The Laryngoscope

Otolaryngology Resident Practices and Perceptions in the Initial Phase of the U.S. COVID-19 Pandemic

Yi Cai, MD[#]; Nicole T. Jiam, MD[#]; Katherine C. Wai, MD[#]; Elizabeth A. Shuman, MD; Lauren T. Roland, MD; Jolie L. Chang, MD

Objective: The coronavirus 2019 (COVID-19) pandemic has had widespread implications on clinical practice at U.S. hospitals. These changes are particularly relevant to otolaryngology–head and neck surgery (OHNS) residents because reports suggest an increased risk of contracting COVID-19 for otolaryngologists. The objectives of this study were to evaluate OHNS residency program practice changes and characterize resident perceptions during the initial phase of the pandemic.

Study Design: A cross-sectional survey of U.S. OHNS residents at 81 programs was conducted between March 23, 2020, and March 29, 2020.

Results: Eighty-two residents from 51 institutions (63% of invited programs) responded. At the time of survey, 98% of programs had enacted policy changes to minimize COVID-19 spread. These included filtered respirator use for aerosol-generating procedures even in COVID-19-negative patients (85%), decreased resident staffing of surgeries (70%), and reduced frequency of tracheotomy care (61%). The majority of residents (66%) perceived that residents were at higher risk of contracting COVID-19 compared to attendings. Residents were most concerned about protective equipment shortage (93%) and transmitting COVID-19 to patients (90%). The majority of residents (73%) were satisfied with their department's COVID-19 response. Resident satisfaction correlated with comfort level in discussing concerns with attendings ($r = 0.72$, $P < .00001$) and inversely correlated with perceptions of increased risk compared to attendings ($r = -0.52$, $P < .00001$).

Conclusion: U.S. OHNS residency programs implemented policy changes quickly in response to the COVID-19 pandemic. Sources of resident anxieties demonstrate the importance of open communication and an integrated team approach to facilitate optimal patient and provider care during this unprecedented crisis.

Key Words: COVID-19, coronavirus, otolaryngology, residency programs, risk perceptions, personal protective equipment (PPE), anxiety, resident burnout, safety.

Level of Evidence: 4.

***Laryngoscope*, 130:2550–2557, 2020**

INTRODUCTION

On January 21, 2020, the United States reported its first case of the novel coronavirus disease 2019 (COVID-19).[1] As of April 3, 2020, the United States leads the world in confirmed cases with over 278 thousand people affected,[2,3] and over 30 states have adopted directives to keep people at home to "flatten the curve."[4] As the number of coronavirus cases continues to climb, healthcare systems have begun to feel the strain on resources. On March 24, 2020, the Center for Disease Control and Prevention[5] recognized that different states may have varying degrees of risk but nonetheless recommended that all U.S. hospitals prepare for a surge of patients with COVID-19 requiring acute and critical care. Preparations included changing practices to prevent the spread of disease and to protect the safety of healthcare workers (HCWs). In response to an evolving body of information from this early stage of the pandemic, some hospitals and professional societies[6] modified departmental policies and physician–hospital coverage plans to minimize risk,[7] viral exposure, and personal protective equipment (PPE) depletion.

Teaching hospitals face the unique responsibility of balancing current public health goals with resident education.[8,9] Specific to otolaryngology–head and neck surgery (OHNS),[10] many procedures such as endoscopy; tracheotomy; and sinus, skull base, and upper airway surgery can aerosolize respiratory droplets. The high viral loads in the nasal[11] and oropharyngeal mucosa, along with our current understanding of the route of severe acute respiratory syndrome (SARS) transmission[12] and anecdotal reports of disease transmission during aerosolizing procedures, place otolaryngologists at a higher risk for contracting COVID-19. Along with other HCWs directly treating COVID-19 patients, OHNS residents may experience considerable anxiety regarding their personal safety, transmission of the infection, and education. Prior studies of HCWs during the 2002–2003 outbreak of

From the Department of Otolaryngology-Head and Neck Surgery (Y.C., N.T.J., K.C.W., E.A.S., L.T.R., J.L.C.), University of California San Francisco School of Medicine, San Francisco, California, U.S.A.

Additional supporting information may be found in the online version of this article.

Editor's Note: This Manuscript was accepted for publication on April 20, 2020.

[#]These authors contributed equally to this work.

Conflicts of Interests and Financial Disclosure: There are no conflicts of interest nor financial disclosures to note. There is no funding source affiliated with this research study.

Send correspondence to Yi Cai, MD, Department of Otolaryngology–Head and Neck Surgery – UCSF, 2380 Sutter St., 2nd Floor San Francisco, CA 94115. E-mail: yi.cai@ucsf.edu

DOI: 10.1002/lary.28733

SARS[13] showed long-term psychosocial effects among HCWs who cared for SARS patients.[14,15]

Recent recommendations from the American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) and Society of University Otolaryngologists (SUO) necessitated changes to resident clinical responsibilities, rotation schedules, and PPE guidelines during this pandemic. The AAO-HNS released a position statement on March 23, 2020, advising otolaryngologists to limit care to time-sensitive problems and use appropriate PPE.[16] The following day, the SUO Council released recommendations to reduce trainee risk of contracting COVID-19 through minimizing unnecessary exposure to patients as well as social distancing among resident team members.[17] With these guiding principles, varying departmental policies were created in response to COVID-19 during March 2020 because current and projected numbers of cases and resource shortages varied broadly across the country.

To our knowledge, there are no published studies examining practice patterns among residents of any specialty during the initial phase of the COVID-19 pandemic. Thus, we conducted a cross-sectional analysis to evaluate U.S. OHNS residents' practice patterns and perceptions or concerns during the early stages of this pandemic. An understanding of institutional guidelines and differences may help inform programs' policies and identify areas of resident-specific concerns during the COVID-19 pandemic.

MATERIAL AND METHODS

Study Design

This study was approved by the institutional review board at the University of California, San Francisco. An anonymous, online survey (see Supporting Information Appendix S1, available online only) was distributed to U.S. OHNS residents on March 23, 2020, via the Qualtrics survey platform (Qualtrics International, Inc., Provo, UT). Resident contact information was gathered using publicly available e-mail addresses from AAO-HNS Section for Residents and Fellows representatives and resident contacts at 81 institutions. Thus, 39 otolaryngology programs were not contacted because no publicly available resident e-mail addresses were available. We collected basic demographic information, including postgraduate year (PGY), size of program, number of hospitals requiring resident coverage, and geographic location as defined by the U.S. Census regions. Residents in PGY1 through PGY3 were defined as junior residents, whereas PGY4 and PGY5 trainees were defined as senior residents. Survey response collection was closed on March 29, 2020. No response was excluded.

Resident Practice Patterns, PPE, and Perceptions Regarding COVID-19

Respondents were asked when (if applicable) any policy changes had been enacted within their city/county, hospital, and department. Departmental policy changes assessed included those affecting rotation schedules, clinical responsibilities, and aerosol-generating procedures. Each study participant was queried on the specific PPE policies for various clinical scenarios. COVID-19 status was dichotomized into COVID-19-positive or person under investigation (PUI) versus COVID-19-negative or those without symptoms. Lastly, participants were asked about their concerns, satisfaction with their department response, and perceived level of risk for residents and attendings for contracting COVID-19. These Likert-scale responses were scored from 1 to 5.

Statistical Analysis

Responses were collated in Microsoft Excel, version 14.5.3 (Microsoft Corp., Redmond, WA) and Stata (Stata 14.0 College Station, TX). Data were analyzed by chi-squared or *t* tests as appropriate. Kaplan–Meier curves were used to analyze the time to policy change for programs by high versus low numbers COVID-19 infections in their states. The states considered to have high numbers of COVID-19 infections were the 10 states with the greatest numbers of COVID-19 cases on the date the survey was released and included California, Florida, Georgia, Illinois, Louisiana, Massachusetts, Michigan, New Jersey, New York, and Washington. For data regarding institutional policy changes, if multiple participants within the same institution provided differing responses, the most common answer provided by respondents was utilized. If there was no majority, then the most conservative answer

TABLE I.
Demographics of Surveyed Academic Otolaryngology–Head and Neck Surgery Programs (N = 51).

Characteristic	Percent (N)
Number of residents in program	
1–10	14% (7)
11–20	53% (27)
21+	33% (17)
Number of hospital sites requiring resident coverage	
1	6% (3)
2–3	47% (24)
4+	47% (24)
Geographic distribution	
Northeast	20% (10)
Midwest	31% (16)
West	31% (16)
South	18% (9)
Policy for shops in city/county	
Business as usual	0% (0)
A few have closed but most remain open	2% (1)
Many have closed but some remain open	37% (19)
Completely shut down by law (few exceptions)	61% (31)
Policy for main hospital system	
Business as usual	0% (0)
Postponement left to discretion of attending	2% (1)
Some elective surgeries/clinics postponed	16% (8)
All elective surgeries/clinics postponed	82% (42)

suggesting a change in policy was used for analysis. To compare dates of policy changes, we selected the earliest date any type of change related to resident staffing of operating rooms, clinics, or inpatient consults was implemented. The relationship between resident satisfaction and resident risk perception or resident comfort with discussing concerns with their department was analyzed using Pearson's correlation coefficient. We evaluated the association between resident satisfaction and timeliness of enacted policy changes, which was dichotomized into early versus later responders by the average date of policy change for programs included in this study.

RESULTS

We obtained complete survey responses from 82 residents across 51 of 81 institutions contacted. This yielded a program response rate of 63% and represents 43% of all U.S. OHNS residency programs (Table I). The percentages of junior and senior resident respondents were similar (51% and 49%, respectively). Most programs (94%) required resident coverage for at least two hospital sites. All geographic regions were represented, and 67% of states with an OHNS residency program (28 of 42) were included. All programs reported policy changes for local businesses, and almost all hospital systems (82%) had postponed elective surgeries and nonurgent clinic visits. A timeline of OHNS residency programs' policy changes relative to nationwide events is depicted in Figure 1. Overall, there was no difference in time to OHNS departmental policy implementation for programs in states with greater versus fewer numbers of COVID-19 cases (P = .13). The average date of implementation nationwide was March 17, 2020. Dates of implementation followed the pattern of spread of COVID-19 across the United States from Western and Northeastern programs to Midwestern and Southern programs (mean dates of policy changes: March 15, 2020; March 16, 2020; March 17, 2020; March 18, 2020,

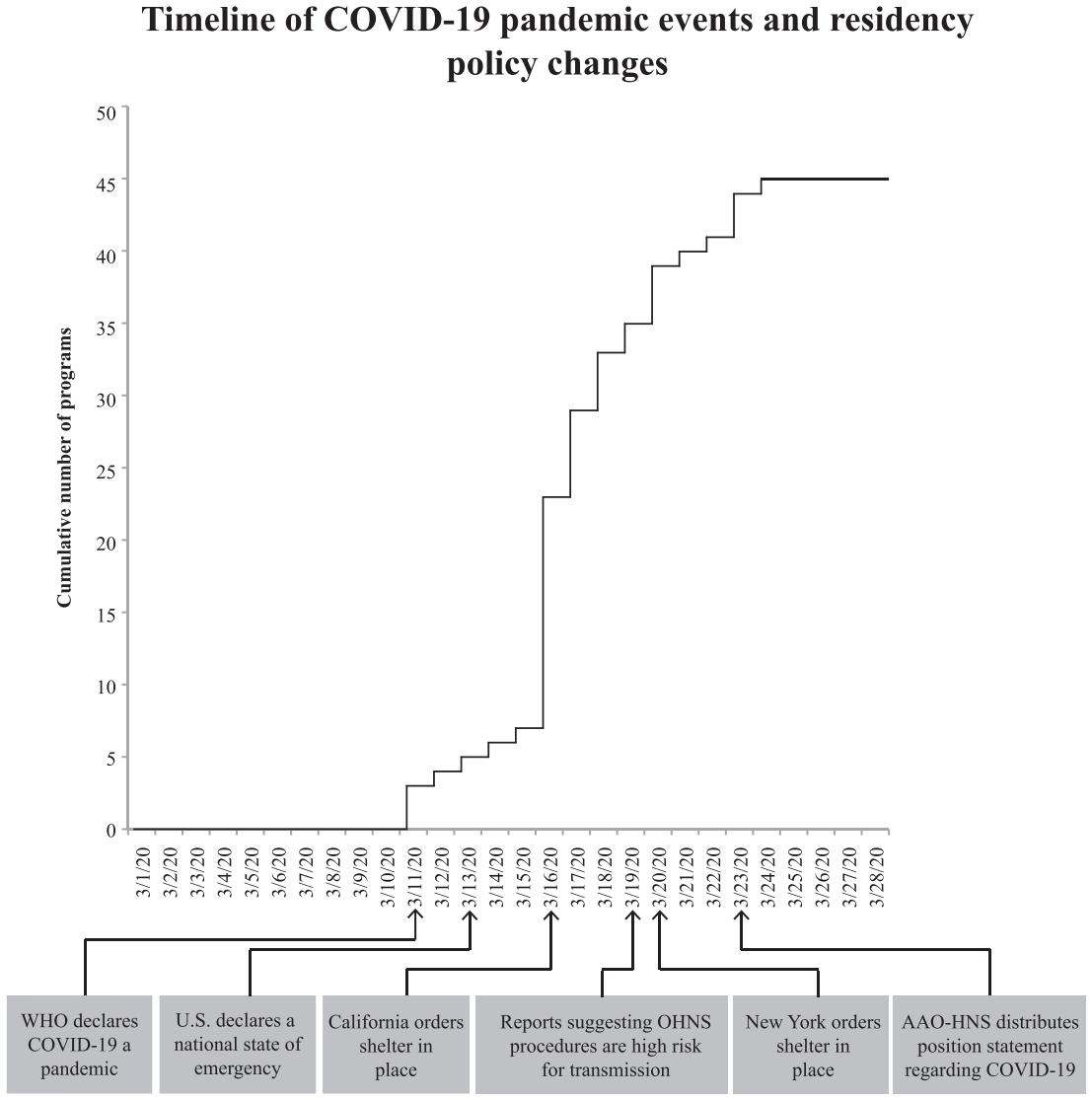

Fig. 1. Timeline of otolaryngology residency program policy changes from March 1, 2020, to March 28, 2020. The curve represents the cumulative number of residency programs (N = 45) implementing policy changes over the time period with referenced governmental policy changes.

respectively). At the time AAO-HNS released a position statement on March 23, 2020, 98% of programs had already implemented their own policy changes. In addition, 96% of programs advised decreased resident coverage in the operating room or clinic, and 92% limited nonurgent inpatient consultations.

TABLE II.
Changes to Resident Staffing and Clinical Practice Across Residency Programs During the COVID-19 Pandemic (N = 51).

Characteristic	Percent (N)
Operating room changes	
No resident staffing of one-surgeon cases	73% (37)
Multisurgeon cases performed by only most experienced providers	67% (34)
Changes to nasal endoscopy, flexible laryngoscopy, or tracheotomy care	
No longer using lidocaine or decongestant sprays	65% (33)
Minimizing frequency of tracheotomy changes	61% (31)
Applying pledgets in nose prior to endoscopy	43% (22)
Nasolaryngoscopy performed by attending or fellow only	18% (9)
Require approval by attending or senior resident	10% (5)
Attending call/rotation changes	
Attendings covering (or covering more) primary call	10% (5)
Attendings covering fewer hospital sites	14% (7)
Resident call/rotation changes	
Senior residents now covering (or covering more) primary call	33% (17)
Residents covering fewer hospital sites	8% (4)
Cohorted residents*	37% (19)
Residents alternating at hospitals weekly	29% (15)

*Cohorting was defined as division of the residency cohort into teams that do not overlap. COVID-19 = coronavirus 2019.

The specific policy changes for resident clinical responsibilities varied between programs (Table II). Over 70% of programs decreased the number of team members in the operating room. Nineteen programs (37%) attempted to mitigate exposure by creating resident cohort groups. Of these 19 programs, 12 created resident cohort schedules that alternated on a weekly basis. Some programs incorporated or increased senior resident (33%) or attending (10%) coverage of the primary call pool. The majority of programs made changes to performance of aerosolizing procedures by halting decongestant/anesthetic spray use (65%) and restricting tracheotomy tube changes to urgent scenarios (61%). For nasolaryngoscopy, 18% of programs required an attending or fellow to perform the procedure, and 10% required attending approval before residents proceeded.

PPE usage policies were also assessed (Fig. 2). For asymptomatic or COVID-19-negative patients, the majority of residents reported use of surgical masks for history and physical exams (80%), and an N95 or powered air-purifying respirator (PAPR) for aerosol-generating procedures (85% and 91%, respectively). In contrast, among COVID-19-positive patients or PUIs, N95 or PAPR use was almost universal.

Resident perception of risk of contracting COVID-19 was queried (Fig. 3). When asked to rate the perceived risk of junior residents relative to senior residents of contracting COVID-19, residents responded differently based on their level of training. The majority of junior residents (64%) and a minority of senior residents (28%) rated junior residents as being at a higher risk of contracting COVID-19 relative to senior residents. There was a significant difference between the average Likert-scale scores between juniors (3.85 ± 0.98) and seniors (3.03 ± 1.05; $P < .05$), with 50% of senior residents reporting equivalent risk among residents. Furthermore, the majority of residents

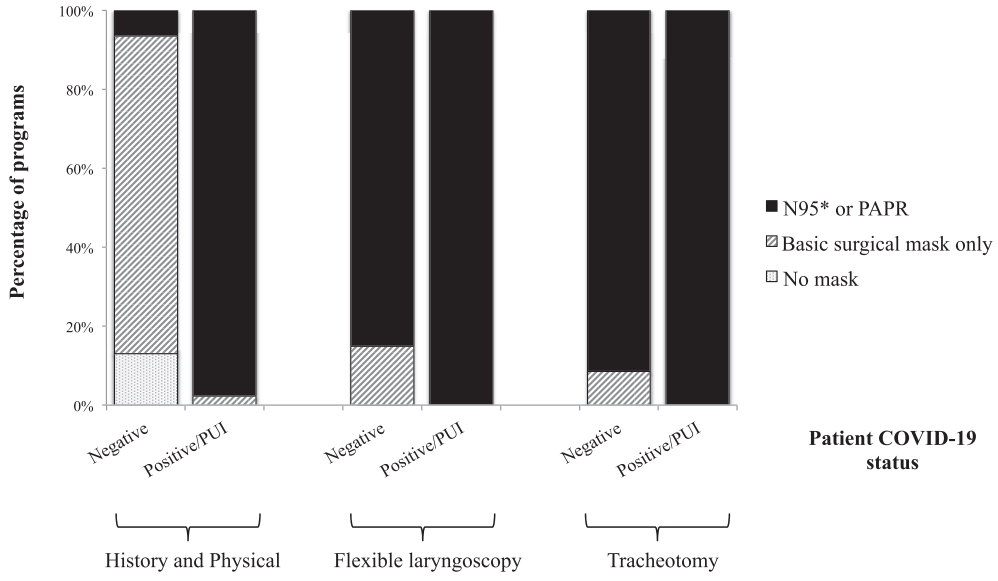

Fig. 2. Resident personal protective equipment practices for common clinical scenarios based on COVID-19 status of patient. *N95 usage refers to N95 masks worn with or without a surgical mask or eye protection. COVID-19 = coronavirus 2019; PAPR = powered, air-purifying respirators; PUI = person under investigation.

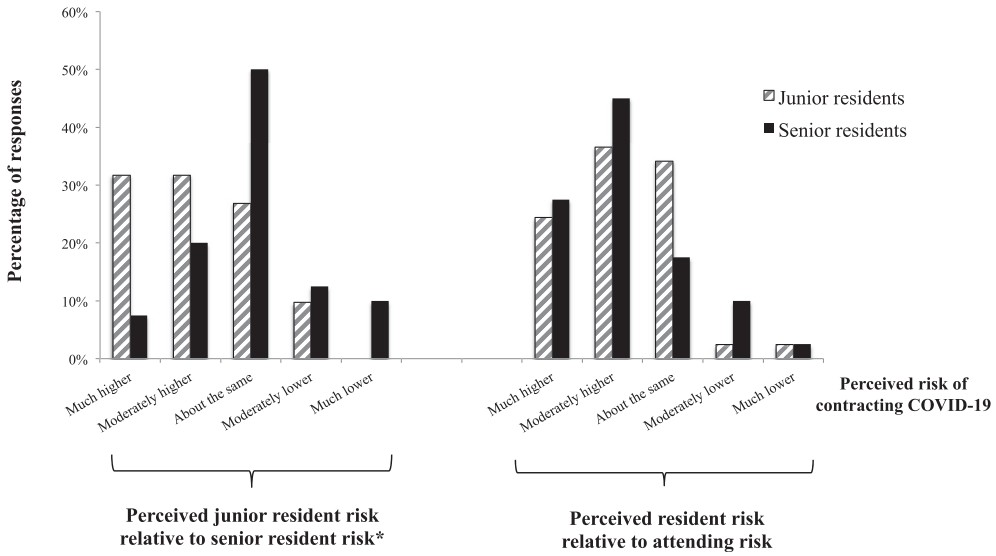

Fig. 3. Resident perceptions of risk for contracting COVID-19 when asked to rate risk level between junior and senior residents and between residents and attendings. Responses from junior (years 1–3 of training) and senior (years 4–5 of training) residents were compared. *There was a statistically significant difference in average scores between junior and senior residents when asked to rate risk level between junior and senior residents ($P < .05$). The majority of residents rated residents at a higher risk level than attendings for contracting COVID-19. COVID-19 = coronavirus 2019.

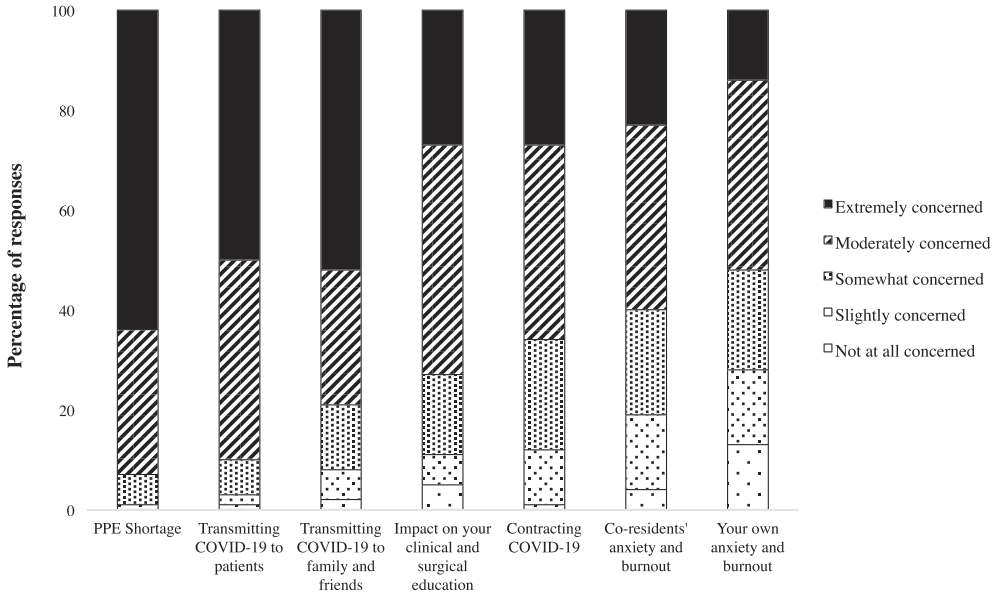

Fig. 4 Resident concerns surrounding the novel coronavirus disease 2019 pandemic based on 82 resident responses. Major areas of concern include PPE shortages and transmitting COVID19 to others. COVID-19 = coronavirus 2019; PPE = personal protective equipment.

at all levels (61% of junior residents; 73% of senior residents) rated a higher risk of contracting COVID-19 when asked to rate risk level between residents and attendings. Only 4% of junior residents and 13% of senior residents perceived a lower risk of contracting COVID-19 for residents compared to attendings. The Likert-scale ratings for resident risk compared to attending risk did not differ between junior and senior residents ($P = .82$).

The areas of greatest concern for residents included PPE shortage, transmitting COVID-19 to patients, and transmitting disease to family or friends. There were extreme or moderate levels of concern about these issues in 93%, 90%, and 79% of survey respondents, respectively (Fig. 4). The effect of COVID-19 on resident education was a significant concern for 73% of respondents, whereas 52% of residents expressed concern about anxiety or burnout for themselves.

Overall, the majority of residents were satisfied with their departments' response to COVID-19 and were comfortable expressing concerns to attendings and department leadership. Seventy-three percent of residents were "extremely satisfied" or "somewhat satisfied" with their

departmental response, and 88% of residents felt "extremely comfortable" or "somewhat comfortable" with communicating their concerns. A minority of residents were dissatisfied with their program response (16%) and uncomfortable communicating their concerns to their department (7%). Satisfaction level was strongly correlated with comfort in communicating their concerns ($r = 0.72$, $P < .00001$) and inversely correlated with resident perception of increased risk of contracting COVID-19 relative to attendings ($r = -0.52$, $P < .00001$). Furthermore, residents at programs with departmental policy changes by March 17, 2020 (the average date of department policy change among programs), had higher average satisfaction scores than residents at programs that implemented changes at a later date (4.23 ± 0.94 vs. 3.30 ± 1.56, $P = .002$).

DISCUSSION

This is the first study to assess the response of OHNS residency programs to a pandemic and resident perceptions of these changes. Our results show timely action by OHNS residency programs across the United States in efforts to both contain the spread of COVID-19 within departments and throughout the broader healthcare system. Almost all programs instituted departmental policies to either reduce resident clinical staffing or limit nonurgent inpatient consults by the time the AAO-HNS released their position statement on March 23, 2020. Most departments made changes to the call schedule, with the major themes of reducing the number of residents within the hospital and minimizing overlaps of teams. Less common adjunctive measures included shared primary call burden by attendings and senior residents.

The majority of residency programs also made changes to the practice of aerosol-generating procedures, such as nasolaryngoscopy, that were congruent with recommendations by the AAO-HNS.[18,19] A majority of programs (63%) eliminated nasal sprays prior to endoscopy. Alternatively, 43% of programs started using pledgets to achieve topical anesthesia or decongestion for endoscopies, which may have value in curbing the sneeze reflex and subsequent aerosolization of droplets. Furthermore, the vast majority of residents started using filtering respirators for aerosol-generating procedures regardless of patient COVID-19 status or symptoms. In a minority of programs, flexible laryngoscopy was performed by only attendings or fellows. These policies are consistent with recently published anesthesiology guidelines[20] which noted that sometimes the most appropriate airway managers are senior-level physicians. Another potential practice change, not assessed in this study, involves laryngoscopy equipment options. An OHNS department in China[21] recommended using the smallest-diameter flexible laryngoscopes available. Meanwhile, our institution has transitioned to disposable flexible video laryngoscopes to further minimize risk of disease transmission during transport and sterile processing of reusable endoscopes.

The changes to tracheotomy care seen in this study echoed similar themes from the AAO-HNS position statement regarding tracheotomy recommendations during the COVID-19 pandemic.[22] Most programs reported a reduction in the frequency of tracheotomy tube changes to prioritize the safety of HCWs. In addition, for COVID-19-positive patients, the AAO-HNS recommended performing tracheotomy no sooner than 2 to 3 weeks after intubation and utilizing heat moisture exchange devices when the patient no longer requires mechanical ventilation, regardless of COVID status. We suspect specific institutional guidelines regarding tracheotomy procedures and routine care will evolve in response to this position statement.

It is notable that two-thirds of the residents who were surveyed perceived their risk of contracting COVID-19 as higher than that of their attendings, and this increased perception of risk correlated with reduced resident satisfaction. Prior studies suggest that risk perceptions among HCWs may have psychosocial implications. In a study of over 10 thousand Singapore HCWs who worked during the 2002 SARS outbreak, 76% perceived a great personal risk of contracting SARS.[14] HCWs at SARS-affected institutions expressed significantly higher levels of anxiety than their counterparts at unaffected institutions,[14] which had ramifications on long-term psychological stress and burnout.[15] A longer duration of perceived risk of contracting SARS also correlated adversely with burnout, posttraumatic stress, and maladaptive coping mechanisms.

Our survey results show that, in addition to creating risk-mitigating policies, OHNS programs have taken measures to manage risk with greater faculty oversight. For example, residents at some programs discussed flexible laryngoscopy with attendings before performing the procedure or attendings performed it themselves. Moreover, attendings and senior residents have increased their share of the call burden at certain programs. Such efforts serve as examples of increased teamwork and communication, which have been shown to reduce perceived risk in a study of HCWs during the 2014 to 2016 Ebola outbreak.[23] Communication within OHNS hospital teams may also serve as a form of social support, which has been shown to be protective against HCW anxiety and stress during the COVID-19 pandemic in Wuhan, China.[24] Taken together, enhanced communication and a supportive network within OHNS departments are vital to survive the high-stress clinical situations associated with the COVID-19 pandemic.

Although concerns about personal anxiety and burnout were least prevalent in our survey, over half of survey respondents were at least moderately concerned about burnout for themselves or for coresidents. Studies on resident burnout suggest that fostering a sense of meaningful work provides residents with purpose and professional satisfaction.[25] Elements that improve meaning in work include direct patient care, intellectual engagement, respect, and community. Clinical practice during the present COVID-19 pandemic presents residents with unique opportunities for meaningful and necessary work in direct patient care. Strategies to enhance intellectual engagement and build community are underway to integrate OHNS residency programs nationally. For instance, the creation of three daily, multi-institutional, OHNS-specific, virtual teaching forums[26–28] has provided residents

with accessible educational opportunities during a time of social isolation. Looking ahead, open communication and an integrated team approach within and between OHNS departments will be essential to provide efficient and thoughtful care to patients and providers alike in the months to come.

There were limitations to this cross-sectional survey study. Our survey represents only 43% of U.S. OHNS residency programs, although this correlates to a larger percentage of total U.S. OHNS residents given that our survey captured over 57% of residency programs with more than 10 residents and all residency programs with more than 20 residents. Thus, our survey results may be less representative of programs with fewer residents. In addition, it is possible that earlier survey responses do not reflect the most current information because policies are rapidly changing at this time, and institutions likely implemented changes in a stepwise process. This may have been further amplified if different programs implemented changes at different rates based on local COVID-19 infection rates. We tried to minimize this limitation by capturing survey responses within a short time interval of 6 days to reflect programs' initial planning phases for the pandemic. Furthermore, self-reflective risk level comparisons are subject to bias, and the elective nature of the survey may allow for selection bias.[23,29] Perceived risk may further change because clinical demands evolve with the pandemic as otolaryngologists at some institutions begin to be redeployed to other departments. Further follow-up surveys of OHNS residents will be essential to characterize practice patterns, perceptions, and stressors for burnout during the course of the COVID-19 pandemic. We believe these efforts are valuable and time-sensitive, particularly as we potentially face multiple waves of the COVID-19 pandemic.

CONCLUSION

The field of OHNS has been responsive to the COVID-19 pandemic across all geographic regions in the United States. Common clinical practice and procedural changes included reducing resident staffing of the operating rooms, limiting nonurgent clinics and consults, creating separate team cohorts, and reducing risks associated with aerosol-generating procedures. OHNS residents are most concerned about PPE shortages and transmitting COVID-19 to others. Overall, the majority of residents were satisfied with their department's response to COVID-19. Residents' satisfaction correlated with their level of comfort in discussing concerns with their attendings and inversely correlated with perceptions of increased risk of contracting COVID-19 relative to their attendings. As our field moves past the initial phase of the COVID-19 pandemic, OHNS residency programs should continue to evolve practice changes in response to resource and clinical needs as well as engage residents in open communication in order to effectively address sources of anxiety related to this healthcare crisis.

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