


Medical students' perspectives on how COVID-19 has impacted their otolaryngology educational experience: A nationwide survey study

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Abstract

Objectives: To evaluate how medical students perceive COVID-19 has impacted various otolaryngology educational experiences and appreciate useful adaptations/resources that can be implemented moving forward. **Methods:** We circulated a web-based questionnaire among pre-clinical/clinical medical students. Participants were asked to rate their experiences in the realms of research, clinical exposure, faculty interaction, interest group (IG) activities, advising, and USMLE preparation considering the COVID-19 pandemic. Qualitative responses were mapped into thematic domains. **Results:** Completed responses from 201 medical students demonstrated an effect across all educational activities. Pre-clinical students experienced a negative impact on their IG involvement (77%; 86/111) and clinical students reported a diminished clinical experience (60%; 40/67), with 54% (36/67) citing below-expectation surgical exposure. Overall, 51% (90/178) of students reported a perceived decrease in beneficial otolaryngology career advising, decreased research involvement (57%, 101/178), and reduced faculty interaction (79%, 141/178). Faculty mentorship programs, curated video resources, and online question banks were selected as valuable resources during COVID-19 (21%, 20%, and 13% of selections, respectively) that may offer ongoing benefit. Free-response feedback also indicated that COVID-19 negatively impacted students' mental well-being and inhibited opportunities to complete away sub-internships. As for supplemental resources, students appreciated virtual grand rounds/teaching, interest group events, online resources, and meetings with attendings/residents. **Conclusions:** According to students, COVID-19 negatively impacted a broad array of otolaryngology educational experiences including research, faculty interaction, and interest group involvement. Students also indicated several well-received adaptations, such as virtual mentorship programs, curated video materials, remote research opportunities, and online question banks. This feedback helps contextualize selection committee decisions and, importantly, assists clerkship directors and undergraduate medical educators to optimize their curriculums.

Keywords

otolaryngology, education, COVID-19, medical education, survey, ENT, United States, head and neck surgery

Introduction

Like many other facets of healthcare, undergraduate medical education across the United States continues to experience changes due to the COVID-19 pandemic. To continue effectively educating future physicians, while also prioritizing safety, medical schools introduced a variety of alterations to their educational curricula. As a result, students needed to adjust to the new realities of virtual classroom learning, research experiences, faculty interactions, USMLE preparation, and clinical exposure.

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Matching into otolaryngology residency is a rigorous and competitive process—requiring strong faculty letters of recommendation, excellent clinical performance on sub-internships, and high grades and USMLE scores.¹ COVID-19 precautions introduced an added layer of challenges and stress as students attempt to assess their interest in the field and compile a competitive application. With most programs limiting or suspending away rotations the past two cycles, many residency directors have also had to grapple with evaluating candidates without the prior rapport often established through visiting sub-internships.^{2,3}

Early in the pandemic, many of these challenges resulted in innovative adaptations. Key challenges to overcome included truncated clinical experience for 3rd and 4th year students, minimal in-person patient interactions, and suspension of in-person residency interviews. Proposed innovative solutions to COVID-imposed limitations ranged from hosting virtual “meet and greet” sessions with residency applicants to using novel interactive online resources to advance surgical knowledge.³⁻⁵

Few studies have provided direct feedback from medical students about their educational experiences during COVID-19. In one of these studies on *general* medical education, Coffey et al surveyed colleagues at UC San Diego and found that while many students appreciated the flexibility of hybrid learning and expanded access to online resources, a significant number of students also felt increased anxiety, isolation, and difficulty concentrating on studies while home amid the pandemic.⁵

In this study, we sought to investigate perceptions among medical students regarding the impact of COVID-19 on their *otolaryngology* educational experiences. We conducted a nationwide survey of students attending medical schools selected to provide broad geographic representation and address fundamental aspects of medical education, including pre-clinical/clinical learning, USMLE preparation, faculty interactions, and research experience.

Patients and Methods

Design

This study was approved by the Columbia University Institutional Review Board (IRB AAAT0653). Data were obtained via a survey distribution. All co-authors collaborated to develop our final questionnaire. The survey was created via Qualtrics (Provo, Utah).⁶ Utilizing “select-all that-apply,” “multiple choice,” and “free response,” questions, both quantitative and qualitative feedback were obtained. Thirty questions were included taking an average of 12 minutes to complete. Survey flow branched primarily based on respondents’ medical school progression: pre-clinical (1st, 2nd year), clerkship year (3rd year), or post-clerkship year (4th year). Questions were tailored for each phase of medical education.

The questionnaire was designed to evaluate two major themes: (1) factors influencing respondents’ decision to pursue a residency in otolaryngology (independent of COVID-19) and, (2) the impact of pandemic-imposed social restriction on student education and experiences in otolaryngology. This manuscript focuses on the results of the latter set of questions. Respondents were asked how COVID-19 impacted a variety of experiences including research, clinical exposure, faculty interaction, interest group activities, advising, USMLE preparation, clerkship rotation, and their anatomy course. The survey can be viewed in [Supplementary Appendix 1](#).

Population and distribution

A Qualtrics-generated survey link was distributed to otolaryngology interest group (IG) leaders at 37 allopathic medical schools which were targeted to provide comprehensive geographic representation of medical training in the United States. IG leaders were instructed that all members were eligible to participate in the survey, regardless of their intention to pursue an otolaryngology residency. To improve response rate, participants who provided their email addresses were entered in a pool to receive \$50 gift cards. The survey was anonymous and optional with all participants providing written informed consent prior to participation. It was initially distributed via email on November 17, 2020, to the primary IG leadership contacts. Follow-up emails were sent to non-respondents in two-week intervals for an additional 6 weeks. Additional IG contacts were also utilized when available.

Statistical analysis

Only complete responses were included in the analysis. Counts and frequencies were used to generate descriptive statistics. Qualtrics software was utilized for data compilation and crosstab analyses before being exported into Microsoft Excel for final statistical analysis. When describing our findings, the terms “majority” or “most” were utilized to indicate that at least 51% of respondents held the specified position.

Two free-response questions yielded a total of 321 narrative comments, which were analyzed and thematically mapped by two independent graders (AH and VY). Themes were then reviewed by authors to finalize thematic domains. Representative comments were reported.

Results

Response and demographics

A total of 227 independent responses were recorded, with 201 (89%) representing fully completed responses. Female respondents accounted for 104 (52%) of respondents. Pre-clinical, clerkship, and post-clerkship students comprised 55%, 24%, and 21% of respondents, respectively. Medical

school representation was distributed across the country, including the Northeast and Southwest (23% of respondents each), Midwest and West (20% of respondents each), and Southeast (14% of respondents). Approximately half of respondents (51%) were “probably or definitely” applying into otolaryngology, followed by 31% who were undecided, and 18% who were probably/definitely not. The number of respondents per institution ranged from 1 to 24. Respondent characteristics are included in [Table 1](#).

Pre-clinical directed questions

Anatomy course, ENT exposure, and interest group impact

Three questions regarding students’ anatomy course, ENT exposure, and IG activities were answered solely by pre-clinical students. A majority of pre-clinical students (67%; 74/111) indicated that COVID-19 had a “somewhat” or “very negative” impact on their anatomy course, with 16% (18/111) believing it had a neutral effect. Most pre-clinical students (62%; 69/111) also believed COVID-19 negatively impacted their ability to gain ENT exposure. Finally, 77% (86/111) of students stated that COVID-19 somewhat or very negatively

impacted their ability to become involved with the ENT IG. [Figure 1](#) further illustrates these pre-clinical results.

Clinical directed questions

Clinical/surgical exposure, assessing interest

Most clinical students (60%; 40/67) indicated that COVID-19 had a “somewhat” or “very negative” impact on their ENT clinical experience. Similarly, 54% (36/67) believed COVID-19 negatively impacted their ability to gain ENT surgical exposure. Moreover, 46% (31/67) of clinical students felt COVID-19 had a negative impact on their ability to assess their interest in ENT. [Figure 2](#) depicts these findings.

Faculty/department support and app competitiveness

At 54% (36 of 67), most clinical students felt that COVID-19 had a “somewhat” or “very negative” impact on their application competitiveness, with 30% (20/67) reporting a neutral impact. As for faculty/department support, 49% (33/67) of clinical students believed COVID-19 had a neutral effect, followed by 24% (16/67) who felt it had a negative effect.

Table 1. Respondents’ general characteristics.

Respondents				
		Total	227	
		Completed	201 (89%)	
Sex	Male		97 (48%)	
	Female		104 (52%)	
School Progression	Pre-Clinical (M1-2)		111 (55%)	
	Clerkship (M3)		48 (24%)	
	Post Clerkship (M4)		42 (21%)	
Intention to Apply	Definitely/Probably		103 (51%)	
	Undecided		62 (31%)	
	Probably/Definitely Not		36 (18%)	
School Representation	Contacted: 37			
	Responded: 30			
	Mean Respondents Per School: 6.69		Range (per school respondents): Min- 1; Max- 24	
	By Region		By Rank ^a	
	Northeast	7 (23%)	1 to 20	7 (23%)
	Southeast	4 (14%)	20 to 40	12 (40%)
	Midwest	6 (20%)	40 to 60	5 (17%)
	Southwest	7 (23%)	60–80	5 (17%)
	West	6 (20%)	80+/Unranked	1 (3%)

^aSchool rank according to US News & World Report Research Rankings, 2021.

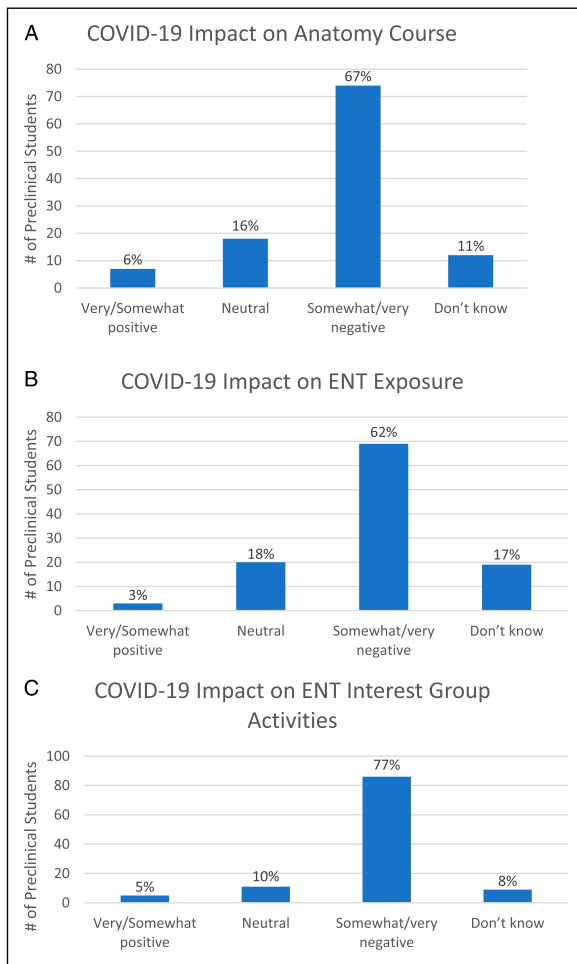


Figure 1. Pre-clinical questions; A. COVID-19 impact on anatomy course/lab; B. COVID-19 impact on ENT exposure; C. COVID-19 impact on interest group activities.

Additional helpful resources

In a “select all that-apply” question shown in Figure 3, clinical students most often selected a formal faculty mentorship program as the most helpful resource to integrate into the otolaryngology curriculum moving forward during COVID-19 (21%; 43 of 209 selections), followed by curated video material (20%; 41 of 209 selections), and online question banks (13%; 28 of 209 selections).

Broadly directed questions

Advising. Overall, 51% (90/178) of students indicated that COVID-19 had a somewhat/very negative impact on ENT advising. However, when stratified by educational progression, 65% (72/111) of pre-clinical students felt that advising was negatively impacted by COVID-19 compared to 27% (18/67) of clinical students (Figure 4a).

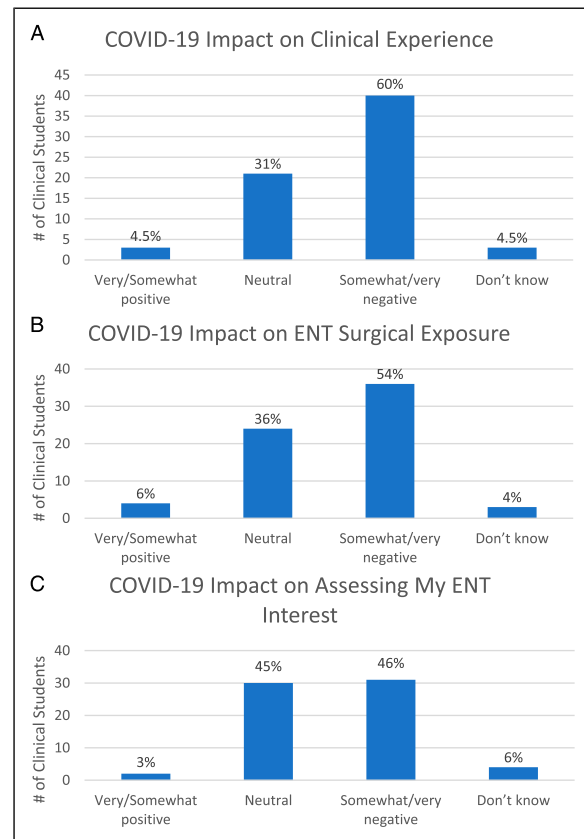


Figure 2. Clinical questions; A. COVID-19 impact on clinical experience; B. COVID-19 impact on ENT surgical exposure; C. COVID-19 impact on assessing interest in ENT.

USMLE exam, research, and faculty interaction

Among all students, 33% (59/178) felt that COVID-19 had a neutral impact on USMLE exam preparation, followed by 26% (47/178) who were unsure, and 25% (44/178) who indicated it had a negative impact. A majority of students (57%; 101/178) stated that COVID-19 had a negative impact on their ability to obtain ENT research experience. Moreover, when stratified, 64% of pre-clinical students agreed that COVID-19 had a negative impact on research involvement. As for faculty interaction, 79% (141/178) of students overall stated that COVID-19 had a negative impact. Comparison for these factors by educational progression can be viewed in Figure 4b-d.

Qualitative results

Ten thematic domains were developed from the free-response question, “How have COVID-19 related changes affected your plans for this year (2020–2021)?” These domains range from those encompassing comments regarding COVID’s impact on shadowing, to research, to pre-clinical/clinical grading (Table 2a).

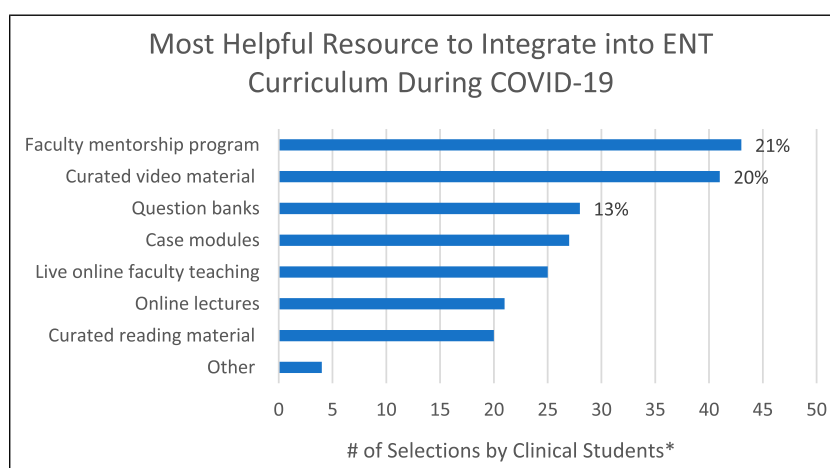


Figure 3. Helpful resources to integrate during COVID-19. *Select-all-that-apply question format; therefore, total will not equal number of clinical students in study.

Ten thematic domains were also developed from the free-response question, “What supplemental resources are available to you during COVID to enhance your learning and exposure to otolaryngology?” These domains include comments about virtual interest group meetings, online resources/textbooks, and Zoom meetings with mentors (Table 2b).

Discussion

This national survey study of 201 medical students sought to better understand how COVID-19 impacted their otolaryngology education and key experiences. We also elucidated medical students’ opinions on which novel resources were most valuable. Qualitative, free-response comments expounded on (and often supported) many of the multiple choice, quantitative findings. We found that most students believe COVID-19 negatively impacted a broad array of pre-clinical and clinical otolaryngology experiences.

Interest group involvement

The adverse impact felt by students begins in the pre-clinical stages. In our general otolaryngology survey, most pre-clinical students agreed that the IG provided their “most significant exposure” to otolaryngology.⁷ In this COVID-19 oriented survey, pre-clinical students report that their involvement in IG activities was in fact negatively affected. This finding is substantial for several reasons. Even prior to the pandemic, students’ otolaryngology exposure was already limited due to a variety of factors, including the optional nature of many otolaryngology clerkship rotations, limited time allocated for head and neck pre-clinical education, and the relatively small size of the field.^{8,9} Otolaryngology interest groups provide a unique avenue for students (especially pre-clinical) to gain valuable, multifaceted exposure to the field via research, faculty/resident mentorship, and shadowing opportunities.¹⁰ These early

experiences are crucial, as exposure to the field plays a major role in students’ ultimate decision about whether to pursue the specialty.¹⁰⁻¹²

While most students indicated that their IG was hindered by COVID-19 (e.g., suspending all events), some stated that their IGs adjusted operations and served to keep them engaged remotely. When asked about valuable supplemental resources during COVID-19, these students replied, “interest group [remote] talks/meetings” and “the student IG is still active and has hosted events over Zoom.” Accordingly, we propose that virtual IG activities, such as speaker series, resident Q&As, and faculty lectures, can serve as invaluable connections to otolaryngology for medical students, particularly if in-person activities are curtailed once again.

Research opportunities

A majority of pre-clinical students (64%) reported an adverse impact on research opportunities, possibly due to limited in-person interactions with faculty and patients. This sentiment was captured by numerous comments; when asked how COVID-19 impacted their plans, students responded, “[I] planned on completing a prospective study over the summer, but it was canceled,” “summer research programs [were terminated]” and “it has made obtaining research more difficult.” This limitation may have a significant adverse effect on applicants since research experience provides students with valuable exposure to otolaryngology and opportunities for mentorship.¹ The impact of research hindrance is even more substantial today, as program directors place an increasing emphasis on research when evaluating applicants around the era of COVID-19.³

Nevertheless, a subset of students continued, or even increased, their engagement in research projects during the pandemic. Students stated that supplemental resources provided to them included, “doing research remotely,” and

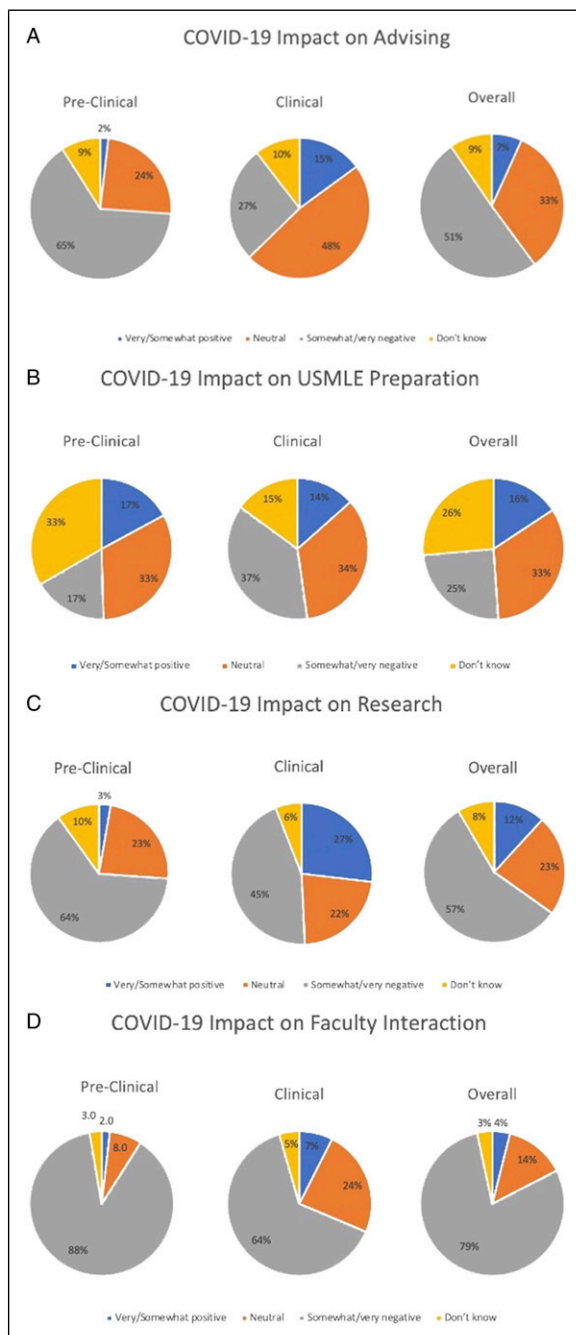


Figure 4. Broadly directed questions; A. COVID-19 impact on advising—comparison by educational progression; B. COVID-19 impact on USMLE STEP exam preparation; C. COVID-19 impact on research; D. COVID-19 impact on faculty interaction.

engaging in “...chart reviews for retrospective studies.” Shahrivini et al similarly found that several students utilized the increased flexibility during COVID-19 to maximize research engagement.¹³ By prioritizing research opportunities which can be completed remotely, such as literature reviews, meta-analyses, and retrospective chart reviews, otolaryngology departments can continue engaging students and

developing their research portfolios, regardless of in-person guidelines.

Faculty interactions and mentorship

Seventy-nine percent of students in our study reported that COVID-19 negatively impacted their interactions with otolaryngology faculty members. This impact on mentorship was well-captured by several comments. One respondent stated, “it is much harder to interact with faculty and begin the process of mentorship,” and another said, “...[I] could not participate in the structured mentorship program over the summer as it was canceled.” The importance of developing and fostering faculty relationships in a field as intimate as otolaryngology cannot be overstated. Through faculty mentorships, students gain clinical/lifestyle insights into the field, productive research opportunities, and letters of recommendation for residency applications. In a survey of program directors, Kasle et al found that 82.8% expressed that a strong faculty letter of recommendation was the most important factor in their evaluation of applicants in the era of COVID-19, confirming the importance of valuable mentor relationships in the otolaryngology application process.³

Although COVID-19 limited *in-person* faculty interactions for most, *virtual* relationship-building (through zoom, phone calls, etc.) with faculty and residents remained a useful means of mentorship for many. Several students commented that valuable resources, included “increased online mentorship opportunities” and “resident mentorship programs...developed during COVID for MS3s...planning to apply to otolaryngology.” Confirming these qualitative findings, “faculty mentorship program” was most often selected by students as the most valuable additional resource to be integrated during COVID-19. Otolaryngology departments and medical school administrations would be well served to facilitate these types of virtual mentorship opportunities for students should in-person interactions be once again limited. Furthermore, even after the era of COVID-19, the use of more virtual mentorship approaches can serve as an effective supplement to in-person mentorship, as this form of communication is both valuable to students and offers increased flexibility for faculty whose time is often greatly limited by clinical and administrative responsibilities.

Remote learning resources

Following faculty mentorship programs, students indicated that the next three most selected valuable resources to be integrated during COVID-19 included curated video materials, question banks, and case modules. Similar to our findings, Shahrivini et al found that 84% of pre-clinical students at UC San Diego agreed that online question banks were valuable learning resources during COVID-19, followed by 83% and 64% saying the same about recorded didactic lectures and Complete Anatomy, respectively.¹³ These additional online learning resources likely increased in importance given

Table 2. Qualitative response domains.**2a. How have COVID-19 related changes affected your plans for this year (2020-2021)?****I. Impact on Shadowing Exposure and Surgical Experience**

- "I can't shadow in the fields I am interested in so I don't know how to pick a specialty or get exposed to it early on."
- "Less opportunity to shadow in the OR and clinic."
- "Couldn't gain any exposure which is scary because it is such a small, tight knit community which relies on making connections and doing research."
- "Surgical experience limited due to COVID surgery restrictions."
- "Hard to do anything in person, and in-person training sessions for things like scoping techniques are over zoom or have limited capacities that fill up quickly."

II. Impact on Research/Decision to Take a Research Year

- "Planned on completing prospective study in ENT over the summer but it was canceled..."
- "Summer research programs were canceled."
- "Haven't been able to...pursue any in-person clinical/research experiences."
- "I was potentially going to apply straight through, but felt more inclined to pursue a research year as the pandemic unfolded."

III. Virtual Interviews

- "Inability to visit programs in person is my main concern - finding a good fit virtually will be more challenging."
- "Loss of away rotations, inability to visit programs during interview, possible "hoarding" of interviews by other students due to ease of virtual interviews"
- "Virtual residency applications and interviews"

IV. Cancelled/Shortened ENT Clerkship, Electives, and Away Rotations

- "Canceled organized elective with otolaryngology department."
- "Decrease in clinical rotations and delay in starting rotations."
- "Our clerkships have been shortened but we have the same requirements as previous years, making the year much more stressful."
- "3 months of clerkships turned into online clerkships turned into online didactics. Shelf scores ranked and I lack competitiveness now."
- "No away rotations- was previously critical to match due to our school being relatively unknown."
- "Could not do away rotations (wasn't able to obtain letters from programs I was interested in)."

V. Virtual Learning & Anatomy Lab

- "My MI experience will be almost entirely virtual."
- "All lectures and most clinical activities are remote."
- "Importantly, our gross anatomy lab is online which removes the opportunity to explore the use of basic surgical tools/techniques."
- "Was not able to move on campus to medical school and will be missing out on...anatomy lab, and physical exam skills."
- "As a first-year pre-clinical student, I did not get to do the usual first-year anatomy dissections."

VI. Interest Group

- "They have limited my involvement in interest group and other extracurricular activities."
- "Cancelled all opportunities for clinical shadowing and many interest group activities..."
- "Limited in person...interest groups."

VII. ENT Mentorship/Faculty Interactions

- "Could not participate in the ENT mentorship program over the summer (it was canceled)."
- "As an MI, all classes are online so I have not been able to meet any faculty."
- "It is much harder to interact with faculty and begin the process of mentorship."

VIII. Isolation Mental Wellness

- "It's affected basically every realm of my life."
- "I sit at home all day and don't interact with actual people. Canceled my wedding."
- "Made me more sad."
- "As a first year it's been disappointing. We are unable to...meet our classmates in person, truly meet our professors, or get much of an idea about what it is like to practice medicine. It has been one setback after the other."

IX. STEP Exam & Grading

- "Delayed step 1 examination due to cancelations."
- "Delayed taking of Step 2 CK."
- "Rotations are graded P/F at my school because of quarantine."
- "Our school changed clinical rotations to P/F three-week rotations."

X. No Effect

- "I am in pre-clinical years, so they have not changed my plans significantly."

(continued)

Table 2. (continued)**2a. How have COVID-19 related changes affected your plans for this year (2020-2021)?**

- “No real changes.”
- 2b. What supplemental resources are available to you during COVID to enhance your learning and exposure to otolaryngology?**
- I. Recorded/Zoom Lectures, Grand Rounds, Didactics**
 - “The ENT department has some recorded lectures about the field of Oto that are designed for students who have minimal knowledge of the field.”
 - “Grand rounds through zoom and zoom lectures from around the country.”
 - “Weekly M&M conferences that have become online.”
- II. Virtual Interest Group Meetings**
 - “None that I know of besides the interest group which has had meetings on Zoom.”
 - “Interest group meetings, websites with information about otolaryngology.”
 - “The student interest group is still active and has hosted events over Zoom.”
- III. Research**
 - “Minimal besides chart reviews for retrospective studies.”
 - “Doing research remotely.”
 - “There are remote opportunities for research and involvement with my home program but they are limited.”
- IV. Online Resources, Textbooks**
 - “I have access to online articles and publications through my school’s library.”
 - “Pasha textbook.”
 - “Headmirror.com”
 - “Online modules through Aquifer”
 - “I have been using the student section on the AAO-OHNS website!”
 - “Online Med Ed”
- V. Zoom Meetings with Mentors, Attendings, Residents**
 - “There have been zoom meetings with otolaryngology attendings to promote the field.”
 - “I have had virtual meetings with my faculty mentor.”
 - “Increased online mentorship opportunities.”
 - “One on one zoom meetings with current residents & faculty.”
- VI. Journal Club**
 - “In-house journal clubs”
 - “Medical student journal club”
- VII. Virtual Advising/Q&A Sessions**
 - “Virtual residency information sessions”
 - “I’ve gone to virtual Q&As for some residency programs along with my classmates that are applying this cycle just to get more info.”
- VIII. Limited In-Person Clinical Experience**
 - “I am still able to attend my 1/2 day of clinic a week.”
 - “...ability to scrub into cases on occasion.”
 - “We have been recently allowed to shadow, but there are limited opportunities.”
- IX. Virtual Rotations, Sub-Is, Conferences**
 - “Virtual away rotations”
 - “Virtual sub-Is”
 - “I’ll be attending virtual conferences throughout the next 2 years.”
- X. None**
 - “None to my knowledge.”
 - “None yet. My institution is trying to make a program for early exposure to ENT.”

COVID-19’s perceived negative impact on anatomy courses, according to most pre-clinical respondents (67%), as well as on clinical and surgical experiences per clinical students (60% and 54%, respectively).

Students in our survey specified several didactic resources they found helpful during COVID-19. Among these were included [Headmirror.com](https://www.headmirror.com/) (a website providing general

otolaryngology information and statistics/advice regarding matching into the field), Pasha’s “Otolaryngology-Head and Neck Surgery,” OnlineMedEd (providing lecture-style videos), and Aquifer (a case-based online learning tool with supplemental questions).¹⁴⁻¹⁷ Hussain et al similarly recommended several resources that could be helpful for students during the pandemic as well: LearnENT to provide case-based

content, Mayo Clinic's Otolaryngology—Head and Neck Surgery Video Atlas to help bolster students' surgical knowledge, and Great Lakes Otolaryngology Consortium for lecture-based content.^{4,18-20} To augment student learning, medical school administrators and clerkship directors could integrate some of these online resources into their curriculums, regardless of in-person teaching limitations.

USMLE STEP exam and mental health

We also sought to elucidate how students' USMLE STEP exams were impacted by COVID-19. Several students commented that their STEP 1 or 2 exams were postponed or canceled. Regarding exam preparation, most students (59%) responded that they were either neutrally impacted or unsure, with one-fourth of all respondents feeling negatively impacted. On the other hand, Shahrivini et al found that most medical students (56.7%) felt that COVID-19 negatively impacted their STEP 1 exam preparation.¹³

Personality and studying preferences may influence how each individual perceives COVID-19's impact on their exam preparation. For instance, a more introverted and self-motivated individual might prefer the extended seclusion and the study timing flexibility that the pandemic provides. Alternatively, an extravert who prefers learning among peers and the structure of a social daily routine or library study spaces might struggle with COVID-era USMLE preparation. Mental health and wellness play an important role in this regard as well. For many students, remaining home during COVID-19, away from colleagues and an adequate social support system, left them feeling isolated, lonely, and struggling to concentrate.⁵

Educational restrictions implemented during the COVID-19 pandemic impacted numerous factors that are important pillars of a successful otolaryngology application, including clinical/surgical exposure, research involvement, conference networking, faculty mentorship, letters of recommendation, and USMLE preparation/performance. Moreover, our qualitative findings suggest that many COVID-era clinical students are being evaluated on a pass/fail basis due to shortened rotations, which may increase well-being but limit a student's ability to stand out among their peers.²¹⁻²⁴ These diverse effects of COVID-19 necessitate a holistic review approach when considering applicants over the next few cycles—for instance, residency directors may reconsider primarily using quantitative measures (e.g., Step 1 score and number of Honor grades) to screen applicants while placing increased emphasis on the interview and valuable extracurricular involvements in their review process.²⁵

Limitations & strengths

Our study has limitations. First, due to our survey distribution method (via IG leaders at various medical schools to IG members), we were unable to calculate an overall response

rate. Instead, we can report an interest group response rate (of the 37 ENT IGs contacted, 30 (81%) forwarded the survey on to their members and provided at least 1 response). Second, while our study elicits respondents' general attitudes about how COVID-19 impacted various aspects of their otolaryngology education (positively or negatively), we could not always capture the more nuanced details of why respondents answered as they did. To address this limitation, we designed two open-ended questions to capture qualitative, free-response answers from students, as well as a free-response text box for any additional comments.

Lastly, although we report several important ways COVID-19 has impacted students' otolaryngology-related experiences, we cannot comment on outcomes—for example, number of applicants matching to otolaryngology, quality of applicants, or preparedness for residency. For instance, although we show that pre-clinical students believe their IG involvement has been adversely affected, we cannot conclude that the number of applicants will decline as a result. This limitation is related to our study population, which includes medical students who have yet to apply into otolaryngology, as well as those of varying interest in the field. However, given that the majority of our study participants indicated they were probably/definitely applying into otolaryngology (51% of students overall; 63% of clinical students), we believe our findings can be reasonably applied to the applicant pool. Nevertheless, the longterm effects of COVID-19 on otolaryngology applicants should be studied in the future once these classes have gone on to apply and match to residency programs.

There are several strengths of this study. The currently published literature presents valuable otolaryngology resources developed during the pandemic, individual author's opinions about the impact of COVID-19 on medical education, or survey data on *general* COVID-era medical education.^{5,13,25-31} However, our study is the first to specifically evaluate how students felt their *otolaryngology* education/experiences were impacted by COVID-19. Moreover, our study is among the largest published (on the topic) in the literature to-date, with over 200 students. We were also able to capture a diverse population of students by educational progression and geographic representation. Finally, our study is unique in that it includes both quantitative and qualitative narrative results which often support and expound upon each other.

Conclusion

We surveyed over 200 medical students from across the country to better understand how COVID-19 impacted their otolaryngology educational experiences. Students expressed that the pandemic had a broad negative influence including on their anatomy lab, otolaryngology IG involvement, surgical/clinical exposure, faculty interactions, advising, and research. Respondents valued integration of virtual faculty mentorship programs, curated video materials, and question banks into the

curriculum, representing opportunities for continued inclusion of these resources and support moving forward.

These findings may assist residency directors as they consider and train candidates in the upcoming residency classes. Our study can also provide medical school administrators and otolaryngology clerkship directors with valuable student feedback regarding how the pandemic has impacted them and which helpful adaptive resources/changes could be carried forward beyond the era of COVID-19.

Declaration of Conflicting Interests

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Statement of human and animal rights

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Statement of informed consent

Written informed consent was obtained from the participant(s) for their anonymized information to be published in this article.

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Supplemental material

Supplemental material for this article is available online.

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