telehealth overall, and stratified by subspecialty and age. Chi-squared tests were performed to analyze the differences in appointment completion rates between 2019 in-person and 2020 telehealth appointments, between proportion of completed visits of the three groups of OHNS physicians in 2019 and 2020, and telehealth utilization between younger (18-64) and older (65+) adults for completed visits in 2020.

All figures were created in GraphPad Prism v7 (GraphPad Software, San Diego, CA). Statistical analysis was performed via SPSS 25.0 (IBM Corp., Armonk, NY) and significance was set at p<0.05.

Results

The Outcome and Setting of Scheduled Visits

Between March 18 and April 12, 2019, 5,913 visits were scheduled within the otolaryngology division at the Yale School of Medicine. This was distributed over 38 total providers: 10 general/specialty otolaryngologists, 7 head and neck oncologists, 3 pediatric otolaryngologists, 3 speech and language pathologists, 10 audiologists, and 5 advanced practice providers. Of these, 3,665 (62.0%) visits were completed. In the corresponding COVID-19-affected time period (March 16 to April 10, 2020), 5,044 visits were scheduled, of which 649 were completed (12.9%). More than half of the scheduled visits (2,647 [52.5%]) in the 2020 period were canceled due to COVID-19 reasons (Figure 1A).
Of the 649 completed visits in the 2020 time period, 55.8% were seen via telehealth (Figure 1A). When broken down by weeks 1-4, the majority of visits performed in weeks 1 and 2 were in-person, while the majority in weeks 3 and 4 were via telehealth (Figure 1B).

Telehealth Utilization and Completion Rates

Between March 16 and April 10, 2020, there were 506 scheduled telehealth visits. Of these, 362 (71.5%) were completed (of which 224 [61.9% of completed visits] and 138 [38.1% of completed visits] were performed via video and telephone, respectively). The overall cancellation and no show/left without being seen rates were roughly equal (14.8% and 13.6%, respectively; Figure 2A).

When analyzed by week, we saw a steep rise in telehealth utilization between weeks 1 and 2 (31 vs. 90 scheduled visits) and between weeks 2 and 3 (90 vs 179 visits). Week 4 had the most scheduled telehealth visits, at 206. In week 1, 38.7% of scheduled telehealth visits were completed; however, for the majority of scheduled visits, the patient did not virtually attend or left without being seen (54.8%). The rates of telehealth visit completion rate rose each week, with only 18.0% of visits canceled and 4.9% of patient no-shows/left without being seen by week 4 (Figure 2B). On chi-squared analysis, a larger percentage of 2020 scheduled telehealth visits were completed compared to 2019 scheduled in-person visits (71.5% vs. 62.0%; p<0.001; Figure 2C).

Differences in Subspecialty Practice Patterns During the COVID-19 Pandemic

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During the 2019 period, most subspecialty divisions saw similar appointment completion rates. The lowest rate was seen in head and neck oncology (55.9%) and the highest was seen in SLP (69.1%). During the 2020 period, appointment completion rates fell for all specialties (general/specialty otolaryngology – 13.0%, pediatric otolaryngology – 12.7%, SLP – 10.2%, audiology – 8.6%, midlevel providers – 8.7%), and was highest for head and neck oncology (25.5%). The telehealth utilization rate for completed appointments in 2020 was highest in pediatric otolaryngology (96.8% [92 of 95 visits]). Telehealth utilization rates were 61.8% (159 of 257), 68.8% (97 of 141), and 66.6% (10 of 15) in general/specialty otolaryngology, head and neck oncology, and for midlevel providers. Telehealth utilization was low in audiology (2.6% [3 of 114]) and in SLP (3.7% [1 of 27]) (Figure 3A).

When stratified by week, we found that general/specialty otolaryngology physicians transitioned to a majority telehealth service between weeks 2 and 3, while head and neck oncology physicians and midlevel providers transitioned between weeks 1 and 2. Pediatric otolaryngology providers performed virtually all of their completed appointment over telehealth from the onset, though it is important to note that only two patients were seen by this subspecialty during week 1. On the other hand, virtually all SLP and audiology visits were completed in-person, with a small amount seen via telehealth at the end of the time period (Figure 3B). Of completed appointments amongst the three major groups of otolaryngology physicians (general/specialty, pediatric, and head and neck oncology), we found that pediatric otolaryngology and head and neck oncology visits each accounted for larger shares of completed visits in 2020 compared to 2019, while 2020 general/specialty otolaryngology visits accounted for a smaller share when compared to 2019.
(pediatric otolaryngology 19.3% vs. 14.4%, head and neck oncology 28.6% vs. 22.3%,
general/specialty otolaryngology 52.1% vs. 63.3%; p<0.001; Figure 3C).

**Patient Age and Practice Patterns During the COVID-19 Pandemic**

During the 2019 period, appointment completion rates between the age groups were similar (range: 58.5% to 67.8%). During the 2020 period, appointment completion rates significantly decreased across all age groups (≤2 years – 11.1%, 3 to 10 years – 9.7%, 11 to 17 years – 13.0%, 18 to 44 years – 13.4%, 45 to 64 years – 14.1%, 65 to 79 years – 15.4%), and was lowest for the ≥80 age group at 8.4%. With the exception of those at the extremes of age (≤2 and 65+), the majority of completed appointments were telehealth visits (range 53.3% to 68.2% for ages 3 and 64). The telehealth utilization rate for those ≤2 was 43.9% (25 of 57), 65-79 was 47.6% (68 of 143), and ≥80 was 34.6% (9 of 26) (Figure 4A).

When stratified by week, we saw that the telehealth utilization rate of those ≥80 lagged behind the other age groups, reaching >50% of visits only during the week 4. The other age groups reached at least 50% during the weeks 2 or 3 (Figure 4B). When comparing telehealth utilization between younger (18-64) and older (65+) adults in 2020, we saw that 187 (59.6%) of all completed visits for younger adults were via telehealth, which was significantly higher than that of older adults (77 [45.6%] of 169 completed visits; p=0.003; Figure 4C).

**Discussion**

Comparable to the drastic adjustment in routine daily living COVID-19 has necessitated, health care administration has transformed considerably. Healthcare systems have revamped their
practice patterns in an attempt to conserve PPE and safeguard both patients and providers.\textsuperscript{12,13} This is true amongst frontline physicians and departments, such as emergency rooms, as well as specialty providers, including otolaryngology.\textsuperscript{14-18} Particularly pertinent to otolaryngology is a heightened concern regarding the increased risk of COVID-19 transmission owing to the nature of the head and neck examination and common otolaryngologic procedures.\textsuperscript{7,8} Furthermore, telehealth and distance care can be especially difficult among subsets of otolaryngology diseases including head and neck cancers and airway disorders.\textsuperscript{19} As the scope of otolaryngology practice is wide, ranging from benign pathologies, including hearing loss and sinusitis, to head and neck cancer, a shift in the quantity and modality of clinical visits is expected and encouraged. Many institutions have fashioned and employed guidelines regarding triaging patient care conditioned on the acuity of the otolaryngologic condition.\textsuperscript{7,8,10} Nevertheless, with a lack of complete understanding of COVID-19 and its impact, there is expected variability within these recommendations.

At the Yale School of Medicine’s Division of Otolaryngology, routine, nonurgent care has been either cancelled, rescheduled, or transitioned to telehealth. Patients with features and symptoms concerning for more malignant pathologies are seen in person initially, or triaged via telehealth preceding an in-person encounter. This has allowed for fewer direct interactions in the setting of a global pandemic, while still providing necessary acute care. In assessing this transition, we analyzed administrative records of our otolaryngology divisions’ outpatient practice patterns during the first four weeks following hospital-wide aggressive COVID-19 policy changes - March 16, 2020 to April 10, 2020 – and compared it to the corresponding time period from one year prior. We specifically examined all board-certified otolaryngology-head and neck surgeons,
speech and language pathologists, audiologists, and otolaryngologic advanced practice providers (including nurse practitioners and physician assistants).

Only 649 of 5,044 (12.9%) of scheduled encounters were completed in the 2020 period, with the majority of visits cancelled secondary to COVID-19, compared to 62% of 5,913 scheduled visits in the 2019 period. Of the 2020 completed visits, 55.8% were via telehealth. In the corresponding 2019 period, no telehealth visits were completed (Figure 1A). Little comparable objective data has quantified the changes in outpatient practice to date. One health care technology company, Phreesia, collected and analyzed data from over 50,000 physician clients from February 1, 2020 through April 16, 2020, utilizing practice management/scheduling software, check-in information provided by patients, and electronic medical records. Consistent with our findings, the COVID-19 affected period saw a significant decline in outpatient visits from baseline. Interestingly, relative to other ambulatory practices, otolaryngology had the second-greatest decline of in-person visitations - approximately 75% - second only to ophthalmology (79%). As mentioned, concern for increased risk of transmission with close examination of the head and neck may contribute to this, and would also apply to ophthalmology. In addition, a relatively large volume of elective, semi-elective, and non-urgent evaluations likely factors in, especially for the surgical sub-specialties.

A weekly increase in telehealth encounters and analogous decrease in in-person encounters was observed among Yale otolaryngology patients, with telehealth surpassing in-person visits at approximately the beginning of the third week (Figure 1B). This likely represents a learning curve in implementing and executing telehealth for the institution, provider, and patient.
Interestingly, while in the first week almost 55% of scheduled telehealth visits were not completed due to patient no-shows or leaving without being seen, by the fourth week only 18% of visits were not completed for these reasons. Furthermore, by the end of the month, a larger percentage of 2020 scheduled telehealth visits were completed compared to 2019 scheduled in-person visits (71.5% vs. 62.0%; p<0.001). Patient and institutional comfort and dexterity with a new interactive format likely contributed considerably to this finding (Figure 2A-C).

Specifically, in regards to provider type, all subspecialty practices incurred a decrease in appointment completion rates in the 2020 period. However, this drop was lowest among head and neck oncology patients, which may reflect a higher acuity in the patients’ pathology. Furthermore, telehealth utilization rates were highest in the pediatric and head and neck oncology sub-specialties, though all specialties exhibited a trend of increasing telehealth usage over the course of one month (Figure 3A,B). While the precise reasoning for higher pediatric and head and neck oncology telehealth utilization rates is unclear, it should be noted that Yale School of Medicine oversees outpatient visits for general and specialty otolaryngology while Yale New Haven Hospital, a separate organization, manages the head and neck oncology and pediatric otolaryngology clinics. Another explanation may, again, include the acuity of care necessitating increased efforts to coordinate visits. Within pediatrics, pre-existing comfort level with technology and telehealth among younger parents and teenagers may be a contributing factor. Not surprisingly, the total number of SLP and audiology visits dropped precipitously in 2020 compared to 2019, and the majority of 2020 visits occurred in-person (Figure 3A,B). SLP and audiology represent fields in which patients are commonly referred for less acute pathologies and exams are more difficult to perform remotely.
General and specialty otolaryngology visits accounted for 63.3% of overall visits in 2019, but only 52% of visits in 2020. 28.6% and 19.3% of all physician visits in 2020 were seen by head and neck oncology and pediatric otolaryngology, respectively, a 5-6% relative increase in each (Figure 3C). Once more, the precise reasoning for this cannot be ascertained from our data. However, as mentioned previously, the dual managing Yale organizations and difference in patient populations may account for this distinction.

Appointment completion rates fell across all age groups in 2020 by 10-15%, with the lowest completion rates in patients ≥80 years old. There was a subsequent rise in telehealth visits universally. However, while the majority of patients’ care transitioned to telehealth, patients ≤2 and ≥80 years old received mostly in-person care (43.9% and 34.6% seen via telehealth, respectively; Figure 4A-C). Both populations represent at-risk patients historically, which is particularly true amongst the elderly during the COVID-19 pandemic.\textsuperscript{21,22} Thus, the slower transition to telehealth for these patients is a cause for concern and further analysis.

One inherent limitation of the current study is its retrospective nature. Additionally, only a four-week time frame was utilized limiting the number of scheduled visits and the analysis included. It is likely that these trends continue to evolve. Lastly, this was a single institution’s experience, which can limit the globalization of our findings. Nonetheless, quantitative data can allow other institutions to glean useful information on possible transitioning methods and expected practice alterations. Continuing to monitor trends within healthcare systems during the COVID-19 pandemic is crucial. Consistent findings of increased in-person interaction among at-risk
populations, for example, may promote innovative and useful action in the application of safe care. Furthermore, with a broader call for healthcare reform and universal access to affordable care, efficient use of resources, via patient triaging and telehealth, can have a profound impact beyond the COVID-19 pandemic.

Conclusion

COVID-19 has had a rapid and global impact on the triaging and administration of health care. The vast majority of outpatient visits in our otolaryngology division were rescheduled or cancelled in response to this pandemic. We identified a sharp rise in the number of telehealth visits, which became more efficient in their completion rates over time. Importantly, older adults were more likely to be seen in person and less likely to have telehealth visits compared to younger adults. Further identification of healthcare trends is vital to promoting safe and efficient care.

Acknowledgement

The authors gratefully acknowledge the support provided by Chassidy Wells, CPC for her assistance in obtaining clinical billing data.
References


Legends

Figure 1) A–Total Breakdown of Scheduled Visits to the Yale Otolaryngology Division in 2019 and 2020; B–Weekly Breakdown of Number of Completed In-Person and Telehealth Visits in 2020

Figure 2) A–Breakdown of Scheduled 2020 Telehealth Visits; B–Weekly Breakdown of Scheduled 2020 Telehealth Visits; C–Completion Rates of In-Person 2019 Visits vs. Telehealth 2020 Visits

Figure 3) A–Visits Breakdown by Specialty; B–Weekly Breakdown of Telehealth vs. Inpatient Visits by Specialty; C–Proportion of Completed Visits to Otolaryngology Physicians between 2019 and 2020

Figure 4) A–Visits Breakdown by Age; B–Weekly Breakdown of Telehealth vs. Inpatient Visits by Age; C–Proportion of 2020 In-Person and Telehealth Visits between Younger (18-64) and Older (65+) Adults
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Figure 2

(A) 506 Scheduled Telehealth Visits Between 3/16/20 - 4/10/20

(B) % of All Scheduled Telehealth Visits

(C) 3/18/19 to 4/12/19: 5913 Scheduled In-Person Visits

3/16/20 to 4/10/20: 506 Scheduled Telehealth Visits

- Video Visits Completed (n = 224 [44.3%])
- Phone Visits Completed (n = 138 [27.3%])
- Cancellations (n = 75 [14.8%])
- No Shows or Left w/o Being Seen (n = 69 [13.6%])

Chi-Squared p<0.001

2,248 Scheduled (38.0%)
3,665 Scheduled (62.0%)

144 Scheduled (28.5%)
362 Scheduled (71.5%)

Not Completed (Canceled, No Shows, Left w/o being Seen)
Completed Visits
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EXEMPTION DETERMINATION

Determination Date: 4/10/2020

Investigator: R Peter Manes
Type of Review: Initial Study
Title of Study: The Impact of the COVID-19 Pandemic on an Academic Otolaryngology Practice
IRB Protocol ID: 2000027831
Submission ID: 2000027831
Documents: • Telehealth Exemption IRB.pdf, Category: IRB Protocol;

- Exempt Category 4: Secondary research on data or specimens.
- The IRB has granted a waiver of HIPAA authorization for access to and use of protected health information (PHI) as described in the approved protocol for the entire study. This waiver does not authorize subject contact.
- HIPAA regulations require that accounting logs be maintained when researchers access patient records under a waiver of authorization including those approved for recruitment purposes. You are thereby reminded of your obligation to create the log. For further information on maintaining logs and on the accounting of disclosures, please see hipaa.yale.edu.
- The protocol does not require annual IRB review.

See the next page for important reminders.
IMPORTANT REMINDERS:

- Exempt research does not require additional IRB oversight except in cases where the study is to be modified in a way that would change the applicability of the exempt status.

- Should you wish to modify the study in way that affects the applicability of the exemption determination, a new protocol must be submitted for the IRB review. See IRB Guidance document 100 GD 9: Guidance on Exemption from IRB Review for examples.

- Information that requires prompt reporting to the IRB must be done so within 5 days of the PI becoming aware of the event (see Policy 710: Reporting Unanticipated Problems Involving Risks to Subjects or Others, including Adverse Events). This includes potential serious noncompliance, continuing noncompliance, and unanticipated problems to subjects or others.

- In conducting this activity, you should refer to and follow the Investigator Manual (HRP-103) as applicable, which can be found in the IRB Library within the IRB system.

Please keep this letter with your copy of the protocol documents.