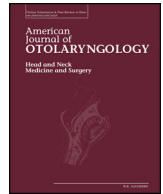




Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



The novel corona virus and rhinology: Impact on practice patterns and future directions

Michael Setzen^{a,b}, Peter F. Svider^{c,d,*}, Sean Setzen^e, Gavin Setzen^{f,g}, Jean Anderson Eloy^{h,i,j,k}, Andrew P. Johnson^l

^a Weill Cornell Medical College, New York, NY, USA

^b Michael Setzen Otolaryngology, PC, Great Neck, NY, USA

^c Bergen Medical Associates, Emerson, NJ, USA

^d Hackensack University Medical Center, Hackensack, NJ, USA

^e Emory University College of Arts and Sciences, Atlanta, GA, USA

^f Albany Medical College, Albany, NY, USA

^g Albany ENT & Allergy Services, PC, Albany, NY, USA

^h Department of Otolaryngology – Head and Neck Surgery, Rutgers New Jersey Medical School, Newark, NJ, USA

ⁱ Center for Skull Base and Pituitary Surgery, Neurological Institute of New Jersey, Rutgers New Jersey Medical School, Newark, NJ, USA

^j Department of Neurological Surgery, Rutgers New Jersey Medical School, Newark, NJ, USA

^k Department of Ophthalmology and Visual Science, Rutgers New Jersey Medical School, Newark, NJ, USA

^l Department of Otolaryngology – Head and Neck Surgery, University of Colorado School of Medicine, Aurora, CO, USA

ARTICLE INFO

Keywords:

Coronavirus

COVID-19

Survey

American Rhinologic Society

ABSTRACT

Objectives: To evaluate the impact of the novel coronavirus pandemic on practice patterns, clinical behavior, personal health, and emotional/psychological concerns of rhinologists.

Methods: A 15-question survey was sent out to the American Rhinologic Society's (ARS) membership to determine the impact of COVID-19 during the crisis. Demographic factors and practice patterns were collected and evaluated.

Results: There were 224 total respondents out of 835 ARS members queried (26.8% response rate). Study queries were sent in April 2020. Notably, 17.8% reported illness in themselves or their staff and 74.4% noted a psychological/emotional impact. A plurality of rhinologists noted their practice volume and in-office procedure volume has become 20.0% and 0.0% of their prior volumes, respectively. In addition, 96.2% were noted to be using telemedicine in our subspecialty.

Conclusion: In addition to severely impacting volume and the perception of future decreases in patients and revenue, the COVID-19 pandemic has had a physical and emotional impact on rhinologists in ways that need to be further studied. These data include significantly novel and objective information. The COVID-19 crisis also reveals the important role of telemedicine in rhinology. Guidelines regarding personal protective equipment for in-office visits, nasal endoscopy, and other in-office and operating room procedures would be particularly helpful as future waves are expected.

1. Introduction

The novel coronavirus disease COVID-19 has had a profound impact on patients and healthcare providers worldwide. As otolaryngologists, particularly in the field of rhinology and endoscopic skull base surgery, the potential for increased virus exposure is even greater because COVID-19 resides in the nasopharynx and upper airway. Providing care in a safe environment for patients, physicians, and the supporting staff has become more challenging because rhinologists and endoscopic skull

base surgeons commonly perform aerosol generating procedures, especially during diagnostic endoscopic procedures involving the nose, paranasal sinuses and nasopharynx, and also surgical procedures, especially those involving powered instrumentation utilizing micro-debrider devices and surgical drills.

Practice patterns have significantly been impacted in different parts of the country. Otolaryngologists are modifying their practice workflow and patient management to reduce risk of exposure to patients, themselves, and their staff. One of these potential changes involves the

* Corresponding author at: Bergen Medical Associates, 466 Old Hook Road, Suite 1, Emerson, NJ, USA.

E-mail address: psvider@gmail.com (P.F. Svider).

Table 1
Survey sent out examining rhinologists' attitudes towards the COVID-19 pandemic.

(1) What region is your practice located in?	Northwest	South	West	Midwest							
(2) What is your practice setting?	Private	Academic	Other								
(3) Have you completed a rhinology fellowship?	Yes	No									
(4) What percentage of your practice is rhinology?	0–25%	25–50%	50–75%	75–100%							
(5) How many years have you been in practice?	0–5	6–10	11–15	16–20	> 20						
(6) As the COVID-19 Pandemic has progressed, how many patients have you seen in person in clinic? (10 = normal number of patients, 5 = 50% of normal patient volume, 0 = not seeing patients in person?)	0	1	2	3	4	5	6	7	8	9	10
(7) During the COVID-19 Pandemic, what have you used for PPE for patients coming in with sinonasal complaints? Mark all that apply:	N95 Masks	Surgical masks	No mask	Gowns	Gloves	Eye protection	Other				
(8) For those still seeing patients as the COVID-19 Pandemic has progressed, how have your nasal endoscopy volume changed (10 = normal amount, 5 = 50%, 0 = not performing nasal endoscopy)	0	1	2	3	4	5	6	7	8	9	10
(9) After the COVID-19 crisis passes, what PPE will you use when performing nasal endoscopy? (Mark all that apply)	N95 mask	Surgical mask	Gown	Gloves	Other						
(10) As the COVID-19 Pandemic has progressed, how has your in-office procedure volume been impacted (10 = normal amount, 5 = 50%, 0 = no longer doing in-office procedures)	0	1	2	3	4	5	6	7	8	9	10
(11) After the COVID-19 crisis passes what PPE will use when performing in-office rhinologic procedures? (Mark all that apply)	N95 mask	Surgical mask	Gown	Gloves	other						
(12) Have you started utilizing telemedicine in your practice during the COVID-19 Pandemic?	Yes	No									
(13) Have you or any of your clinic staff members become infected with COVID-19?	Yes	No									
(14) After the COVID-19 crisis do you anticipate a significant decrease in patient volume and revenue?	Both	Patient volume	Revenue								
(15) Has the COVID-19 crisis affected you psychologically/emotionally?	Yes	No									

Table 2
Demographics of survey respondents.

	% of respondents
Region of practice	
Northeast	27.3%
West	18.5%
Midwest	19.9%
South	34.3%
Practice setting	
Private	63.3%
Academic	31.7%
Other	5.0%
Completed rhinology fellowship?	
Yes	46.6%
No	53.4%
What percentage of your practice is rhinology?	
0–25%	3.6%
25–50%	20.7%
50–75%	29.7%
> 75%	45.9%
How many years have you been in practice?	
0–5 years	18.4%
6–10 years	11.7%
11–15 years	14.3%
16–20 years	13.9%
> 20 years	41.7%

utilization of telemedicine [1,2]. Furthermore, implementing mitigation efforts has curtailed practice operations and in many areas elective surgical procedures and in-office procedures have been dramatically reduced or ceased completely. This survey serves to capture the impact of the coronavirus pandemic on current rhinologic practice patterns in the United States. In addition, we remain concerned about measuring impact on physician wellness during this difficult time. These data could help inform responses to future crises and be used to guide post-pandemic practice recovery measures.

2. Methods

A 15-question survey was sent out to the American Rhinologic Society (ARS) membership (Table 1) on Monday April 13, 2020 and Friday April 17, 2020. There were 835 ARS members, including current regular, fellows and international members, queried, making for a 26.8% response rate. All respondents are referred to as rhinologists in this study. The survey was created using the Google forms function feature, and all responses were anonymous. Individual responses were available, allowing for comparison by demographic factors asked within the survey. In addition to demographic questions, questions relating to clinical and practice behavior during the pandemic were included. Particular attention was placed on questions regarding safety patterns, including personal protective equipment (PPE) patterns utilized during the COVID-19 crisis, as this is something that impacts not only the individual otolaryngologist but also staff members.

Responses were compiled by the Google forms features offered by Google. After receiving responses, they were evaluated by the authors both in isolation as well as in comparison by region of practice. Statistical analysis included Chi-Square comparison of categorical data, with threshold for significance set at $p < 0.05$. Statistical comparison was performed using SPSS version 20 (Chicago, IL). All data were collected in April 2020. This project was granted IRB exemption through the University of Colorado on initial exempt application.

3. Results

Out of the ARS membership receiving this study, we had 224 total study responses; not every individual responded to every question (Table 1). A plurality of respondents practiced in the South (24.3%) (Table 2), while a clear majority was in private practice (63.3%). A majority was non-fellowship-trained (53.4%). Most respondents noted that rhinology comprised a majority of their practices (Table 2). A plurality (41.7%) noted having been in practice for > 20 years.

Nearly one-quarter of rhinologists are not seeing any patients as the

Table 3
COVID-19 crisis questions.

10 = 100% of normal volume, 5 = 50% normal patient volume, 0 = 0% patient volume	
As the COVID-19 pandemic has progressed, how has your patient volume in clinic been impacted?	
10	0.9%
9	2.3%
8	0.0%
7	0.5%
6	1.4%
5	0.9%
4	1.8%
3	9.0%
2	20.3%
1	41.0%
0	22.1%
For those still seeing patients as the pandemic has progressed, how has your nasal endoscopy volume changed?	
10	1.0%
9	1.0%
8	0.5%
7	0.0%
6	0.0%
5	1.9%
4	0.5%
3	5.7%
2	10.5%
1	42.1%
0	36.8%
How has your in-office procedure volume been impacted as the COVID-19 pandemic has progressed?	
10	1.4%
9	0.9%
8	0.0%
7	0.0%
6	0.0%
5	1.8%
4	0.9%
3	2.3%
2	6.8%
1	28.8%
0	57.2%

COVID-19 pandemic has progressed (Table 3), with a plurality (41.0%) noting that they are seeing 10% of their typical volume. For those still seeing patients, 42.1% performed nasal endoscopy in 10% of their patients, while 36.8% are not performing nasal endoscopy at all. The majority (57.2%, Table 3) are not performing in-office procedures as the pandemic has progressed. It is important to note that we count nasal endoscopy with debridement under nasal endoscopy.

In terms of PPE, N95 masks are the most common protective masks donned, with 80.8% using these for patients coming in for sinonasal complaints, 54.3% using these when performing nasal endoscopy, and 58.4% using these when performing in-office procedures apart from nasal endoscopy (Table 4). Gloves were used by 87.2% when seeing patients with sinonasal complaints, 82.8% when performing nasal endoscopy, and 85.8% when performing in-office procedures (Table 4). Note that these figures were for the mid-April dates for which we sent out surveys.

Of respondents, 96.2% reported incorporating telemedicine into their practices, and 74.4% reported anticipating a decrease in patient volume or revenue following the pandemic (Fig. 1). 82.0% reported COVID-19 infections in them or their staff (Fig. 2), and 74.4% of respondents reported being impacted psychologically/emotionally by the sequelae of the pandemic.

Upon comparison of findings by region of practice, several findings were noted. Significant differences were noted, with a significantly greater proportion of rhinologists and staff members in the Northeast becoming infected (32.2%) versus those in the West, South, and

Table 4
Characteristics of personal protective equipment (PPE) utilized by rhinologists.

During the COVID-19 pandemic, what have you used for PPE for patients coming in with sinonasal complaints? Mark all that apply.	
N95	80.8%
Surgical mask	55.7%
No mask	2.3%
Gowns	45.2%
Gloves	87.2%
Eye protection	81.7%
After the crisis passes, what PPE will you be using when performing nasal endoscopy?	
N95	54.3%
Surgical mask	49.3%
No mask	9.0%
Gowns	29.9%
Gloves	82.8%
Eye protection	73.8%
After the crisis passes what PPE will you be using when performing in-office Rhinologic procedures?	
N95	58.4%
Surgical mask	51.1%
No mask	4.1%
Gowns	53.4%
Gloves	85.8%
Eye protection	79.0%

Midwest (23.3%, 10.8%, and 7.0%, respectively) ($p < 0.05$). In terms of emotional/psychological sequelae, no significant differences were noted among these regions: there were 79.1%, 81.4%, 67.6%, and 86.7% noting emotional/psychological sequelae in the Midwest, Northeast, South, and West respectively (p -value > 0.05). Telemedicine usage did not significantly differ among regions ($p > 0.05$), with 97.7%, 94.9%, 96.0%, and 97.5% utilizing this technology in the Midwest, Northeast, South, and West, respectively.

4. Discussion

The COVID-19 crisis has had a severe impact on U.S. citizens from a public health and mortality perspective as well as an economic standpoint. As of this writing, there are $> 40,000$ deaths, a number sure to significantly rise by the time of publication. With the shutdown of the U.S. economy portending unemployment rates exceeding 13%–15% [3], the secondary effects of this public health emergency also harbor additional societal impacts. Furthermore, healthcare workers on the frontlines face significant risks of illness and even death. While not considered “frontline” workers in the same way as those working in the emergency department, intensive care unit, or intubating patients, otolaryngologists do face special risks, as the virus resides in high concentration in the nasal cavity, nasopharynx, and oropharynx. Hence, there has been anecdotal evidence suggesting procedures such as nasal endoscopy place healthcare providers and assisting staff at increased likelihood of contracting disease [1,2]. Understanding how rhinologists have been impacted thus takes on special importance for designing guidelines encompassing how to proceed during the current crisis as well as in future expected waves.

Interestingly, the vast majority of rhinologists have been performing fewer than 20% of the number of nasal endoscopies that they were performing pre-COVID-19 (Table 3). A plurality noted they performed approximately 10% of their typical nasal endoscopy volume during the COVID-19 crisis. This is consistent with and obviously relates to the fact that rhinologists are only seeing 10% of patients relative to before the pandemic (Table 3), and 22.1% are not seeing patients at all during this public health emergency. Several considerations are likely responsible for this. There are concerns with exposure due to the fact that the virus resides in the very areas nasal endoscopy is being performed, and anything that aerosolizes viral particles or leads to mucosal contact leads to a significant risk profile for both the rhinologist as well as any assisting staff. In addition, most states banning elective cases precludes

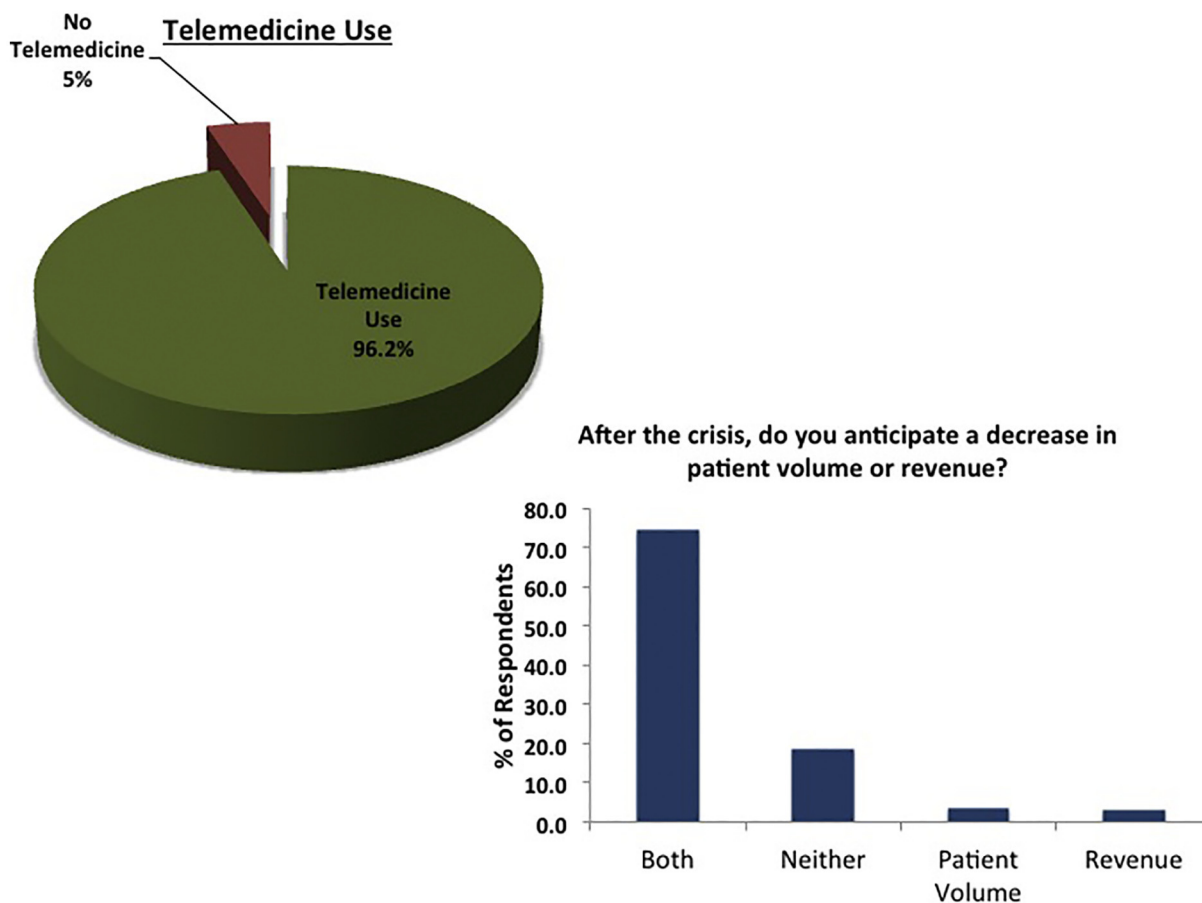


Fig. 1. Telemedicine use (top left panel) during the COVID-19 crisis. Attitudes regarding whether a decrease in patient volume or revenue are expected after the COVID-19 crisis (bottom right panel).

or delays the immediate need for nasal endoscopy in many instances. Finally, although there is no definite data available at this time, some practitioners may be considering imaging as an alternative to nasal endoscopy during this time as a way of minimizing risk [1,2].

The vast majority of rhinologists have incorporated PPE including N95 masks, gloves, and eye protection for all patients coming in with sinonasal complaints (Table 4). Furthermore, these numbers persist with regard to gloves and eye protection for those still performing nasal endoscopy and in-office procedures. For in-office procedures, greater than half of respondents reported utilizing surgical masks and gowns, while only a quarter of individuals reported using gowns for nasal endoscopy. Hence, there have been differences among rhinologists in choice of PPE, emphasizing the need for standardized guidelines released by our specialty's organizations. There has been anecdotal evidence that procedures aerosolizing nasal particles and impacting nasal mucosa (such as during endoscopy) as well as performing endoscopic endonasal procedures without appropriate PPE can lead to significant disease spread; what exactly is the correct type of PPE is something that needs to be clarified in order to safely proceed with practice during the current crisis and future waves. Anecdotally, the Stanford Rhinology group has suggested that the use of PAPR masks in the operating room should be the standard in protecting both the surgeon and staff members for minimizing infection, especially if the patient tests positive for COVID-19.

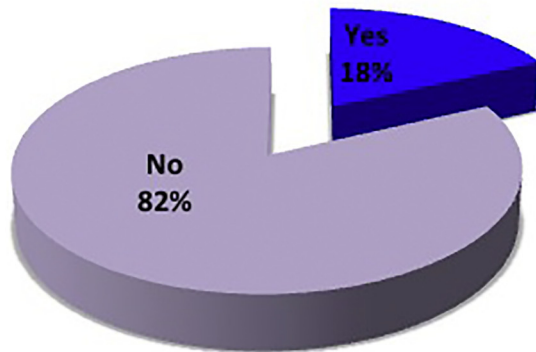
The overwhelming proportion of rhinologists (96.2%) have incorporated telemedicine during the COVID-19 crisis (Fig. 1). This may be tied into recent billing changes from the Centers for Medicaid and Medicare Services (CMS), in which initial telehealth visits can now be billed at the same rates as in-person visits [1,2,4] retroactive to the beginning of March 2020. Many commercial insurance providers have

followed suit in these reimbursement practices. These visits minimize risk to rhinologists and their staff and allow for the majority of rhinologic issues to be dealt with in a contactless manner. These visits can be used to determine which patients would need to be scheduled for subsequent nasal endoscopy.

There has been prior debate about whether rhinologic patients are amenable to telehealth visits, as several studies have noted ear-related complaints to be most accommodating to these [5,6]. Nonetheless, the current survey demonstrates rhinologic visits are also accommodating and may be critical for maintaining patient care as well as revenue stream. Having guidelines released by organizations and societies such as the American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAO-HNSF) and the ARS codifying which situations are appropriate for telemedicine versus which patients require in person evaluation may be helpful for rhinologists as the COVID-19 pandemic progresses and with future waves in mind [1,2].

Another important practice consideration is the impact the COVID-19 pandemic is having on both physician and staff wellbeing. In terms of physical health, approximately 18% of respondents reported that they or their staff had contracted COVID-19 in recent months (Fig. 2). Whether this relates to nasal endoscopy, direct patient contact, or has no relation to the workplace is unknown and merits further consideration in subsequent analyses. In addition to a physical impact, there is concern with practitioners regarding an emotional or psychological impact that can be short-term or long-term. Significantly and perhaps surprisingly, three-quarters of respondents noted such an impact during the COVID-19 crisis (Fig. 2). Several news reports have suggested a potential for healthcare workers to suffer long-term sequelae such as Post-Traumatic Stress Disorder (PTSD) once this pandemic “passes” [7–9] and the, AAO-HNSF, the ARS and other relevant

COVID-19 Infections (You or your staff?)



Affected psychologically/emotionally?

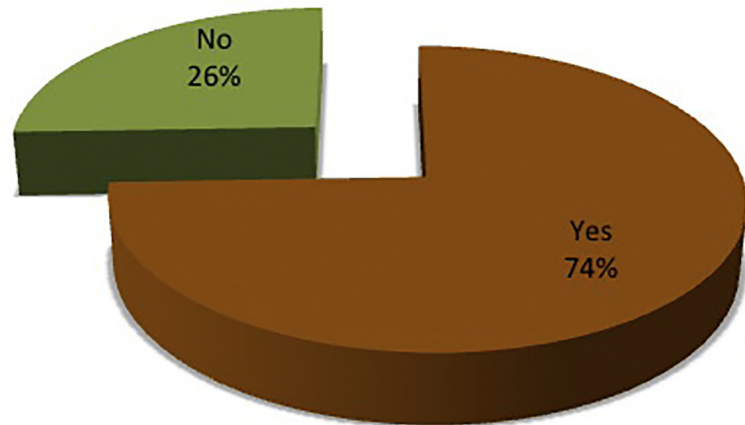


Fig. 2. Were any COVID-19 infections contracted by rhinologists or their staff (top panel)? Were rhinologists' impacted psychologically or emotionally (bottom panel)?

organizations should probably make resources available to address this potential consequence, particularly with such an overwhelming number of rhinologists reporting an emotional or psychological impact. Furthermore, these experiences may contribute to burnout among otolaryngologists, a topic that has been well documented in previous analyses [10–14]. Prior analyses have noted numerous factors contributing to otolaryngology burnout, including hours per week worked, younger age, length of time in practice, and being married and having children [10]. Another study noted moderate burnout in two-thirds of academic otolaryngologists, a figure that was greater among women and microvascular surgeons; for academic otolaryngologists, reporting burnout greatly increased the chances of leaving academics within 1–2 years [13]. Experiencing stresses related to COVID-19 and developing PTSD may certainly facilitate the incidence of burnout, something that should be studied after this pandemic ends.

One of the few differences noted by demographics included regional differences in infectivity, with respondents from the Northeast noting far higher infectivity rates (32.2%) relative to other areas. An obvious consideration is that differences in infection rates are a manifestation of overall disease prevalence in the said area, although this may be speculative. Besides this, there were no regional differences in emotional/psychological sequelae or the use of telemedicine; furthermore, there were no significant geographic differences noted among other clinical behaviors. We intentionally left the emotional/psychological impact question vague as these issues may arise from considerations in both the workplace and out of the workplace and nonetheless would still have a potential downstream impact on burnout, PTSD, and other factors; this represents a future invaluable area of study.

5. Limitations and future directions

To our knowledge, this is the first survey examining attitudes and practice patterns among rhinologists amidst the COVID-19 pandemic. There are several limitations the authors would be remiss not to comment upon. Some of these limitations are inherent to surveys. The addition of more survey questions would have been invaluable in detailing practice behavior during this difficult time, but there is a link between an increasing number of questions and a decreased response rate [15,16]. Another weakness deals with the type of questions asked. With a finite number of questions, some were asked in a yes/no manner, others involved answers on a scale to 10, while others asked respondents to check all that apply. Considering these were different types of questions, combining them in a statistical manner is limited with this study design.

Another potential shortcoming dealt with our focus applying what was felt were the most common concerns the authors have had in their own practices, as there are certainly other valuable questions that could have been asked. For example, we did not query as to how otolaryngologists/staff members contracted disease, although in many case individuals would not be able to answer this definitively regardless. Finally, it would be of interest to repeat this questionnaire should another wave occur, particularly if additional guidelines from organizations such as the AAO-HNSF and the ARS are released and clinical behavior is changed as a result. These are certainly challenging times for everyone involved, and perhaps with greater preparation the answers to a similar survey might be much different in the future.

6. Conclusion

In addition to severely impacting practice volume and the perception of future decreases in patients and revenue, the COVID-19 pandemic has had a physical impact and significant emotional impact on rhinologists in ways that need to be further studied. Information regarding testing and treatment are necessary, as well as resources addressing the emotional sequelae of this disease, as this survey results bring up concerns regarding PTSD and burnout among rhinologists.

The COVID-19 crisis also reveals a significant potential role for telemedicine in our subspecialty, and guidelines regarding PPE for in office visits, nasal endoscopy, and other in-office and operating room procedures would be helpful particularly as future waves are expected. As rhinologists may be at particular risk for contracting disease due to traditional reliance on nasal endoscopy for diagnosis and procedural intervention, examining alternatives such as imaging (including in-office CT when available) should be considered and merits further study as well as mention in any future guidelines released by our specialty's organizations.

Declaration of competing interest

None.

References

- [1] Pollock K, Setzen M, Svider PF. Embracing telemedicine into your otolaryngology practice amid the COVID-19 crisis: an invited commentary. *Am J Otolaryngol* 2020. in press.
- [2] Setzen M, Svider PF, Pollock K. COVID-19 and rhinology: a look at the future. *Am J Otolaryngol* 2020. in press.
- [3] The New York Times. The unemployment is probably around 13 percent Available at <https://http://www.nytimes.com/2020/04/03/upshot/coronavirus-jobless-rate-great-depression.html>.
- [4] Medicare telemedicine health care provider fact sheet. Centers for Medicare & Medicaid Services Available at <http://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet>, Accessed date: 20 March 2020.
- [5] Gilani S, Bommakanti K, Friedman L. Electronic consults in otolaryngology: a pilot study to evaluate the use, content, and outcomes in an academic health system. *Ann Otol Rhinol Laryngol* 2020;129:170–4.
- [6] McCool RR, Davies L. Where does telemedicine fit into otolaryngology? An assessment of telemedicine eligibility among otolaryngology diagnoses. *Otolaryngol Head Neck Surg* 2018;158:641–4.
- [7] CNBC. Could you get PTSD from your pandemic experience? The long-term mental health effects of coronavirus Available at <https://http://www.cnbc.com/2020/04/17/long-term-mental-health-ptsd-effects-of-covid-19-pandemic-explained.html> Accessed April 18, 2020.
- [8] Galea S, Merchant RM, Lurie N. The mental health consequences of COVID-19 and physical distancing: the need for prevention and early intervention. *JAMA Intern Med* 2020. <https://doi.org/10.1001/jamainternmed.2020.1562>. Online ahead of print.
- [9] Psychology Today. Bracing for an epidemic of PTSD among COVID-19 workers Available at <https://http://www.psychologytoday.com/us/blog/the-aftermath-trauma/202004/bracing-epidemic-ptsd-among-covid-19-workers>.
- [10] Fletcher AM, Pagedar N, Smith RJ. Factors correlating with burnout in practicing otolaryngologists. *Otolaryngol Head Neck Surg* 2012;146:234–9.
- [11] Geelan-Hansen K, Anne S, Benninger MS. Burnout in otolaryngology-head and neck surgery: a single academic center experience. *Otolaryngol Head Neck Surg* 2018;159:254–7.
- [12] Golub JS, Johns 3rd MM. From burnout to wellness: a professional imperative. *Otolaryngol Head Neck Surg* 2018;158:967–9.
- [13] Golub JS, Johns 3rd MM, Weiss PS, Ramesh AK, Ossoff RH. Burnout in academic faculty of otolaryngology-head and neck surgery. *Laryngoscope* 2008;118:1951–6.
- [14] Judge PD, Haynes DS, Tawfik KO. Professional disappointment as a cause of burnout. *Otolaryngol Head Neck Surg* 2018;158:977–8.
- [15] Kost RG, de Rosa JC. Impact of survey length and compensation on validity, reliability, and sample characteristics for ultrashort-, short-, and long-research participant perception surveys. *J Clin Transl Sci* 2018;2:31–7.
- [16] Sahlqvist S, Song Y, Bull F, et al. Effect of questionnaire length, personalisation and reminder type on response rate to a complex postal survey: randomised controlled trial. *BMC Med Res Methodol* 2011;11:62.